COMPENDIUM

Society for Community Mobilization for Sustainable Development
(MOBILIZATION), New Delhi

11th National Seminar

on

Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World

5th-7th March, 2024

Organised by:
Society for Community Mobilization for Sustainable Development (MOBILIZATION), New Delhi

In association with
Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur

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MPUAT, Udaipur, Rajasthan

March, 2024, 11th National Seminar

11th National Seminar on *"Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World"* 5th - 7th March, 2024, organized by Society for Community Mobilization for Sustainable Development in collaboration with MPUAT, Udaipur, Rajasthan

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कलराज मिश्र
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संदेश

मुझे यह जानकर प्रसन्नता हुई है कि महाराणा प्रताप कृषि एवं प्रौद्योगिकी विश्वविद्यालय, उदयपुर एवं सोसायटी फॉर कम्युनिटी मोबिलाइजेशन फॉर सस्टेनेबल डबलपमेंट, नई दिल्ली के संयुक्त तत्वावधान में 'परिवर्तनशील कृषि एवं सतत विकास' विषयक राष्ट्रीय संगोष्ठी का आयोजन किया जा रहा हैं।

जलवायु परिवर्तन के इस दौर में फसलचक्र भी प्रभावित हुआ है। रासायनिक उर्वरकों के अति प्रयोग, भूमि की क्षीण होती उर्वरा शक्ति और कृषि की भविष्य की चुनौतियों के संदर्भ में यह जरूरी है कि भारतीय परिप्रेक्ष्य में सतत विकास के आलोक में खेती का विकास हो। कृषि में तकनीक के साथ प्रकृति से जुड़ी स्थितियां, जैविक खाद और पोषण के परिप्रेक्ष्य में सुनियोजित कार्य जरूरी है। विश्वास है संगोष्ठी में इस विषयक विमर्श होगा।

मेरी हार्दिक शुभकामनाएं हैं।

(कलराज मिश्र)

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सत्यमेव जयते

मुख्य मंत्री
राजस्थान

संदेश

मुझे यह जानकर प्रसन्नता है कि महाराणा प्रताप कृषि एवं प्रौद्योगिकी विश्वविद्यालय, उदयपुर और सोसायटी फॉर कम्यूनिटी मोबिलाइजेशन फॉर सस्टेनेबल डेवलपमेंट, नई दिल्ली के संयुक्त तत्वावधान में 'परिवर्तनशील कृषि एवं सतत विकास' विषय पर उदयपुर में राष्ट्रीय संगोष्ठी का आयोजन किया जा रहा है। साथ ही, इस अवसर पर एक स्मारिका प्रकाशित की जा रही है।

वर्तमान में कृषि को एक ऐसे नए दृष्टिकोण की जरूरत है, जो पोषण सुरक्षा, पर्यावरण संबंधी स्थिरता और भूति की उत्पादकता के उद्देश्यों के बीच संतुलन स्थापित करे। इसका एक व्यावहारिक समाधन प्राकृतिक खेती में निहित है, जिसे देश के यशस्वी प्रधानमंत्री श्री नरेन्द्र मोदी जी भी अपनी योजनाओं के जरिये प्रोत्साहन दे रहे हैं। प्राकृतिक खेती सतत विकास के लक्ष्यों को हासिल करने में भी मददगार साबित हो सकती है।

मैं आशा करता हूँ कि यह संगोष्ठी वैज्ञानिकों द्वारा किए गए नवाचारों और शोध परिणामों की राष्ट्रीय स्तर पर चर्चा कर कृषि सुधार हेतु नीति निर्धारण में सहायक होगी।

मैं संगोष्ठी के आयोजन और स्मारिका के प्रकाशन की सफलता के लिए अपनी शुभकामनाएं प्रषित करता हूँ।

(भजन लाल शर्मा)

कैलाश चौधरी
KAILASH CHOUDHARY

कृषि एवं किसान कल्याण
राज्यमंत्री
भारत सरकार
MINISTER OF STATE FOR AGRICULTURE
& FARMERS WELFARE
GOVERNMENT OF INDIA

संदेश

कृषि, देश के समग्र विकास, ग्रामीण आय बढ़ाने और राष्ट्र की खाद्य एवं पोषण सुरक्षा को बनाए रखने हेतु भारत की अर्थव्यवस्था का आधार है। भारत के पास दुनिया का दूसरा सबसे बड़ा कृषि योग्य भूमि संसाधन, 20 कृषि-जलवायु क्षेत्र और दुनिया में मौजूद सभी 15 प्रमुख जलवायु उपलब्द्घ हैं। कृषि वैज्ञानिकों, किसानों एवं सरकार के प्रयासों ने देश को एक तरफ खाद्य सुरक्षा जरूरतों को पूरा करने में सक्षम बनाया है, साथ ही लाखों लोगों को रोजगार भी दिया है। आजादी के बाद भी कृषि क्षेत्र देश की 50 प्रतिशत से अधिक आबादी के लिए आय और आजीविका का प्रमुख स्रोत बना हुआ है। खाद्य उत्पादन में विश्व स्तर पर भारत ने अपनी एक अलग पहचान बनाई है किन्तु आज भी कई चुनौतियाँ बनी हुई हैं। अस्थिरता और जलवायु परिवर्तन का मुद्दा स्पष्ट होता जा रहा है, जिस पर यदि ध्यान नहीं दिया गया, तो इस क्षेत्र के विकास पर गंभीर प्रभाव पड़ सकता है।

भारत सरकार ने टिकाऊ कृषि को प्राथमिकता दी है और इसके लिए कई उपाय शुरू किए हैं। विविध पहलों के माध्यम से स्मार्ट और टिकाऊ कृषि के लिए शुरू से अंत तक सहायता प्रणाली विकसित करने के प्रयासों को सुव्यवस्थित किया जा रहा है। आज,चुनौतियों का सामना करने के लिए विज्ञान और प्रौद्योगिकी तथा बदलती दुनिया के लिए कृषि पर पुनर्विचार को एकीकृत करने की आवश्यकता है।

मुझे यह जानकर खुशी हुई किसतत विकास एवं सामुदायिक गतिशीलता के लिए मोबिलाइजेशनसोसायटी नई दिल्लीएवं महाराणा प्रताप कृषि एवं प्रौद्योगिकी विश्वविद्यालय (एमपीयूएटी) उदयपुर के सहयोग से 5-7 मार्च, 2024 के दौरान एक बहुत ही प्रासंगिक विषय, "परिवर्तनकारी कृषि और सतत विकास: बदलती दुनिया के लिए कृषि पर पुनर्विचार" पर 11वीं राष्ट्रीय संगोष्ठी, आयोजित की जा रही है।

मैं आयोजकों को बधाई देता हूं और संगोष्ठी की सफलता की कामना करता हूं।

(कैलाश चौधरी)

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कैलाश चौधरी
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सत्यमेव जयते

कृषि एवं किसान कल्याण
राज्यमंत्री
भारत सरकार
MINISTER OF STATE FOR AGRICULTURE
& FARMERS WELFARE
GOVERNMENT OF INDIA

MESSAGE

Agriculture and allied sectors form the core strength of India's economy as a vehicle of inclusive growth, enhancing rural income and sustaining food and nutritional security of the nation. India has the 2nd largest arable land resource in the world, 20 agro-climatic regions and all 15 major climates that exist in the world. These inherent strengths, coupled with government focus have enabled the country to meet food security needs on the one hand while gainfully employing millions on the other. Over the seven decades since independence, this sector has shown strong resilience against a diverse set of adversities and has remained a key source of income and livelihood for more than 50 percent of the country's population. Despite its critical role and significant thrust from the Government to sustainably nurture the sector, challenges persist. The issue of unsustainability and climate change is becoming evident, which if remains unattended, could severely impact growth of the sector.

The Government of India has prioritized sustainable agriculture and initiated several measures towards the same. Efforts have been streamlined for developing an end-to-end support system for smart and sustainable agriculture through diverse initiatives. To meet the challenges there is a need to integrate science and technology and Rethinking Agriculture for a Changing World.

I am happy to Know that the 11th National Seminar on a very relevant topic, "Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World" during March 5 -7, 2024, is being organised by Society for Community Mobilization for Sustainable Development (MOBILIZATION) New Delhi in association with Maharana Pratap University of Agriculture and Technology (MPUAT) Udaipur .

I congratulate the organisers and wish the seminar all success.

(Kailash Choudhary)

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शोभा करांदलाजे
SHOBHA KARANDLAJE

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Government of India
D.O. No.....MOS(A&FW)/VIP/2022-23/

Message

Indian agriculture is unique with 20 agro-eco regions, and 80 agro-eco sub-regions growing more than 100 crops. There is a large untapped potential in Indian agriculture to become the growth engine for the sustainable development of India as large yield gaps are existing. However, the challenges of growing water scarcity, increasing land degradation, growing population, urbanization, and most importantly impacts of climate change. Building a future strategy for sectoral growth and reflecting on the nation's accomplishments is crucial. Indicating its resiliency, India's agriculture sector has grown during the pandemic. But in the years to come, sustainability will become increasingly important as the threat posed by climate change grows. A vibrant agricultural sector forms strong connections with other economic sectors, making it a crucial cornerstone of rural development. Enhancing rural livelihoods involves empowering people in rural areas. It also involves effectively involving rural communities and individuals in the management of their own social, economic, and environmental goals.

It is a matter of great pride that science and technology led strategy ensured spectacular food grain production and health in sustaining food security of the nation. However, adoption of these advanced technology now needs to be combined with grassroot innovations.

I am upbeat to discover that the Society for Community Mobilization for Sustainable Development (MOBILIZATION) New Delhi is sorting out a National Seminar, "Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World" during March 5-7, 2024 in a joint effort with Maharana Pratap University of Agriculture and Technology (MPUAT) Udaipur .

I hope the seminar will sharpen the researchers, argumentation experts and different stakeholders about emerging challenges in agriculture and related scientific solution and their application to guarantee improvement of efficiency and productivity.

Shobha Karandlaje

(Shobha Karandlaje)

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सत्यमेव जयते

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Secretary (DARE) &
Director General (ICAR)

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कृषि अनुसंधान और शिक्षा विभाग एवं
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कृषि एवं किसान कल्याण मंत्रालय, नई दिल्ली–110 001

GOVERNMENT OF INDIA
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Message

I am happy to know that Society for Community Mobilization for Sustainable Development (MOBILIZATION) is organizing 11th National Seminar on "Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World", during March 5–7, 2024 at Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur.

Today, the Indian agriculture sector is at crossroads of transformation. The modern resource-intensive farming techniques introduced during the green revolution have reached their limits. With the support of technological advancements in improved crop and animal varieties, fertilizers, pesticides, irrigation, and mechanization, agriculture has transformed from a "subsistence" to a "profit" industry. This has met the expected demand for agricultural goods and services, but it has done so without considering the detrimental effects of the reduction in the quantity and quality of available resources. However, people's knowledge of nutrition, food safety, and the environmental effects of modern farming methods is expanding. Nowadays, corporations are redefining farming and fostering its development to elevate it to a global standard. For sustainable agriculture there is a need for optimal utilization of water resources, new irrigation infrastructure and balanced use of fertilizers, among other priorities for the agriculture sector. Thus, this is an opportune time to expand sustainable agriculture methods that will advance this objective while enhancing productivity, the environment, and public health.

Economic, environmental and social sustainability is increasingly gaining the attention of academia, policy makers and commitment in the policies of national economies. Global warming and climate change, weather disasters and disruptions are just some of the challenges that can drastically disrupt stable business models, and thus jeopardize sustainability. Agriculture, as an activity at the centre of the value chain, is facing these problems, and, at the same time, contributes to feeding the growing world population and is responsible for conserving resources and ensuring sustainability. Priority should be given to enhancing the agriculture value chain's long-term resilience and raising farmer incomes via ethical and sustainable farming methods. I do hope that the deliberations in National Seminar will address the key interventions necessary to take Indian agriculture on a sustainable pathway.

I wish the Seminar a grand success.

(Himanshu Pathak)

21st February, 2024
New Delhi

सत्यमेव जयते

कृषि वैज्ञानिक चयन मंडल
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प्रतिभा की खोज In search of talent कृ.वै.च.मं. कृषि वैज्ञानिक चयन मंडल

डॉ संजय कुमार एफ एन ए, एफ एन ए स सी, एफ एन ए ए एस सी, एफ सी आई एस आई
अध्यक्ष
Dr. Sanjay Kumar FNA, FNASc, FNAASc, FCISI
Chairman

Dated: 22/02/2024

MESSAGE

By 2050, we will need to feed almost 9 billion people, requiring a 70% increase in food production. However, climate change throws additional challenges at our already resource-stressed agricultural sector. Innovation and building climate resilience are crucial for securing our food supply.

Smallholder farmers, who produce a substantial portion of the world's food, often lack access to timely and accurate information for farm management, affordable and appropriate technologies, risk-reduction insurance, and funding for expansion.

Sustainable agriculture demands not just increased output, but also efficient use of scarce resources, climate resilience and mitigation and improved human well-being.

With great anticipation, I mark the upcoming 11th National Seminar on "Transformative Agriculture and Sustainable Development," hosted by the Society for Community Mobilization for Sustainable Development (MOBILIZATION) New Delhi and Maharana Pratap University of Agricultural and Technology (MPUAT) Udaipur from March 5-7, 2024.

This seminar brings together scientists, extension professionals, entrepreneurs, and stakeholders to devise strategies for enhancing profitability and building a sustainable future for agriculture.

We extend our best wishes for a successful and impactful event!

(Sanjay Kumar)

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उप महानिदेशक (कृषि शिक्षा)
Dr. Rakesh Chandra Agrawal
Deputy Director General (Agril. Edn.)

MESSAGE

Sustainable agriculture is an integrated systematic approach to plant and animal production and distribution that protects the environment, expands the Earth's natural resource base, and makes the most efficient use of nonrenewable resources. The sustainable development principle, which states that we must meet the needs of the present without compromising the needs of future generations, is adopted by this approach to agriculture.

While there is no single solution to sustainable agriculture, transformational changes can be envisioned and implemented to perpetuate good stewardship of the natural systems that farms depend on. Reconnecting people with nature and policymakers with reality could be achieved through education and training. The integration of focus sustainability is an issue that has clearly gained momentum over recent years within the agricultural industry at large, as well as specifically within institutions of agricultural research and higher education.

While innovative technology is being developed to improve input efficiency, policy changes pertaining to infrastructure, pricing, and market dynamics are also imperative. Mapping out the technologies that are currently available and developing effective extension strategies and agricultural education are also important to ensure that farmers have access to them quickly and effectively.

I appreciate the joint endeavour of the Society for Community Mobilization for Sustainable Development (MOBILIZATION) New Delhi and Maharana Pratap University of Agricultural and Technology (MPUAT), Udaipur to organize a National Seminar on a very relevant topic, Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World" during March 5 -7, 2024.

I hope the deliberations in the seminar will bring forth the major relevant issues for sustainable development, success stories as well as constraints at farmers' fields, which will be useful in devising future strategies for Rethinking Agriculture for a Changing World.

(R.C. Agrawal)

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डॉ. ऊधम सिंह गौतम
उप महानिदेशक (कृषि विस्तार)
Dr. U.S. Gautam
Deputy Director General (Agril. Extn.)

MESSAGE

The agricultural sector is a central pillar of the Indian economy, employing 60 percent of the nation's workforce and contributing to about 18.3 percent Share of GVA of agriculture and allied sectors in total economy. A vibrant, resilient and sustainable agricultural sector will be crucial to achieving many of the proposed SDGs, as agriculture is a key factor in determining outcomes from poverty levels and food security, to health, gender equality, and a range of environmental issues. India have developed a clear understanding of how to make transformative changes in their often complex and diverse agricultural and food systems that would enable them to address these kinds of key cross-sectoral issues in a coordinated way. Despite a sizeable increase in the per capita production of food and ample grain production, hunger and malnutrition are far from being eradicated.

Rural India has transformed over the last few decades, bringing about new challenges that go beyond agriculture and include non-farm economic activities. The sector faces multiple challenges, including lagging yields in key crops as compared to global averages, restricted market access, lack of competitive prices for produce, and limited water availability. The latter leaves farmers to rely on rain-fed agriculture severely impacted by climate change. All these factors have eroded farm incomes, created increased pressure on government subsidies, and affected rural livelihoods. Despite of all challenges, the recent agriculture sector reforms empower Indian farmers to connect directly with buyers and sell their agricultural produce beyond their local market places to reduce their dependence on intermediaries to achieve optimum price realization. The removal of barriers of marketing enables farmers to enter contract farming with private sector players and establish a framework for price guarantees and purchase of their agricultural produce.

I am happy to know that 11thNational Seminar entitled "Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World" is being organised by Society for Community Mobilization for Sustainable Development (MOBILIZATION) New Delhi In association with Maharana Pratap University of Agriculture and Technology (MPUAT) Udaipur during March 5 -7, 2024. The theme of the seminar is appropriate and need of the hour. I hope the output of the seminar will be highly valuable in updating the knowledge base of the farming community on the technology' know how of the latest technology aspects.

I sincerely extend my wishes to the organisers a grand success.

(U S Gautam)

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Maharana Pratap University of Agriculture and Technology

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महाराणा प्रताप कृषि एवं प्रौद्योगिकी विश्वविद्यालय

विश्वविद्यालय परिसर, उदयपुर - 313 001 (राजस्थान), भारत

डॉ. अजीत कुमार कर्नाटक
कुलपति

Dr. Ajeet Kumar Karnatak
Vice-Chancellor

No. PS/VC/MPUAT/2024/ 74
Date: 13th February, 2024

Message

It is a matter of great pleasure that the Society for Community Mobilization for Sustainable Development (MOBILIZATION), New Delhi in association with Maharana Pratap University of Agriculture and Technology, Udaipur is organizing 11th National Seminar on "Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World" during March 5 -7, 2024 at Udaipur. I am honored to be a part of an event that highlights the multidimensional facets of agriculture and its significance in our lives.

Agriculture is a major contributor to India's economy and accounts for about 18 per cent of the country's GDP; it provides employment to nearly 50 per cent of India's population Rapid.advancement in technology is revolutionizing the agricultural sector in India, but the domain still faces several challenges that impact its productivity in particular and sustainability by and large. Although the Green Revolution had been successful in feeding a rapidly growing human population, it has also depleted the earth's soil, its biodiversity and contributed to rapid climate change. We must move quickly to transform agriculture by employing a suite of practices known as regenerative agriculture. Unless we act now, we will not have a livable planet for tomorrow. Governments, businesses, scientists and civil society groups must focus attention on sustainability issues while ensuring food security of the present. It is need of the hour to establish an exchange forum at the national level to identify and discuss issues across a range of disciplines, to enhance the ability of farmers to face challenges and make the agrarian community sustainable for the socioeconomic empowerment of society at large.

I hope that the experts and delegates in the seminar will actively engage in the discussions and take full advantage of the learning opportunity. I extend my warmest greetings to each one of you as we embark on a journey of knowledge and exploration in the beautiful city of lakes, Udaipur. I congratulate the organizers for their unstinted efforts in organizing this seminar.

13.02.24

(Ajeet Kumar Karnatak)

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सदस्य (प्राकृतिक संसाधन प्रबंधन)
Dr. B. S. Dwivedi
Member (Natural Resource Management)

Dr. B.S. Dwivedi
Member (NRM) ASRB
New Delhi

MESSAGE

An environment-friendly, productive, and profitable agriculture is essential, as it continues to be the primary means of subsistence for the vast majority of the hungry and poor, and a source of livelihood for millions of producers and traders. In addition to ensuring higher output, the path towards sustainable agriculture must redress climate change, and ensure an efficient use of the finite natural resources. Given the financial and other resource constraints, it would be essential to prioritize the means to create a workable, less resource-intensive, and more advantageous mechanism, by examining the inter-connections among the different problems and opportunities for evolving suitable decision-making strategies.

I am happy to learn that the Society for Community Mobilization for Sustainable Development (MOBILIZATION), New Delhi is hosting the 11th National Seminar on "Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World" on March 5-7, 2024 at Maharana Pratap University of Agriculture and Technology, Udaipur.

I hope the deliberations on innovative ways of transforming Indian agriculture would help to achieve the sustainable development and enhanced farm income. The Seminar will also provide a platform for knowledge-sharing and newer collaborations among the stakeholders.

I extend my best wishes for a grand success of the National Seminar.

(B.S. Dwivedi)

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डॉ. मेजर सिंह
सदस्य (पादप विज्ञान)
Dr. Major Singh
Member (Plant Science)

MESSAGE

The degree of agricultural development in a country determines its developmental trajectory. If a country cannot feed its people, it cannot grow or even survive. Therefore, any country in need of sustainable economic growth and development must prioritize food security. The Government of the country has to provide for the basic dietary needs of its people in terms of both quantity and quality. This highlights the importance of relevant knowledge, abilities, and attitudes gained through agricultural education in order to improve food production. To ensure a regenerative and sustainable agriculture system, fundamental changes need to be implemented at the policy level regarding the restoration and management of our natural environment. Innovations in agriculture are crucial to manage the challenges related to food crisis, climatic extremities, and inclusive growth. The recent advancements in the areas of breeding and genetic engineering, water management, nutrient and pest management, information and communication technologies, value addition, and entrepreneurship in crop and livestock sectors hold immense potential for the betterment of farming community and their livelihoods. The focus has to be laid upon empowering farmers to harness the benefits of these new technologies and approaches.

The efforts of public and private sectors in dissemination of technologies have been commendable. However, there is a need for convergence and stakeholders' participation to ensure the attainment of the goal of sustainable development. It is my sincere hope that some of the crucial interventions required to move Indian agriculture towards sustainability will be discussed at the National Seminar on "Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World", during March 5-7, 2024 jointly organised by Society for Community Mobilisation for Sustainable Development, New Delhi and Maharana Pratap University of Agricultural and Technology (MPUAT), Udaipur.

I appreciate the efforts of organisers for successful Seminar.

(Major Singh)

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डॉ. एस. पी. किमोठी
सदस्य (पशु विज्ञान एवं मत्स्य विज्ञान)
Dr. S. P. Kimothi
Member (Animal Science & Fisheries Science)

D.O. No. PPS/MEM/ASRB/2024
Dated: February 20, 2024

MESSAGE

Sustainable agricultural methods, eco-friendly technologies, and nature-positive approaches are the foundation of innovative food systems. Agricultural policies that are environment friendly and embrace pro-farmer and pro-agriculture practices are urgently needed. A paradigm shift in food systems is therefore the need of the hour.

Agriculture continues to be the backbone of Indian economy and rural livelihoods. All efforts have to be made to make the sector more vibrant and lucrative. Therefore, generation and speedy dissemination as well as judicious utilization of novel farming technologies must take utmost priority. Besides striving towards food and livelihood security; attainment of social equity, climate resilience and sustainable development goals too need serious attention for inclusive growth in the country.

Extension system has a vital role to play in keeping the farmers of our country continuously updated with modern agricultural technologies to enhance income and overcome the emerging crises related to climate change, production constraints, global competitiveness and sustainability of natural resources.

I am glad to learn that a National Seminar on "Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World" is being organized by the Society for Community Mobilization for Sustainable Development, New Delhi and Maharana Pratap University of Agricultural and Technology (MPUAT), Udaipur during March 5 -7, 2024

The scientists, extension professionals and other stakeholders will get an excellent opportunity of cross-learning from their experiences in resource–efficient production technologies, entrepreneurship development and income enhancement.

I extend my best wishes for successful organization of the seminar.

(Shiv Prasad Kimothi)

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Dr. J.P. Sharma
Former Vice-Chancellor
Sher-e-Kashmir University of Agricultural Sciences &
Technology of Jammu-180 009, J&K
President, Society for Community Mobilization for Sustainable Development (MOBILIZATION)

Message

With over half of the country's population directly or indirectly dependent on agriculture for their livelihood, it remains a cornerstone of India's socio-economic fabric. The sector not only provides food for the nation but also serves as a source of raw materials for various industries, including textiles, sugar, and pharmaceuticals. Moreover, the agricultural sector plays a crucial role in India's trade dynamics and accounts for a significant portion of the country's exports. Additionally, agriculture serves as a buffer against economic shocks, providing stability to rural economies and mitigating the impacts of inflation and external market fluctuations. Despite its paramount importance, the sector is facing the interconnected challenges of food security, environmental sustainability, climate change, and rural development. However, transformative agricultural practices hold promise in bolstering the resilience and adaptability of farming systems to combat and recover from these challenges effectively.

Established in 2003, the Society for Community Mobilization for Sustainable Development (MOBILIZATION) has evolved into a robust professional body boasting over 1800 esteemed members, including academicians, scholars, development planners, fellow farmers, and grassroots mobilizers. Notably, we are proud to welcome approximately 20 foreign members into our fold. Over the years, MOBILIZATION has expanded its scope and activities to provide our members with a dynamic platform for sharing professional insights and addressing emerging challenges. Our initiatives span a diverse range, from orchestrating ten successful national seminars to disseminating pertinent literature and producing the quarterly research journal "Journal of Community Mobilization for Sustainable Development" (online ISSN 2231 6736, print ISSN 2230 9047), which has received a commendable rating of 5.02 from the National Academy of Agricultural Sciences (NAAS) (ID-J171). Through these endeavors and more, MOBILIZATION remains committed to advancing sustainable development goals and fostering meaningful dialogue and collaboration within our community. We look forward to continuing our journey towards a more sustainable and equitable future, guided by our shared vision and collective efforts.

I am delighted to share that the Society for Community Mobilization for Sustainable Development in association with Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur, is organizing the 11th National Seminar on Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World from 5th -7th March 2024. Considering the pressing global challenges we face, particularly in the realm of food security, environmental sustainability, and socioeconomic development, this conference aims to foster dialogue and collaboration among experts, practitioners, policymakers, and stakeholders in the agricultural and allied sectors. By reimagining the role of agriculture in a rapidly changing world, we seek to explore innovative approaches, technologies, and strategies that can drive transformative change towards a more sustainable and equitable future. Additionally, it will catalyze identifying actionable solutions and charting a course towards a more resilient and inclusive agricultural system.

It is with immense satisfaction and delight that MOBILIZATION is bringing out a distinctive souvenir and an abstract book for this occasion. I extend my deepest gratitude to all individuals who have selflessly contributed their time and efforts to ensure the success of this national endeavor.

(J.P. Sharma)

DIRECTORATE OF RESEARCH
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Dr. Arvind Verma
Director Research

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/MPUAT/2024/6215 DATE: 26/02/2024

Message

It's a matter of great pleasure that Society for Community Mobilization for Sustainable Development, New Delhi in association with Maharana Pratap University of Agriculture and Technology, Udaipur is organizing 11th National Seminar on "Transformative Agriculture and Sustainable Development: Rethinking Agriculture for a Changing World" from 5th –7th March, 2024.

The seminar is immensely important due to its potential to address critical global challenges in agriculture. By fostering discussions, sharing insights, and promoting collaborative efforts, such a seminar can contribute significantly to the pursuit of sustainable development goals. From ensuring global food security to mitigating the impacts of climate change, enhancing biodiversity conservation, and promoting economic development, the seminar provides a platform to explore innovative solutions and rethink traditional agricultural practices.

This seminar will provide a great scope for networking and foster fruitful partnerships between various stakeholders. The keynote and plenary talks from leading scientists, experts and research scholars, as well as the oral and poster presentations in the various scientific sessions, will provide the participants with the most up-to-date information in the field and insights for addressing the current societal needs.

I hope that the seminar will be intellectually rewarding and beneficial to students, young researchers and faculty. I convey my warm greetings and best wishes for the success of the event.

Director Research

Dr. Arvind Verma
Director Research
Directorate of Research
MPUAT, Udaipur

Preface

The global agricultural landscape stands at a pivotal moment. As we navigate the complexities of climate change, dwindling natural resources and a burgeoning population, the need for transformative agriculture has never been more urgent. In the pursuit of sustainable development, rethinking our approach to agriculture is not just advisable; it is imperative. At the heart of this imperative lies the recognition that agriculture cannot continue with business as usual. Traditional farming methods, reliant on intensive chemical inputs and monoculture practices, have taken a toll on the environment, degrading soil health, polluting water sources and contributing to biodiversity loss. Moreover, these practices often perpetuate cycles of poverty and food insecurity, particularly in rural communities across the Global. However, amidst these challenges, lies an opportunity for innovation and transformation. The concept of transformative agriculture encompasses a holistic approach that seeks to reconcile agricultural productivity with environmental stewardship and social equity. It is about shifting from short-term gains to long-term resilience, from exploitation to regeneration, and from exclusion to inclusivity.

Furthermore, transformative agriculture recognizes the interconnectedness of social, economic, and environmental dimensions. It emphasizes the importance of empowering smallholder farmers, particularly women and marginalized communities, who are disproportionately affected by the impacts of climate change and global market dynamics. Through access to land, resources, and markets, smallholders can play a pivotal role in driving sustainable agricultural development, while also safeguarding rural livelihoods and cultural heritage.

Moreover, rethinking agriculture for a changing world requires a paradigm shift in our approach to food systems. From farm to fork, food systems should prioritize nutrition, food sovereignty and food justice. This entails promoting diversified diets, reducing food waste, and ensuring equitable access to nutritious food for all. Moreover, fostering local food economies and shortening supply chains can enhance food security, resilience, and community cohesion. Furthermore, transformative agriculture necessitates policy reforms and institutional support to create an enabling environment for sustainable farming practices. This includes investing in agricultural research and extension services, reforming subsidies to incentivize sustainable practices, and strengthening land tenure rights for smallholder farmers. Fostering multi-stakeholder partnerships and knowledge-sharing platforms can facilitate the exchange of best practices and accelerate the adoption of transformative agricultural approaches. It is time to sow the seeds of change and cultivate a more sustainable and resilient agricultural future for generations to come. This Seminar will be indeed fruitful in extracting out the latest technologies and dissemination of same among students, researchers and policy makers.

We record our sincere gratitude to Dr Ajeet Kumar Karnataka, Hon'ble Vice Chancellor, MPUAT, Udaipur for his inspiration, continuous guidance and untiring support to make the seminar successful. We are also thankful to Dr J.P. Sharma, President, Mobilization society for his consistent guidance and motivation in organisation of the seminar. Thanks are due to ICAR, New Delhi for financial support for this academic endeavour. Sincere gratitude to all those who have expressed their wishes through messages for success of the event. We are deeply indebted to all the conveners and committee members for their sincere efforts in making necessary arrangements for the seminar. We are also thankful to all the participants for their contribution aligned to give this seminar a great success.

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Sh Amandeep	:	ICAR-IARI, New Delhi	Member
Sh Fatheen Abrar	:	ICAR-IARI, New Delhi	Member
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Sh. Bharat Singh Kharwar	:	Lab Asst. Dept. of Soil Science	Member
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Dr. Kamlesh Meena	:	Associate Professor, CDFT, MPUAT, Udaipur	Member
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Dr. Vishakha Bansal	:	Professor, Dept. of EECM, CCAS, MPUAT, Udaipur	Member
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Dr. Deepak Rajpurohit	:	Associate Professor, CTAE, MPUAT, Udaipur	Member
Function: *The committee members will facilitate the medical help and provide details of taxi and others to the guests and participants for tour excursion.*			

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Dr. Gaytri Tiwari	:	Professor, CCAS, Udaipur	**Convener**
Dr. Sumitra Meena	:	Asst. Prof., CCAS, MPUAT, Udaipur	Member
Function: *The committee members will arrange cultural programme and contact folk artists for the same.*			
Programme Compeering Committee			
Dr. Gaytri Tiwari	:	Professor, CCAS, Udaipur	**Convener**
Dr. Girijesh Singh Mahra		ICAR-IARI, New Delhi	Member
Dr. Sonu Mehta	:	Guest Faculty, CCAS, Udaipur	Member
Function: *The committee will conduct the inaugural and valedictory function, arrange for ICAR and Kulgeet, National Anthem.*			

CONTENTS

Lead Paper-1

Harnessing Innovations for Agrifood System Transformation: Pathways to Sustainable Agriculture and Development

J.P. Sharma[1] and Reshma Gills[2]

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[2]Scientist, ICAR-Central Marine Fisheries Research Institute, Kochi, Kerala

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Agriculture serves as the cornerstone of human civilization, offering sustenance, livelihoods, and economic stability to societies globally. Its importance goes beyond simple crop cultivation and animal husbandry; agriculture moulds cultures alters landscapes, and influences economies. It provides essential raw materials for diverse industries and fuels rural development by stimulating infrastructure investments and generating employment, particularly in developing nations where many depend on farming for their livelihoods. As per the Food and Agriculture Organization (FAO, 2022), agriculture engaged 866 million individuals in 2021, constituting 27% of the worldwide workforce. Despite its modest economic scale, the sector holds significant importance in combatting malnutrition and hunger, with over 820 million individuals enduring chronic undernourishment as of 2021 (UN, 2022). Additionally, it supplies vital nutrients and sustenance to billions, with smallholder farmers responsible for producing over 80% of the world's food (Herrero *et al.*, 2017; Ritchie, 2021). As the most populous country globally, India's agriculture sector plays a crucial role in meeting the diverse demands for food production and nutrition. According to the Economic survey (2023), the agriculture sector's share in India's GDP stood at around 17-18%. While agriculture's contribution to GDP has gradually declined over the years due to the growth of other sectors, it remains a crucial source of employment, engaging around 50% of the country's workforce (Chand and Singh, 2022).

Despite being a crucial sector for the country's economy, India's agrifood system grapples with numerous challenges that impede its efficiency, sustainability, and inclusivity. One significant challenge is the issue of low and unstable incomes for farmers (Nandi *et al.*, 2022). According to the National Sample Survey Office (NSSO) data, the average monthly income of a farming household in India is substantially lower than that of non-farming households (NSO, 2021). Additionally, farmers often face price volatility for their produce, leading to income uncertainty (Sekhar, 2004; Abokyi *et al.*, 2020). Another challenge is the fragmented nature of landholdings, with a majority of farmers owning small plots of land, which hinders economies of scale and limits their ability to invest in modern technology and machinery (Niroula *et al.*, 2005; Manjunatha *et al.*, 2013; Baruah *et al.*, 2022), while water scarcity and inadequate irrigation infrastructure exacerbate agricultural vulnerabilities, particularly in rain-fed regions (Bhattacharyya *et al.*, 2015; Rao *et al.*, 2015; Gomiero, 2016; Sathyan *et al.*, 2018; Kuchimanchi *et al.*, 2021). Climate change and soil degradation further undermine the sector's sustainability. Furthermore, inadequate access to credit and institutional finance remains a concern for many farmers, particularly smallholder farmers (Kumar *et al.*, 2020; NABARD, 2023). The COVID-19 pandemic exacerbated these challenges, highlighting vulnerabilities in agricultural supply chains and disrupting market access for farmers (Dilnashin *et al.*, 2021; Rasul, 2021; Vyas *et al.*, 2021; Karunarathna *et*

al., 2023). To tackle a range of interlinked challenges and unlock the sector's complete potential for sustainable development, alterations to India's traditional agrifood systems are essential.

Agrifood System Transformation

Agrifood System Transformation refers to the comprehensive overhaul of the entire food system, encompassing agricultural production, processing, distribution, consumption, and waste management (Ericksen, 2008; Conti *et al.*, 2024). This represents a paradigm shift in how we produce, distribute, and consume food, with a focus on sustainability, resilience, and equity (Fassio and Tecco, 2019; Rockström *et al.*, 2020). This transformation entails reimagining agricultural practices to prioritize regenerative and climate-smart approaches, transition towards more sustainable and resilient farming practices and promote agroecological approaches that promote soil health, biodiversity, and ecosystem resilience and aims to address pressing challenges such as food insecurity, malnutrition, environmental degradation, and inequitable distribution of resources (FAO, 2017a; Day and Cramer, 2022; Acharya, 2023; Simon-Rojo, 2023). It also involves redesigning food supply chains to prioritize local sourcing, reducing food waste, enhancing value chains and market linkages, improving equitable access to nutritious and culturally appropriate foods, addressing food insecurity and malnutrition with enhanced transparency and traceability, and fostering inclusive growth and rural development while empowering smallholder farmers and marginalized communities (Krishnan *et al.*, 2020; Wang *et al.*, 2022; Herrero *et al.*, 2023). Agrifood system transformation recognizes the interconnectedness of social, economic, and environmental factors within the food system and seeks to create a more equitable, resilient, and sustainable way of food production (Mausch *et al.*, 2020; McGreevy *et al.*, 2022). By integrating principles of social justice, environmental stewardship, and economic viability, transformative agrifood systems hold the potential to create a more resilient, equitable, and sustainable food system for present and future generations (El Bilali *et al.*, 2021). FAO (2021) introduced a strategic framework comprising four pillars to drive transformative development in the agrifood system: better production, better nutrition, better environment, and better living, collectively known as the 4Bs. These objectives can be realized through the implementation of four cross-cutting accelerators: technology, innovation, data and information, and complementary factors such as governance, human capital, and institutions. By leveraging various technological and institutional innovations at each stage, the transformation of agrifood systems can be accelerated, fostering resilience to meet present demands and effectively address existing challenges (Figure 1).

i) *Better production*: Improved production aims to promote sustainable patterns of production and consumption by enabling inclusive and effective food and agricultural supply chains on a local and global scale. Its goal is to develop agrifood systems that are resilient and sustainable, especially in the face of shifting surroundings and climates. This entails encouraging sustainable agricultural methods to support productivity and food security while protecting ecosystems and sustainably managing natural resources, as well as increasing productivity to support producers' income and guarantee an abundance of commodities within communities. It also means fighting illicit fishing to protect fishing livelihoods, enhancing community resilience through more efficient use of freshwater, and using sustainable forest management techniques to support local economies while protecting natural resources.

ii) *Better nutrition*: It is a multifaceted endeavour aimed at eradicating hunger, attaining food security, and enhancing nutrition across various aspects, encompassing the advocacy for nutritious foods and the expansion of access to wholesome diets. This

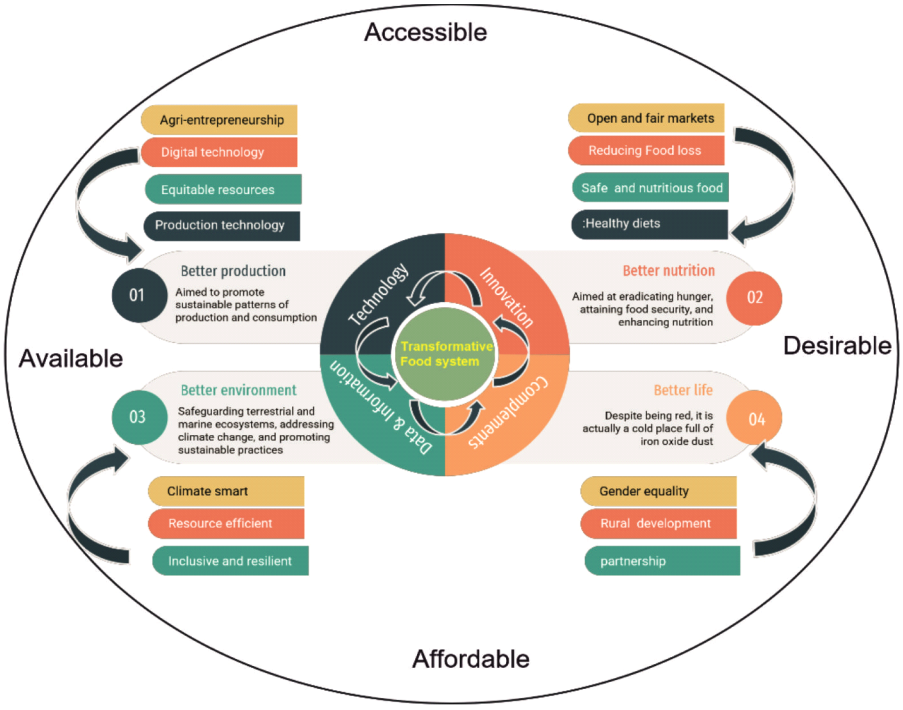

Figure 1: Strategies for transforming agrifood system (Source authors, conceptualised from FAO, 2021)

encompasses several key objectives, including the reduction of undernourishment, particularly in the critical early years of life, to nurture healthy and productive individuals. Additionally, it involves ensuring a consistent supply of healthy foods to promote overall well-being and enhancing food security to stabilize prices and improve access, particularly for marginalized populations. Furthermore, efforts are directed towards enhancing food safety measures to safeguard public health, especially in vulnerable demographics like mothers and children, against non-communicable diseases. Finally, better nutrition initiatives also focus on optimizing food distribution systems to minimize loss and waste while fostering community self-sufficiency.

***iii) Better environment*:** The pursuit of a better environment is crucial in safeguarding terrestrial and marine ecosystems, addressing climate change, and promoting sustainable practices like reduce, reuse, recycle, and residual management. Key initiatives include conserving endemic biodiversity to sustain local communities' reliance on endemic species for food, agriculture, and medicine, as well as safeguarding local breeds to uphold traditional livelihoods. Moreover, implementing climate-smart agricultural practices and policies helps mitigate climate change impacts while enhancing community resilience. Efforts also focus on bolstering fish stocks to aid vulnerable coastal fishing communities and preserving marine ecosystems to ensure equitable access to resources for small-scale artisanal fishers. Additionally, forest ecosystem conservation is vital in providing essential services, especially for local and mountainous communities. These combined efforts pave the way for more efficient, inclusive, resilient, and sustainable agrifood systems.

***iv) Better life*:** It aims to foster inclusive economic growth and diminish disparities, a better life initiative targets reducing inequalities across urban and rural areas, affluent and impoverished nations, and between

genders. This entails strategies such as augmenting the income of small-scale food producers to enhance community well-being, directing government investments toward the agricultural sector to bolster rural livelihoods, and promoting secure land tenure through ownership or strengthened rights over agricultural land, facilitating prosperous communities for both men and women. Moreover, ensuring women's rights to land ownership and control is integral to mitigating gender disparities and fostering overall community welfare.

Innovation for Agrifood System Transformation

Innovation plays a pivotal role in driving the transformation of agrifood systems. By embracing novel technologies, methodologies, and approaches, transformative strategies in agriculture enhance efficiency, sustainability, and resilience across the entire food production and distribution chain. From precision farming techniques to advanced supply chain management systems, innovative solutions for transformative agriculture are revolutionizing how food is grown, processed, transported, and consumed. Moreover, the strategies for the same should be selected in such a way that fosters inclusivity by providing opportunities for small-scale producers and marginalized communities to participate in and benefit from the evolving agrifood landscape. Ultimately, innovations and strategies for agrifood system transformation should address pressing challenges such as food insecurity, environmental degradation, and economic disparities while paving the way for a more sustainable and equitable future. Some of the strategies for the same is discussed as follows;

1) Improved crop production technologies: Improved production technologies are integral to the transformative journey of the agrifood system, offering innovative solutions to address challenges and maximize efficiency. These technologies encompass a wide array of advancements, from precision agriculture techniques that optimize resource use and minimize environmental impact to genetic engineering and breeding methods that enhance crop resilience and nutritional value. Through selective breeding, genetic engineering, and other innovative techniques, varietal improvement aims to develop crop varieties with superior traits tailored to meet the diverse needs of farmers and consumers alike. These traits may include higher yields, improved nutritional content, resistance to pests and diseases, and tolerance to environmental stresses such as drought or salinity. Additionally, varietal improvement efforts often prioritize traits that contribute to sustainable agricultural practices, such as reduced chemical inputs and enhanced resource use efficiency. By continually innovating and diversifying crop varieties, varietal improvement plays a vital role in shaping a more resilient, equitable, and food-secure future for communities worldwide within the agrifood system.

***2) Equitable access to resources*:** It is a fundamental pillar in driving transformative change within the agrifood system, ensuring fairness, inclusivity, and sustainability. According to the Food and Agriculture Organization (FAO), smallholder farmers, who represent about 90% of the world's agricultural workforce, often face barriers to accessing land, credit, and markets, limiting their productivity and income potential (Rapsomanikis, 2015). Additionally, women, who comprise nearly half of the global agricultural labour force, often have unequal access to resources compared to men, hindering their ability to fully participate in agricultural activities (Akter, 2017; Mora, *et al.*, 2023). By promoting equal access to land, water, seeds, finance, and knowledge, this approach aims to empower smallholder farmers, marginalized communities, and women, enabling them to participate fully in agricultural production and benefit from its outcomes. According to the World Bank (2014), improving women's access to productive resources could increase agricultural output in developing countries by up to 4%, reducing hunger

and poverty. Equitable access to resources fosters social justice, reduces inequalities, and enhances resilience in the face of economic, environmental, and climatic challenges. Moreover, it promotes diverse and sustainable farming practices, strengthens local food systems, and contributes to food security and nutrition outcomes (Matin *et al.*, 2018). By prioritizing equitable access to resources, the agrifood system can unlock the potential of all stakeholders, catalyzing holistic and lasting transformations towards a more just, inclusive, and sustainable future (Schoneveld, 2022).

3) Inclusive agribusiness and agri-preneurship development: Agri-entrepreneurship plays a pivotal role in catalyzing transformative change within the agrifood system by harnessing innovation, creativity, and business acumen to address pressing challenges and unlock opportunities. By fostering a culture of entrepreneurship among farmers, agribusinesses, and rural communities, this approach empowers individuals to become agents of change and drivers of sustainable development (Schoneveld, 2022). This approach entails fostering economic opportunities and empowerment across the agricultural value chain while ensuring the participation and benefit of all stakeholders, particularly smallholder farmers and marginalized communities (Sargani *et al.*, 2020; Mujèinoviæ *et al.*, 2024). By promoting inclusive agribusiness models, such as farmer cooperatives, contract farming arrangements, and social enterprises, the food system becomes more resilient, equitable, and sustainable. Inclusive agribusiness practices prioritize fair trade, gender equality, and environmental stewardship, contributing to poverty reduction, food security, and rural development (Chamberlain and Anseeuw, 2019; Schelle and Pokorny, 2021). Moreover, inclusive agribusiness facilitates access to markets, finance, and technology for small-scale producers, enabling them to improve productivity, increase incomes, and enhance their livelihoods. Through supportive policies, access to finance, capacity building, and market linkages, agri-entrepreneurship can unleash the potential of smallholder farmers and marginalized groups, driving economic prosperity, food security, and environmental sustainability within the agrifood system (Bisht *et al.*, 2020; ATM, 2023).

4) Digital Technologies: Digital technologies are at the forefront of transforming agrifood systems, revolutionizing every aspect from production to consumption (Abbasi *et al.*, 2022; Abiri *et al.*, 2023). Using technologies like sensors, drones, and AI-driven analytics, farmers may practice precision agriculture to maximise crop yields, minimise environmental impact, and optimise resource management (Alexandrova-Stefanova *et al.*, 2023; Benfica *et al.*, 2023). IoT also makes it easier to automate processes like planting, harvesting, and equipment maintenance, which lowers personnel costs and improves operational effectiveness (Dhanaraju *et al.*, 2022; Morchid *et al.*, 2023). Blockchain technology ensures transparency and traceability in the supply chain, fostering trust among consumers and enabling fairer transactions for farmers (El Mane *et al.*, 2022; Panwar *et al.*, 2023). Mobile applications provide access to market information, financial services, and advisory support, empowering farmers with knowledge and resources to make informed decisions (Qiang *et al.*, 2012; Kansiime *et al.*, 2019; Emeana *et al.*, 2020). Additionally, machine learning algorithms assist in pest detection, disease management, and livestock monitoring, thereby improving overall productivity and sustainability (Hossain *et al.*, 2022; Araújo *et al.*, 2023; Curti *et al.*, 2023). As these technologies continue to evolve, they hold the potential to address key challenges facing agrifood systems, such as food security, climate change resilience, and equitable distribution, ushering in a new era of innovation and efficiency in agriculture.

***5) Managing the post*-harvest losses**: Post-harvest loss management is a critical component of transformative agrifood systems, aimed at reducing

the substantial losses incurred after crops are harvested but before they reach consumers (Kumar and Kalita, 2017; Gills and Sharma, 2021). Through innovative technologies and best practices, such as proper storage facilities, improved transportation infrastructure, and enhanced preservation techniques, stakeholders can mitigate losses and maximize the value of agricultural produce (Gills *et al.*, 2015). Cold chain systems help maintain the quality and freshness of perishable goods while drying and processing techniques extend the shelf life of crops (Adekomaya *et al.*, 2016; Ren *et al.*, 2022). Additionally, advanced monitoring systems and predictive analytics enable early detection of potential spoilage or contamination, allowing for timely interventions to salvage food and minimize waste (Sonwani *et al.*, 2022; Nemade *et al.*, 2024). By addressing post-harvest losses comprehensively, agrifood systems can enhance food security, increase income for farmers, and contribute to sustainable development goals, ultimately transforming the way food is produced, distributed, and consumed.

6) Open and Fair markets: Open and fair markets are essential pillars for transformative agrifood systems, fostering transparency, efficiency, and equity for both producers and consumers (Borsellino *et al.*, 2020; Samoggia and Beyhan, 2022). In an open market environment, producers have access to fair pricing, enabling them to receive a reasonable return on their investments and efforts. Transparent market mechanisms ensure that farmers receive accurate information about supply, demand, and pricing trends, empowering them to make informed decisions about production and marketing strategies (Gardner *et al.*, 2019; Thakur *et al.*, 2023). Additionally, fair market practices promote competition, preventing monopolies or unfair trade practices that could disadvantage small-scale producers (Qaqaya and Lipimile, 2008). For consumers, open and fair markets ensure access to a diverse range of high-quality, nutritious food options at competitive prices, while also providing assurances about food safety and authenticity (Wu *et al.*, 2021). By promoting open and fair markets, transformative agrifood systems can stimulate economic growth, reduce poverty, and enhance food security, ultimately benefiting both producers and consumers alike.

7) Providing a healthy diet: The provision of healthy diets is a cornerstone of transformative agrifood systems, aiming to ensure that all individuals have access to nutritious and diverse food options (McDermott and De Brauw, 2020; Brouwer *et al.*, 2021; Al-Jawaldeh and Abbass, 2022). According to data from the World Health Organization (WHO, 2023), unhealthy diets are among the leading risk factors for non-communicable diseases (NCDs) such as obesity, diabetes, and cardiovascular diseases, which collectively account for 74% of global deaths (41 million people each year). Transformative agrifood systems prioritize the production and distribution of nutrient-rich foods, including fruits, vegetables, whole grains, and lean proteins, to address these challenges (Branca *et al.*, 2019). Moreover, initiatives such as the Sustainable Development Goals (SDGs) call for action to end hunger, achieve food security, improve nutrition, and promote sustainable agriculture by 2030, highlighting the critical role of agrifood systems in promoting health and well-being worldwide (Hainzelin *et al.*, 2018; Gil *et al.*, 2019). By leveraging innovative approaches such as urban agriculture, diversified farming systems, and sustainable food production practices, transformative agrifood systems have the potential to enhance access to healthy diets, reduce malnutrition, and contribute to the overall health and prosperity of communities globally.

8) Safe and nutritious food: The provision of safe and nutritious food is a fundamental aspect of transformative agrifood systems, crucial for promoting public health and well-being (Woodhill *et al.*, 2022; Hendriks *et al.*, 2023). According to the World Health Organization (WHO, 2024), unsafe food poses

significant risks to human health, causing an estimated 600 million cases of foodborne illnesses and 420,000 deaths annually worldwide. Transformative agrifood systems prioritize the implementation of food safety measures throughout the entire food supply chain, including production, processing, distribution, and consumption (Krstic, *et al.*, 2023). This involves adherence to stringent hygiene standards, quality control procedures, and regulatory frameworks to prevent contamination and ensure the safety of food products (Nguyen, 2018). Furthermore, initiatives such as the Codex Alimentarius, developed jointly by the WHO and the Food and Agriculture Organization (FAO), provide internationally recognized guidelines and standards for food safety management (WHO, 2023b). By embracing innovative technologies such as blockchain for traceability, rapid detection methods for contaminants, and improved packaging techniques for preservation, transformative agrifood systems can enhance the safety and nutritional quality of food, safeguarding public health and fostering sustainable development (Friedman and Ormiston, 2022).

9) Climate-smart technologies in agriculture: According to the World Bank (2023), agriculture accounts for approximately 25% of global greenhouse gas emissions, making it a significant contributor to climate change. Climate-smart agriculture (CSA) is pivotal in transformative agrifood systems, offering sustainable solutions to mitigate the impacts of climate change while enhancing food security and resilience (Matteoli *et al.*, 2020; Christian *et al.*, 2024). According to the Food and Agriculture Organization (FAO), agriculture is highly vulnerable to climate change, with adverse effects such as extreme weather events, shifting rainfall patterns, and rising temperatures threatening food production and livelihoods (Gitz *et al.*, 2016; Holleman *et al.*, 2020). CSA practices integrate climate adaptation, mitigation, and productivity enhancement strategies, emphasizing the conservation of natural resources, soil health improvement, and carbon sequestration (Baliwada *et al.*, 2014; Muhie, 2022). Data from the Intergovernmental Panel on Climate Change (IPCC) suggests that adopting CSA practices could increase crop yields by up to 22% globally by 2050, while simultaneously reducing greenhouse gas emissions from agriculture (Mbow *et al.*, 2019). Climate Technology Centre and Network (CTCN) indicates that the adoption of climate-smart technologies, such as drought-resistant crop varieties, precision irrigation systems, and solar-powered agricultural machinery, can increase crop yields by up to 20% and reduce water usage by 30% compared to conventional methods. Key components of CSA include agroforestry, conservation agriculture, precision irrigation, and climate-resilient crop varieties, which contribute to sustainable intensification and enhanced ecosystem services (Baliwada *et al.*, 2014; Christian *et al.*, 2024). Additionally, advancements in digital agriculture, including satellite imaging, weather forecasting, and remote sensing, provide farmers with real-time data and decision support tools for optimizing resource use and minimizing environmental impact (Abbasi *et al.*, 2022; Abiri *et al.*, 2023). By promoting CSA, transformative agrifood systems can bolster the resilience of farmers, ensure food security, and mitigate the impacts of climate change on agricultural productivity, paving the way for a more sustainable and prosperous future.

10) Resources use efficiency: Creating a resource-efficient agricultural environment is essential for transformative agrifood systems, ensuring sustainable production while minimizing environmental impact (Cakmakcr *et al.*, 2023). According to the United Nations Food and Agriculture Organization (FAO), agriculture currently accounts for around 70% of global freshwater use and is a significant contributor to deforestation and habitat loss (FAO, 2017b). To address these challenges, transformative agrifood systems prioritize resource-efficient practices such as precision agriculture, which utilizes technologies like sensors, drones, and GPS to optimize inputs such as water, fertilizers, and pesticides. Data from the FAO

suggests that precision agriculture can reduce water usage by up to 30% and increase crop yields by 20% or more (FAO, 2017b). Additionally, agroecological approaches, such as intercropping, crop rotation, and integrated pest management, promote biodiversity, soil health, and natural resource conservation (Reddy, 2017; Muhie, 2022). By embracing resource-efficient agricultural practices, transformative agrifood systems can enhance resilience, productivity, and sustainability, ensuring the long-term viability of food production while safeguarding the environment for future generations.

11) Gender-sensitive agriculture: Gender equity is a crucial aspect of transformative agrifood systems, recognizing the significant contributions of women in agriculture and ensuring their equal access to resources, opportunities, and decision-making power (FAO, 2024; Lecoutere *et al.*, 2024). According to the Food and Agriculture Organization (FAO), women comprise about 43% of the agricultural labour force in developing countries and play a vital role in food production, processing, and marketing (FAO, 2011). However, they often face systemic barriers such as limited access to land, finance, and agricultural extension services, which hinder their productivity and livelihoods. Data from the International Fund for Agricultural Development (IFAD, 2019) indicates that investments in gender-responsive agricultural interventions can increase yields by up to 30%, contributing to poverty reduction and food security. Transformative agrifood systems prioritize gender-responsive policies and interventions that promote women's empowerment, such as land rights reform, access to credit and training, and support for women's participation in decision-making forums (FAO, 2024). By fostering gender equity, agrifood systems can unlock the full potential of women as agents of change, driving sustainable development & inclusive growth.

12) Creating partnerships in research and action: Partnerships are integral to transformative agrifood systems, facilitating collaboration among diverse stakeholders to address complex challenges and achieve sustainable development goals (FAO, 2023; Maryono *et al.*, 2014). According to the United Nations Sustainable Development Goals (SDGs), achieving zero hunger and ensuring food security requires multi-stakeholder partnerships that leverage the expertise, resources, and networks of governments, civil society, academia, and the private sector (UN, 2023). Data from the World Economic Forum indicates that agricultural productivity needs to increase by 60% by 2050 to meet the growing global demand for food. Transformative agrifood systems foster partnerships that promote innovation, knowledge sharing, and capacity building, driving agricultural transformation and resilience. Initiatives such as the Global Alliance for Climate-Smart Agriculture (GACSA) and the Scaling Up Nutrition (SUN) Movement exemplify the power of partnerships in advancing sustainable agriculture and nutrition outcomes (Faling *et al.*, 2018). By fostering inclusive and collaborative partnerships, agrifood systems can accelerate progress towards a more resilient, equitable, and sustainable future for all.

13) Reforms in rural development: Rural development is a linchpin for transformative agrifood systems in India, where agriculture remains a cornerstone of the economy and a primary livelihood source for millions. Transformative agrifood systems prioritize rural development initiatives aimed at enhancing agricultural productivity, improving livelihoods, and reducing poverty in rural areas. Data from the National Bank for Agriculture and Rural Development (NABARD) indicates that rural development programs, such as the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) and the National Rural Livelihoods Mission (NRLM), have played a pivotal role in empowering smallholder farmers, promoting sustainable agriculture practices, and creating rural employment opportunities. Furthermore, investments in rural infrastructure, market linkages, and access to finance are essential for building resilient

agrifood systems that can withstand economic shocks and climate variability (Priyadarshini and Abhilash, 2021). By prioritizing rural development, India can unlock the full potential of its agrarian economy, alleviate poverty, and foster inclusive growth for rural communities.

Government Initiatives for Transformative agri-food systems in India

India's agrifood sector is undergoing a transformative phase, driven by various government initiatives aimed at enhancing productivity, sustainability, and inclusivity. Government initiatives play a pivotal role in driving transformative agrifood systems in India by addressing various challenges and unlocking opportunities for sustainable growth and development. From enhancing irrigation infrastructure and promoting sustainable agriculture practices to providing financial protection and improving market access, these initiatives are instrumental in empowering farmers, enhancing productivity, and ensuring food security in the country. As India continues its journey towards agricultural transformation, sustained efforts and effective implementation of government programs will be crucial in realizing the full potential of the agrifood sector and fostering inclusive and resilient rural development. Recognizing the crucial role of agriculture in the country's economy and its potential to address key challenges such as food security, poverty alleviation, and rural development, the Indian government has launched numerous programs and policies to catalyze positive change in the agrifood system. Some of the major initiative are as follows**;**

1. Pradhan Mantri Krishi Sinchayee Yojana (PMKSY): The Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) is a flagship scheme launched by the Indian government in 2015 to improve water use efficiency in agriculture. With a focus on enhancing irrigation infrastructure, water management practices, and sustainable water use, PMKSY aims to increase crop productivity and ensure water security for farmers. Launched with a data-driven approach, PMKSY leverages comprehensive data analytics to identify regions requiring critical irrigation support, optimize water usage, and implement efficient irrigation techniques. Through initiatives like the Accelerated Irrigation Benefit Programme (AIBP) and the Har Khet Ko Pani (Water to Every Field) component, PMKSY has helped expand irrigation coverage, promoting micro-irrigation techniques, and reducing water stress in agricultural regions across the country. With an allocation of over Rs. 50,000 crores (approximately $6.7 billion USD) over five years, PMKSY aims to expand irrigation coverage, improve water management practices, and promote micro-irrigation techniques. As of 2021, PMKSY has facilitated the creation of over 2.5 million hectares of additional irrigation potential, benefiting millions of farmers across the country (https://pmksy-mowr.nic.in/).

2. National Mission for Sustainable Agriculture (NMSA): The National Mission for Sustainable Agriculture (NMSA) is another critical initiative started in 2010 aimed at promoting climate-resilient and environmentally sustainable agriculture practices in India. NMSA focuses on soil health management, water conservation, crop diversification, and agroforestry to enhance agricultural productivity while mitigating the adverse impacts of climate change. Through schemes like the Soil Health Card program, Paramparagat Krishi Vikas Yojana (PKVY), and the Rainfed Area Development program, NMSA empowers farmers with knowledge, resources, and incentives to adopt sustainable farming practices. With an allocation of Rs. 11,000 crores (approximately $1.5 billion USD) over five years, NMSA has led to the distribution of over 20 million Soil Health Cards to farmers, facilitating informed decision-making on nutrient management and improving soil health (https://nmsa.dac.gov.in/).

3. Pradhan Mantri Fasal Bima Yojana (PMFBY): The Pradhan Mantri Fasal Bima Yojana (PMFBY) is a crop insurance scheme introduced by the Indian government to provide financial protection to farmers against crop losses due to natural calamities, pests, and diseases. With a premium subsidy of up to 90% for small and marginal farmers and 75% for other farmers, PMFBY aims to stabilize farmers' income, encourage risk-taking in agriculture, and ensure food security by mitigating the adverse impact of crop failures. As of 2021, PMFBY has covered over 50 million hectares of cropped area, benefitting over 37 million farmers and facilitating timely claim settlements amounting to billions of rupees. By offering affordable premium rates, timely claim settlements, and widespread coverage, PMFBY has emerged as a crucial tool for enhancing farmers' resilience to climate risks and safeguarding their livelihoods (https://pmfby.gov.in/).

4. National Agricultural Market (e-NAM): The National Agricultural Market (e-NAM) is a digital platform launched in 2016 by the Indian government to create a unified national market for agricultural commodities. e-NAM facilitates online trading of agricultural produce, promotes price transparency, and eliminates intermediaries, thereby ensuring fairer prices for farmers and reducing post-harvest losses. With the integration of mandis (market yards) across states, e-NAM enables farmers to access a wider market and get better remuneration for their produce, ultimately contributing to the modernization and efficiency of India's agrifood supply chainWith over 1,000 mandis integrated into the e-NAM platform, it has facilitated over Rs. 2.5 lakh crores (approximately $33.6 billion USD) worth of trade since its inception, promoting price transparency and reducing intermediaries' role in the agrifood supply chain. (https://www.enam.gov.in/web/).

CONCLUSION

Agricultural transformations are essential to ensure food security for India's burgeoning population. With the continuous increase in population and changing dietary patterns, there is a pressing need to enhance agricultural productivity and diversify food production to meet the diverse nutritional needs of the population. Similarly, transformations in agri-food systems are needed to address the sustainability challenges confronting Indian agriculture, including soil degradation, water scarcity, and climate change. Strategies for agrifood system transformation encompass a multifaceted approach aimed at addressing complex challenges while fostering sustainability and resilience. These strategies often include promoting sustainable agricultural practices such as agroecology and regenerative farming, which prioritize soil health, biodiversity conservation, and natural resource management. Additionally, improving access to markets and finance for small-scale farmers and rural communities is essential for inclusive growth and poverty reduction. Enhancing food processing, storage, and distribution infrastructure helps reduce food loss and waste while ensuring food security and supply chain resilience. Moreover, investing in research and innovation to develop climate-smart technologies and digital solutions can revolutionize productivity and resource efficiency. Collaborative partnerships among stakeholders, including governments, civil society, academia, and private sector entities, are critical for effective policy formulation, implementation, and monitoring. By adopting these comprehensive strategies, agrifood systems can undergo transformative change towards a more sustainable, equitable, and resilient future.

REFERENCES

Abbasi, R., Martinez, P. and Ahmad, R. 2022. The digitization of agricultural industry–a systematic literature review on agriculture 4.0. *Smart Agricultural Technology*, 2, p.100042.

Abiri, R., Rizan, N., Balasundram, S.K., Shahbazi, A.B. and Abdul-Hamid, H. 2023. Application of digital technologies for ensuring agricultural productivity. *Heliyon*.

Abokyi, E., Strijker, D., Asiedu, K.F. and Daams, M.N. 2020. The impact of output price support on smallholder farmers' income: evidence from maize farmers in Ghana. *Heliyon*, 6(9).

Acharya, G.D. 2023. Sustainable transformation of agrifood systems: a circular economic and agroecological perspective. *SAARC Journal of Agriculture*, 21(1):1-12

Adekomaya, O., Jamiru, T., Sadiku, R. and Huan, Z. 2016. Sustaining the shelf life of fresh food in cold chain–A burden on the environment. *Alexandria Engineering Journal*, 55(2), pp.1359-1365.

Akter, S., Rutsaert, P., Luis, J., Htwe, N.M., San, S.S., Raharjo, B. and Pustika, A. 2017. Women's empowerment and gender equity in agriculture: A different perspective from Southeast Asia. *Food policy*, 69, pp.270-279.

Alexandrova-Stefanova, N., Mroczek, Z.K., Nosarzewski, K., Audouin, S., Djamen, P., Kolos, N. and Wan, J. 2023. *Harvesting change: Harnessing emerging technologies and innovations for agrifood systems transformation – Global foresight synthesis report*. Rome. FAO and Cirad. https://doi.org/10.4060/cc8498en

Al-Jawaldeh, A. and Abbass, M.M. 2022. Unhealthy dietary habits and obesity: the major risk factors beyond non-communicable diseases in the eastern mediterranean region. *Frontiers in Nutrition*, 9, p.817808.

Araújo, S.O., Peres, R.S., Ramalho, J.C., Lidon, F. and Barata, J. 2023. Machine Learning Applications in Agriculture: Current Trends, Challenges, and Future Perspectives. *Agronomy*, 13(12), p.2976.

ATM. 2023. *Gearing up to solve food security challenges; Building agritech ecosystem for the global south*. Atal Innovation Mission, NITI Aayog & UN Capital Development Fund. https://www.niti.gov.in/sites/default/files/2023-04/Report-UNCDF.pdf

Baliwada, H., Gills, R. and Sharma, J.P. 2014. *Climate resilient technologies for sustainable agriculture.* Technologies for sustainable rural development: having potential of socio-economic upliftment. Allied Publishers: New Delhi, India, pp.256-263.

Baruah, S., Mohanty, S. and Rola, A.C. 2022. Small Farmers Large Field (SFLF): a synchronized collective action model for improving the livelihood of small farmers in India. *Food Security*, pp.1-14.

Benfica, R., Chambers, J., Koo, J., Nin-Pratt, A., Falck-Zepeda, J., Stads, G.J. and Arndt, C. 2023. *Food System Innovations and Digital Technologies to Foster Productivity Growth and Rural Transformation.* In: von Braun, J., Afsana, K., Fresco, L.O., Hassan, M.H.A. (eds) Science and Innovations for Food Systems Transformation. Springer, Cham. https://doi.org/10.1007/978-3-031-15703-5_22

Bhattacharyya, R., Ghosh, B.N., Mishra, P.K., Mandal, B., Rao, C.S., Sarkar, D., Das, K., Anil, K.S., Lalitha, M., Hati, K.M. and Franzluebbers, A. J. 2015. Soil degradation in India: Challenges and potential solutions. *Sustainability*, 7(4), pp.3528-3570.

Bisht, I.S., Rana, J.C. and Pal Ahlawat, S. 2020. The future of smallholder farming in India: Some sustainability considerations. *Sustainability*, 12(9), p.3751.

Borsellino, V., Schimmenti, E. and El Bilali, H. 2020. Agri-food markets towards sustainable patterns. *Sustainability*, 12(6), p.2193.

Branca, F., Lartey, A., Oenema, S., Aguayo, V., Stordalen, G.A., Richardson, R., Arvelo, M. and Afshin, A. 2019. *Transforming the food system to fight non-communicable diseases.* Bmj, 364.

Brouwer, I.D., van Liere, M.J., de Brauw, A., Dominguez-Salas, P., Herforth, A., Kennedy, G., Lachat, C., Omosa, E.B., Talsma, E.F., Vandevijvere, S. and Fanzo, J. 2021. Reverse thinking: taking a healthy diet perspective towards food systems transformations. *Food Security*, 13(6), pp.1497-1523.

Çakmakçr R., Salýk, M.A. and Çakmakçý, S. 2023. Assessment and Principles of Environmentally Sustainable Food and Agriculture Systems. *Agriculture*, 13(5), p.1073.

Chamberlain, W. and Anseeuw, W. 2019. Inclusive businesses in agriculture: Defining the concept and its complex and evolving partnership structures in the field. *Land use policy,* 83, pp.308-322.

Chand, R. and Singh, J. 2022. *Workforce changes and employment; some findings from PLFS data series*. NITI Aayog Discussion Paper 1/2022.

Christian, K.T.R., Philippe, C.A.B., Abraham, A.G., Camel, L., Félicien, A., Gauthier, B.I.A.O.U. and Sohounhloue, C.K.D. 2024. Recent climate-smart innovations in agrifood to enhance producer incomes through sustainable solutions. *Journal of Agriculture and Food Research*, p.100985.

Conti, C., Hall, A., Percy, H., Stone-Jovicich, S., Turner, J. and McMillan, L. 2024. What does the agri-food

systems transformation agenda mean for agricultural research organisations? Exploring organisational prototypes for uncertain futures. *Global Food Security*, 40, p.100733.

Curti, P.D.F., Selli, A., Pinto, D.L., Merlos-Ruiz, A., Balieiro, J.C.D.C. and Ventura, R.V. 2023. Applications of livestock monitoring devices and machine learning algorithms in animal production and reproduction: an overview. *Animal Reproduction*, 20, p.e20230077.

Day, C. and Cramer, S. 2022. Transforming to a regenerative US agriculture: the role of policy, process, and education. *Sustainability Science*, 17(2), pp.585-601.

Dhanaraju, M., Chenniappan, P., Ramalingam, K., Pazhanivelan, S. and Kaliaperumal, R. 2022. Smart farming: Internet of Things (IoT)-based sustainable agriculture. *Agriculture*, 12(10), p.1745.

Dilnashin, H., Birla, H., Rajput, V.D., Keswani, C., Singh, S.P., Minkina, T.M. and Mandzhieva, S.S. 2021. Economic shock and agri-sector: post-COVID-19 scenario in India. *Circular Economy and Sustainability*, 1, pp.1479-1490.

Economic Survey. 2023. Agriculture and food management: from food security to nutritional security. https://www.indiabudget.gov.in/economicsurvey/doc/eschapter/echap08.pdf

El Bilali, H., Strassner, C. and Ben Hassen, T. 2021. Sustainable agri-food systems: environment, economy, society, and policy. *Sustainability*, 13(11), p.6260.

El Mane, A., Chihab, Y., Tatane, K. and Korchiyne, R. 2022. Agriculture Supply Chain Management Based on Blockchain Architecture and Smart Contracts. Applied *Computational Intelligence and Soft Computing*, 2022.

Emeana, E.M., Trenchard, L. and Dehnen-Schmutz, K. 2020. The revolution of mobile phone-enabled services for agricultural development (m-Agri services) in Africa: The challenges for sustainability. *Sustainability*, 12(2), p.485.

Ericksen, P. J. 2008. Conceptualizing food systems for global environmental change research. *Glob. Environ. Chang.* 18, 234–245.

Faling, M., Biesbroek, R. and Karlsson Vinkhuyzen, S. 2018. The strategizing of policy entrepreneurs towards the Global Alliance for Climate Smart Agriculture. *Global Policy*, 9(3), pp.408-419.

FAO. 2011. The role of women in agriculture. https://www.fao.org/3/am307e/am307e00.pdf

FAO. 2017a. The future of food and agriculture – Trends and challenges. Rome.

FAO. 2017b. Water for sustainable food and agriculture: a report produced for the G20 Presidency of Germany. FAO. https://www.fao.org/3/i7959e/i7959e.pdf

FAO. 2021. FAO's Strategic Framework 2022-31. https://www.fao.org/3/cb7099en/cb7099en.pdf

FAO. 2022. World Food and Agriculture – Statistical Yearbook 2022. Rome. https://doi.org/10.4060/cc2211en

FAO. 2023. Transformative partnerships guidance – How transformative partnerships can help FAO to better deliver its strategic objectives. Rome. https://doi.org/10.4060/cc8751en

FAO. 2024. Transforming agrifood systems and achieving gender equality. https://www.fao.org/3/cc5343en/online/status-women-agrifood-systems-2023/transforming-agrifood-gender-equality.html

Fassio, F. and Tecco, N. 2019. Circular economy for food: A systemic interpretation of 40 case histories in the food system in their relationships with SDGs. *Systems*, 7(3), p.43.

Friedman, N. and Ormiston, J. 2022. Blockchain as a sustainability-oriented innovation?: Opportunities for and resistance to Blockchain technology as a driver of sustainability in global food supply chains. *Technological Forecasting and Social Change*, 175, p.121403.

Gardner, T.A., Benzie, M., Börner, J., Dawkins, E., Fick, S., Garrett, R., Godar, J., Grimard, A., Lake, S., Larsen, R.K. and Mardas, N. 2019. Transparency and sustainability in global commodity supply chains. *World Development*, 121, pp.163-177.

Gil, J.D.B., Reidsma, P., Giller, K., Todman, L., Whitmore, A. and van Ittersum, M. 2019. Sustainable development goal 2: Improved targets and indicators for agriculture and food security. *Ambio*, 48(7), pp.685-698.

Gills, R. and Sharma, J.P. 2021. *From an Empty-Plate Lunch to Silk-Stocking Dinner: Some Futuristic Approaches in Agriculture*. Climate Change and Resilient Food Systems: Issues, Challenges, and Way Forward, pp.35-72.

Gills, R., Sharma, J.P. and Bhardwaj, T. 2015. Achieving zero hunger through zero wastage: An overview of present scenario and future reflections. *The Indian Journal of Agricultural Sciences,* 85(9), pp.1127-1133.

Gitz, V., Meybeck, A., Lipper, L., Young, C.D. and Braatz, S. 2016. Climate change and food security: risks and responses. Food and Agriculture Organization of the United Nations (FAO) Report, 110(2).

Gomiero, T. 2016. Soil degradation, land scarcity and food security: Reviewing a complex challenge. *Sustainability*, 8(3), p.281.

Hainzelin, E., Guillou, M., Andersen, I., Arnold, T., Astralaga, M., Beukeboom, M. and Bickersteth, S. 2018. Food systems for sustainable development: Proposals for a profound four-part transformation. *Agron. Sustain. Dev*, 38, p.41.

Hendriks, S., Soussana, J.F., Cole, M., Kambugu, A. and Zilberman, D. 2023. *Ensuring Access to Safe and Nutritious Food for All Through the Transformation of Food Systems*. Science and Innovations for Food Systems Transformation, p.31.

Herrero, M., Hugas, M., Lele, U., Wirakartakusumah, A., Torero, M. 2023. A Shift to Healthy and Sustainable Consumption Patterns. In: von Braun, J., Afsana, K., Fresco, L.O., Hassan, M.H.A. (eds) Science and Innovations for Food Systems Transformation. Springer, Cham. https://doi.org/10.1007/978-3-031-15703-5_5

Herrero, M., Thornton, P.K., Power, B., Bogard, J.R., Remans, R., Fritz, S., Gerber, J.S., Nelson, G., See, L., Waha, K. and Watson, R.A. 2017. Farming and the geography of nutrient production for human use: a transdisciplinary analysis. *The Lancet Planetary Health*, 1(1), pp.e33-e42.

Holleman, C., Rembold, F., Crespo, O. and Conti, V. 2020. *The impact of climate variability and extremes on agriculture and food security – An analysis of the evidence and case studies.* Background paper for the state of food security and nutrition in the world 2018. FAO Agricultural Development Economics Technical Study No. 4. Rome, FAO. https://doi.org/10.4060/cb2415en

Hossain, M.E., Kabir, M.A., Zheng, L., Swain, D.L., McGrath, S. and Medway, J. 2022. A systematic review of machine learning techniques for cattle identification: Datasets, methods and future directions. *Artificial Intelligence in Agriculture*, 6, pp.138-155.

IFAD. 2019. Mainstreaming gender-transformative approaches at IFAD – action plan 2019-2025. https://webapps.ifad.org/members/eb/126/docs/EB-2019-126-INF-6.pdf

Kansiime, M.K., Alawy, A., Allen, C., Subharwal, M., Jadhav, A. and Parr, M. 2019. Effectiveness of mobile agri-advisory service extension model: Evidence from Direct2Farm program in India. *World development perspectives*, 13, pp.25-33.

Karunarathna, N., Siriwardhane, D. and Jayarathne, A. 2023. Exploring the measurements of COVID-19-induced supply chain disruptions and their implications on the economic vulnerability of small-scale farmers. *International Journal of Industrial Engineering and Operations Management.*

Krishnan, R., Agarwal, R., Bajada, C. and Arshinder, K. 2020. Redesigning a food supply chain for environmental sustainability–An analysis of resource use and recovery. *Journal of cleaner production*, 242, p.118374.

Krstiæ, M., Agnusdei, G.P., Tadiæ, S. and Miglietta, P.P. 2023. Prioritization of e-traceability drivers in the agri-food supply chains. *Agricultural and Food Economics*, 11(1), p.42.

Kuchimanchi, B.R., van Paassen, A. and Oosting, S.J. 2021. Understanding the vulnerability, farming strategies and development pathways of smallholder farming systems in Telangana, India. *Climate Risk Management*, 31, p.100275.

Kumar, A., Sonkar, V.K. and Saroj, S. 2020. Access to credit in eastern India: implications for the economic well-being of agricultural households. *Economic & Political Weekly*, May, 23.

Kumar, D. and Kalita, P. 2017. Reducing postharvest losses during storage of grain crops to strengthen food security in developing countries. *Foods*, 6(1), p.8.

Lecoutere, E., Achandi, E.L., Ampaire, E.L., Fischer, G., Gumucio, T., Najjar, D. and Singaraju, N. 2024. Fostering an enabling environment for equality and empowerment in agri-food systems: An assessment at multiple scales. *Global Food Security*, 40, p.100735.

Manjunatha, A.V., Anik, A.R., Speelman, S. and Nuppenau, E.A. 2013. Impact of land fragmentation, farm size,

land ownership and crop diversity on profit and efficiency of irrigated farms in India. *Land use policy*, 31, pp.397-405.

Maryono, M., Killoes, A.M., Adhikari, R. and Aziz, A.A. 2024. Agriculture development through multi-stakeholder partnerships in developing countries: A systematic literature review. *Agricultural Systems*, 213, p.103792.

Matin, N., Forrester, J. and Ensor, J. 2018. What is equitable resilience?. *World development*, 109, pp.197-205.

Matteoli, F., Schnetzer, J. and Jacobs, H. 2020. Climate-Smart Agriculture (CSA): An Integrated Approach for Climate Change Management in the Agriculture Sector. Handbook of Climate Change Management: Research, Leadership, Transformation, pp.1-29.

Mausch, K., Hall, A. and Hambloch, C. 2020. Colliding paradigms and trade-offs: Agri-food systems and value chain interventions. *Global Food Security*, 26, p.100439.

Mbow, C., Rosenzweig, L.G., Barioni, T.G., Benton, M., Herrero, M., Krishnapillai, E., Liwenga, P., Pradhan, M.G.R.F., Sapkota, F.N.T. and Tubiello, Y.X. 2019. Climate change and land. IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems.

McDermott, J. and De Brauw, A. 2020. National food systems: inclusive transformation for healthier diets. IFPRI book chapters, pp.202054-202065.

McGreevy, S.R., Rupprecht, C.D., Niles, D., Wiek, A., Carolan, M., Kallis, G., Kantamaturapoj, K., Mangnus, A., Jehlièka, P., Taherzadeh, O. and Sahakian, M. 2022. Sustainable agrifood systems for a post-growth world. *Nature sustainability*, 5(12), pp.1011-1017.

Mora, C., Morgan, M. and Elias, M. 2023. Gender equality in agrifood systems: Indicator list (GEASIL).

Morchid, A., El Alami, R., Raezah, A.A. and Sabbar, Y. 2023. Applications of internet of things (IoT) and sensors technology to increase food security and agricultural Sustainability: Benefits and challenges. *Ain Shams Engineering Journal*, p.102509.

Muhie, S.H. 2022. Novel approaches and practices to sustainable agriculture. *Journal of Agriculture and Food Research*, p.100446.

Mujèinoviæ, A., Bojnec, Š., Nikoliæ, A., Tonkoviæ, A.B., Gašparoviæ, S., Lazereg, M., Stojanoviæ, A. and Bojadjieva, D. 2024. Pathways for Young Farmers' Entrepreneurship in Sustainable Rural Development. NEETs in European rural areas, p.69.

NABAR.2023. Assessing the state of affairs in Indian agriculture with a focus on credit & insurance and storage & marketing. https://www.nabard.org/auth/writereaddata/tender/1201243818assessing-the-state-of-affairs-in-indian-agriculture-with-a-focus-on-credit-insurance-and-storage-marketing.pdf

Nandi, R., Pratheepa, C.M., Nedumaran, S., Rao, N. and Rengalakshmi, R. 2022. Farm parent and youth aspirations on the generational succession of farming: Evidence from South India. *Frontiers in Sustainable Food Systems*, 5, p.804581.

Nemade, B.P., Shah, K., Marakarkandy, B., Shah, K., Surve, B.C. and Nagra, R.K. 2024. An Efficient IoT-Based Automated Food Waste Management System with Food Spoilage Detection. *International Journal of Intelligent Systems and Applications in Engineering,* 12(5s), pp.434-449.

Nguyen, H. 2018. Sustainable food systems: Concept and framework. Food and Agriculture Organization of the United Nations: Rome, Italy.

Niroula, G.S. and Thapa, G.B. 2005. Impacts and causes of land fragmentation, and lessons learned from land consolidation in South Asia. *Land use policy*, 22(4), pp.358-372.

NSO. 2021. Situation assessment of agricultural households and land and livestock holdings of households in rural India, 2019. https://mospi.gov.in/sites/default/files/publication_reports/Report_587m_0.pdf

Panwar, A., Khari, M., Misra, S. and Sugandh, U., 2023. Blockchain in Agriculture to Ensure Trust, Effectiveness, and Traceability from Farm Fields to Groceries. *Future Internet*, 15(12), p.404.

Priyadarshini, P. and Abhilash, P.C. 2021. Agri-food systems in India: Concerns and policy recommendations for building resilience in post COVID-19 pandemic times. *Global Food Security*, 29, p.100537.

Qaqaya, H. and Lipimile, G. 2008. The effects of anti-competitive business practices on developing countries and their development prospects. https://unctad.org/system/files/official-document/ditcclp20082_en.pdf

Qiang, C.Z., Kuek, S.C., Dymond, A. and Esselaar, S. 2012. Mobile applications for agriculture and rural development. ICT Sector Unit, World Bank

Rao, C.S., Lal, R., Prasad, J.V., Gopinath, K.A., Singh, R., Jakkula, V.S., Sahrawat, K.L., Venkateswarlu, B., Sikka, A.K. and Virmani, S.M. 2015. Potential and challenges of rainfed farming in India. *Advances in agronomy*, 133, pp.113-181.

Rapsomanikis, G. 2015. The economic lives of smallholder farmers; an analysis based on household data from nine countries. https://www.fao.org/3/i5251e/i5251e.pdf

Rasul, G. 2021. Twin challenges of COVID-19 pandemic and climate change for agriculture and food security in South Asia. *Environmental Challenges*, 2, p.100027.

Reddy, P.P. 2017. Agro-ecological approaches to pest management for sustainable agriculture (pp. 1-339). Singapore: Springer.

Ren, Q.S., Fang, K., Yang, X.T. and Han, J.W. 2022. Ensuring the quality of meat in cold chain logistics: A comprehensive review. *Trends in Food Science & Technology*, 119, pp.133-151.

Ritchie, H. 2021. Smallholders produce one-third of the world's food, less than half of what many headlines claim" Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/smallholder-food-production.

Rockström, J., Edenhofer, O., Gaertner, J. and DeClerck, F. 2020. Planet-proofing the global food system. *Nature Food*, 1(1), pp.3-5.

Samoggia, A. and Beyhan, Z. 2022. Fairness-enabling practices in agro-food chain. *Sustainability*, 14(11), p.6391.

Sargani, G.R., Zhou, D., Raza, M.H. and Wei, Y. 2020. Sustainable entrepreneurship in the agriculture sector: The nexus of the triple bottom line measurement approach. *Sustainability*, 12(8), p.3275.

Sathyan, A.R., Funk, C., Aenis, T. and Breuer, L. 2018. Climate vulnerability in rainfed farming: Analysis from Indian watersheds. *Sustainability*, 10(9), p.3357.

Schelle, C. and Pokorny, B. 2021. How Inclusive Is Inclusive? A Critical Analysis of an Agribusiness Initiative in Kenya. *Sustainability*, 13(19), p.10937.

Schoneveld, G.C. 2022. Transforming food systems through inclusive agribusiness. *World Development,* 158, p.105970.

Sekhar, C. S. C. 2004. Agricultural Price Volatility in International and Indian Markets. *Economic and Political Weekly*, 39(43), 4729–4736. http://www.jstor.org/stable/4415712

Simon-Rojo, M. 2023. The role of ecosystem services in the design of agroecological transitions in Spain. *Ecosystem Services*, 61, p.101531.

Sonwani, E., Bansal, U., Alroobaea, R., Baqasah, A.M. and Hedabou, M. 2022. An Artificial Intelligence Approach Toward Food Spoilage Detection and Analysis. *Frontiers in Public Health*, 9, p.816226.

Thakur, P., Mehta, P., Devi, C., Sharma, P., Singh, K.K., Yadav, S., Lal, P., Raghav, Y.S., Kapoor, P. and Mishra, P. 2023. Marketing performance and factors influencing farmers choice for agricultural output marketing channels: the case of garden pea (Pisum sativum) in India. *Frontiers in Sustainable Food Systems*, 7, p.1270121.

UN. 2022. Over 820 million people suffering from hunger; new UN report reveals stubborn realities of 'immense' global challenge. https://www.un.org/es/desa/over-820-million-people-suffering-hunger-new-un-report-reveals-stubborn-realities

UN. 2023. Goal 17: Revitalize the global partnership for sustainable development. https://www.un.org/sustainabledevelopment/globalpartnerships/

Vyas, S., Chanana, N., Chanana, M. and Aggarwal, P.K. 2021. From farm to fork: early impacts of COVID-19 on food supply chain. *Frontiers in Sustainable Food Systems*, 5.

Wang, J., Ding, X., Gao, H. and Fan, S. 2022. Reshaping Food Policy and Governance to Incentivize and Empower Disadvantaged Groups for Improving Nutrition. *Nutrients*, 14(3), p.648.

WHO. 2023. Noncommunicable diseases. https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases

WHO. 2023b. FAO-WHO 46th session of the Codex Alimentarius Commission adopts new standards. https://www.who.int/news-room/events/detail/2023/11/27/default-calendar/fao-who-46th-session-

of-the-codex-alimentarius-commission-adopts-new-standards

WHO. 2024. Estimating the burden of foodborne diseases. https://www.who.int/activities/estimating-the-burden-of-foodborne-diseases

Woodhill, J., Kishore, A., Njuki, J., Jones, K. and Hasnain, S. 2022. Food systems and rural wellbeing: challenges and opportunities. *Food Security,* 14(5), pp.1099-1121.

World Bank. 2014. Levelling the Field: Improving Opportunities for Women Farmers in Africa. https://www.worldbank.org/en/region/afr/publication/levelling-the-field-improving-opportunities-for-women-farmers-in-africa

World Bank. 2023. Climate Change. https://www.worldbank.org/en/topic/climatechange/overview

Wu, W., Zhang, A., van Klinken, R.D., Schrobback, P. and Muller, J.M. 2021. Consumer trust in food and the food system: a critical review. *Foods*, 10(10), p.2490.

Lead Paper-2

Nutrition Sensitive Agriculture for improving Livelihood and Farm Income of Indian Farmers: Prospects, Challenges and Way Ahead

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INTRODUCTION

Agriculture is the backbone of Indian economy and employs nearly half (54.6%) of the workforce in the country. Out of 320 million work force, 170 million are employed in agriculture. With a population of 1.39 billion, India is the world's second most populous country, and is projected to become most populous by 2027-30, leaving China behind. It is the 7th largest country geographically in the world with 328-million-hectare area. India has about 160 million hectare of arable land, second largest after the United States of America and experiences all the 15 prominent climates with 46 out of 60 soil-types that exist on the earth. The sector engages 49.6% of the workforce, often seasonally, under-employed, under-paid and accounts for about 17% share in India's Gross Domestic Product (GDP).

Indian agriculture achieved several landmarks primarily due to science-led agricultural development. The most signifying milestone has been food security that brought confidence and raised the country's stature globally. The food grain production, which was merely 51 million tons (Mt) in 1950-51 increased over 6 times to over 314 Mt in 2022. Presently, despite declining availability of land and water for farming and increasing climate vulnerability, the food grain production has reached 330.53 million tons (3rd Advanced estimates 2022-23-DA&FW) for field crops and 342.33 million tons for horticultural commodities (3rd Advance Estimates 2021-22-DA&FW). Similar increase has been recorded in milk, meat, egg, and fish as well as in the non-food crops. The technological advancements through improved varieties, production and protection technologies, health, nutrition and breed improvement in livestock, poultry and fisheries along with innovative frontline extension through KVKs have been vital in increasing the productivity and output. In comparison to 2005-14, the continued technology-backstopping from ICAR improved the average productivity in the country during 2014-23 by 20.2% in cereals including coarse cum-nutri-cereals, 21.6% in pulses, 13.6% in oilseeds, 13.5% in sugarcane, 29.2% in fruits, 7.1% in vegetables, and 30.4% in spices. Similarly, the technology upscaling in livestock sector increased the 9-years average total milk production in the country by 55.62%, egg production by 69.63%, and meat production by 78.60% over average value of immediate past 9-years period.

Overall, in terms of production India is among top five countries among more than 80 percent of agricultural commodities. In terms of geographic features also, it shows great diversity being a homeland to most rainy places, arid regions, and snowy mountains. On the economic front, India's growth performance in the last three decades has been very special as there has been a notable shift during economic development (Kotwal *et al.* 2011). The average annual real per capita GDP grew at 5 per cent from 1990-91 to 2017-18 (Indiastat 2019). India made rapid progress in the agricultural sector also (Joshi *et al.* 2006). In the past three decades, Food grain production increased from 176.39 million tonnes

to 168.38 million tonnes (Government of India 2018). During the same period, the horticulture sector also witnessed remarkable increases in area and production. The annual production grew rapidly, expanding from 127.7 to 311.7 million tonnes.

On one hand India has achieved food security by help of Green Revolution technologies and the massive adoption of high-yielding varieties in staple foods by farmers but on other hand the bigger goal of nutritional security remains a daunting challenge. Despite significant economic growth, the performance of India in reducing malnutrition and undernutrition has not been noteworthy (Gillespie *et al.* 2012; Dixit 2011; Haddad and Zeitlyn 2009; von Braun *et al.* 2005; Subramanyam *et al.* 2011). Global Nutrition Report (2016) clearly indicates how India still lags behind many poorer countries in Africa in tackling malnutrition effectively. Though the country almost doubled the rate of stunting reduction in the past 10 years compared with the previous decade, it is still home to almost a third (31%) of the global burden of stunting (Global Nutrition Report 2018). Moreover, against the global nutrition targets of 2019, no progress has been achieved in reducing under-five wasting, adult female obesity, adult male obesity, adult female diabetes, adult male diabetes and WRA anaemia. India has shown a dismal performance in reducing child overweight also which has slightly increased from 1.9 per cent in 2006 to 2.4 per cent in 2015 (Country Nutrition Profile 2019; Global Nutrition Report 2018).

Another disturbing situation is the emergence of triple burden of malnutrition. In addition to hunger and micronutrient deficiencies, over-nutrition which is excess intake of calories leading to obesity has emerged in part from a lack of harmony between food systems and the promotion of human health where some are getting too little food while others are getting too much of the wrong food. India still has one of the worst rates of child malnutrition in the world, despite decades of investment to address this problem. India is ranked at the bottom of the Global Hunger Index (2022), which is determined by factors such as child stunting, wasting, and death placing India in 107th rank of 121 Countries. According to the census 2011, total children in India are 1.587 million out of which male constitute 0.829 million and female constitutes 0.758 million. With nearly 20 per cent of the 0-4 years' child population of the world, India is home to the largest number of children in the world where nearly every fifth child in the world lives in India. Around 40 per cent of children remain undernourished with their growth and development impeded irrevocably, over the lifetime. According to UNICEF-WHO-The World Bank Joint Child Malnutrition Estimates 2014, child mortality rate in India is 56 per 1000 live births, 20 percent of total children (under 5 years) are wasting and 28 percent of total children (under 5 years) are born underweight. Table 1 summarizes the scenario of malnourished children in India

India is home to the largest number of children in the world where nearly every fifth child in the world lives in India but around 40 per cent of children remain

Table 1: Scenario of malnourished children in India

Total children	1.587 million (0.829 million male and 0.758 million female)
Child Birth	0.25 million annually
Child Survival	0.175 million annually
Mortality	0.08 million annually
Child sex ratio	914 /1000 (declined from 927/1000-Census 2001)
Infant Mortality rate	47 (male – 46, female 49) per 1000 live births
Under five Mortality rate	59 (male: 55; female 64) per 1000 live births
Lowweight Babies	22% of total child population
Underweight	42.5% of children 0-5 years
Anaemic Children	79% children (6-35 months)
Immunisation level of infants	44% of total child population

Source: Census 2011, SRS 2010 and NFHS-3

undernourished with their growth and development impeded irrevocably, over the lifetime. India has met only four out of ten Millennium Development Goals by 2015, lacking far behind in overcoming extent of child malnutrition, Infant mortality rate, maternal mortality rate and sanitation. Despite of many National level nutritional programmes like Integrated Child Development Services (ICDS), Mid-Day Meals Program, Public Distribution System (PDS), community public works programs and Annapurna Program, India is home to 40 percent of the world's malnourished children and 35 percent of the developing world's low-birth weight infants. The reason behind these gaps lies in inability of India to understand the location specific and family specific nutritional needs of more than six lakh villages having diverse climate, cropping pattern, eating habits, dietary pattern, socio-economic conditions and communication needs. There is a gap between nutrition and agriculture which needs to be bridged.

Agriculture and Nutrition-the connect and the disconnect

A number of researchers in recent years exploring the linkages between agriculture and nutrition have reported that agriculture interventions can play a promising role in enhancing nutritional status (Gulati *et al.* 2012; Kadiyala *et al.* 2014; Kadiyala*et al.* 2012; Das *et al.* 2014; Bhaskar *et al* 2017). Another study by Headey 2011 came out with similar findings suggesting that India needs to exploit the links between agriculture and nutrition. The recent establishment of the Sustainable Development Goals (at least 12 of the 17 SDGs are related to nutrition) and the UN's labeling of the decades as the "The Decade of action on Nutrition' shows that there is a global commitment to tackling the varied challenges of malnutrition. Further, the need for agriculture to support health and nutrition has been reflected in United Nations 2030 agenda for sustainable development. It reflects nutrition's central role in achieving sustainable development, as well as its interrelationship with the majority of development sectors. The potential of agriculture for producing nutritious food has not been appropriately tapped for reducing malnourishment, especially in India. Production of quality food in adequate quantity alone may not improve nutritional outcomes, unless malnutrition is addressed by adopting a multi-sectoral approach (FAO, 2013; Das *et al.*, 2014). Making agriculture more nutrition sensitive requires a new way of thinking, planning, implementing, and partnering as well as the active engagement of a variety of stakeholders from multiple sectors. There is a dire need to identify critical entry points where nutrition goals can be incorporated into agro-food systems. Therefore, agricultural policies and programs need to be more nutrition-sensitive for improving the nutritional outcomes.

Nutrition Sensitive Agriculture for Improving Livelihood

Agri-nutri pathways

Agriculture sector cannot be overlooked in combating malnutrition because it plays a critical role in provision of food, livelihoods, and income. However, a major concern that prompts urgent attentions in which ways agriculture can be leveraged for improving nutrition and health. Agriculture and Nutrition are next door neighbours as one complements the other and share a common entry point 'food', but there has been a lack of synchronization in both aspects. In principle, reshaping agriculture to improve nutrition will require steps in four main areas: bridging knowledge gaps, ensuring that the agriculture, nutrition and health sectors do not work in isolation or at cross-purposes, seeking out and scaling up innovations and successes, and creating an enabling environment (Fan and Pandya-Lorch 2012). Ruel and Alderman (2013) have also identified six pathways through which agricultural interventions can impact nutrition: (1) food availability and access from own-production; (2) income from sale of commodities produced; (3) food prices from changes in supply and demand; (4) social and

economic empowerment of women through increased access to and control over resources; (5) women's time through contribution in agriculture, which can be either positive or negative for their own nutrition and that of their children; (6) women's health and nutrition status through engagement in agriculture, which also can have either positive or negative impacts, depending on exposure to toxic agents and the balance between energy intake and expenditure.

Nutrition Sensitive Agriculture and Food Systems

By now it is well recognized, that the economic prosperity and agricultural growth and production in India has not significantly translated into nutritional status of the population (Fan and Pandya-Lorch 2012; Gillespie *et al.* 2012). Past strategy of agricultural development has been focused only on improving production of staples and providing remunerative prices to farmers. Though this strategy has helped in achieving self-sufficiency at the national level, it has not been able to curb poor nutritional outcomes which results primarily due to inadequate intake of micro and macro nutrients. Against this background, nutrition sensitive agriculture (NSA) which aims to achieve nutritional and health objectives through sustainable agricultural development has picked up momentum. It has emerged as a new agricultural development agenda that changes the way we think about food systems and looks at food security through a nutrition lens.As self sufficiency in food production has not resulted in the nutritional transformation needed for reducing high levels of malnutrition, it aims to narrow the gap between available and accessible food and addresses the utilization dimension of food and nutrition security.In recent years, researchers from different organizations and disciplines have devoted considerable effort to the topic of nutrition sensitive agriculture which has evolved our understanding of agri-nutri linkages and has further changed nutrition and health scenarios in India.

In simple terms, nutrition sensitive agriculture is an approach that explicitly incorporates nutrition goals in agricultural interventions and at all stages of the food chain – from production, processing, retailing and consumption. It seeks to ensure the production and consumption of a variety of affordable, nutritious, culturally acceptable and environmentally sustainable foods in adequate quantity and quality to meet the daily dietary requirements of the population.

Interventions to Make Agriculture and Food Systems Nutrition Sensitive

Biofortification

As monotonous, staple-based diets are still the norm for poor households, making staple food itself more nutritious has been recognized as one of the strategies in tackling malnutrition. Biofortification is a way to improve the nutrient quality of food supplies with increased bioavailability by using modern biotechnology techniques, conventional plant breeding, and agronomic practices. It can be very effective in poverty driven areas where population rely on cheaper and more widely available staple foods such as wheat and rice for sustenance. The research focus of Indian Agricultural Research Institute has been continuously reoriented to address contemporary development challenges. With malnutrition emerging as one of the alarming problems in the country the institute has recognized the pressing need for the nutritional biofortification of the staples and thus have initiated many programmes in different crops. In the recent years many biofortified varieties of cereals, pulses, oilseeds, vegetables and fruits have been developed, for example country's first provitamin-A rich maize variety Pusa Vivek QPM9 Improved and Pusa HM4,HM8 and HM9. Improved Mustard varieties like Pusa Mustard 30 and Pusa Double Zero Mustard 31 with low erucic acid content have been adopted by many villages. â-Carotene rich cauliflower (Pusa Beta Kesari 1) and Fe-rich pearl millet (Pusa Composite 701 and 443) were also released by the institute with much success.

Biofortified crops offer a rural based intervention that, by design, initially targets the undernourished in rural and remote areas and poor households who eat large amounts of food staples daily. Gradually it penetrates to urban populations as production surpluses are marketed. Biofortification as a food based intervention can be very effective in reducing micronutrient deficiencies along with other existing mix of micronutrient interventions such as fortification and supplementation programs (Bouis and Welch, 2010). In the present context of agriculture, the challenge of global climate and rising food prices will negatively affect the nutrition of the poor forcing them to rely on staple foods like cereals to keep them from going hungry. Therefore, biofortification is a way forward to supplement the diets of the poor as this strategy relies on foods people habitually eat.

Agriculture diversification

Diversification of agriculture has the potential to improve access to more diverse and nutritious foods, a key component of meeting the "Minimum Acceptable Diet" for nutrition of children. This necessitates synchronizing transitioning of food consumption with food production at farmer's field level. One of the farmers' most important tasks is to produce food of sufficient quantity (enough calories) and quality (with the vitamins and minerals needed by the human body) to feed the world population sustainably for healthy, productive lives. Evidence shows that diversification of agriculture has the potential to improve the quantity and quality of diets in households. It can also reduce income poverty through produce sales and agricultural labour. Further agriculture improvement decreases food price volatility by diversification and increases government revenues that can be used to finance health care, education, and nutrition interventions.

Post-Harvest Value Addition in Community Agri-Nutri Security Centres (CANSCs)

One of the primary objectives of CANSCs is to bring value added nutri products like soynuts, pearlmillet pop, soymilk, multigrain cookies, beetroot mango bar etc. to the village and to integrate these nutrition rich snacks into the diets of the individuals, especially infants, young children and women of reproductive age. It adopts a community-based food system approach in which these CANSCs have been set up in villages at public locations with small scale processing facilities comprising of spice coating pan, solar dryer and microwave oven to impart skill in minimal processing techniques to rural women. In these centers rural women are trained in processing and making value added agri-nutri products using machineries which makes clear the role of value added agri-nutri products in nutrition security. The centers are set up in remote rural areas, where many people are not able to access fresh, locally grown food. In the face of such state of rural areas where a majority of individuals are obese and children malnourished a set of complementary strategies are required to eradicate these maladies. One way out is to boost the development of small scale enterprises on agriculture related to nutrition to increase the income as well as to ensure nutritional security. From this perspective CANSCs give rural women the opportunity to get together to share the cost, planning and preparation of healthy and nutri rich value added foods. Moreover it highlights how important it is for women to develop entrepreneurial skills to be financially independent and specialize in processing of locally available crops into nutri rich foods which can become a strategic lever for dynamic growth in developing countries where rural entrepreneurship plays an important role. Besides focusing on capacity building in rural women these centers act as a forum to impart agri-nutri education, to conduct awareness programs, to steam videos on agri-nutrition, to organize rural women-scientists interface etc. It focuses on how social and behavioral change principles can guide these interventions and affect diets of rural people (women). Furthermore, it facilitates social learning, inter exchange of ideas and will help rural people to discover common interests that can lead to the formation of new groups focusing on a variety of social issues.

Farming Systems for Nutrition

Farming System for Nutrition (FS4N) comes under the production pathway through which agriculture can improve nutritional outcomes. It provides agricultural remedies to the nutritional maladies. It considers the farm, the farm household, and off-farm activities in a holistic way to take care not only of farming but also aspects of nutrition, food security, sustainability, risk minimization, income and employment generation, which make up the multiple objectives of farm households. In order to integrate nutrition and agriculture or livelihood security the Farming System for Nutrition (FS4N) model should be followed which will target the problem of malnutrition through mainstreaming nutritional criteria in the selection of the components of a farming system involving crops, livestock, poultry and aquaculture wherever feasible. As agricultural interventions are more likely to be successful if human capital component such as nutrition education and development component such as WASH are incorporated, it strongly advocates their incorporation. Most of the farmers are cultivating same varieties of crop year after year. The need of hour is to diversify the cropping pattern and to include such varieties of crops which are rich in nutrients. The cropping pattern at village level needs to be analyzed and according to climatic conditions of a particular village, nutria-rich varieties can be grown. ICAR-IARI, New Delhi has a basket of such varieties which are rich in nutrients as shown in Table 2.

Women-Managed Kitchen Gardens

Kitchen gardening does not talk about new concepts and instead emphasizes home food production such as fruits and green vegetables on a small patch of land. It is one of the most cost-effective ways to produce non staples which can significantly contribute to household nutritional security through the supply and consumption of diverse vegetables in rural households. As vegetables and fruits provides vitamins

Table 2: Post harvest products developed by ICAR-IARI, New Delhi

Value Addition of Fruits and Vegetables		
Mango	Dehydrated Ripe mango slices and powder	Rich in calcium, vitamin A and vitamin C
Soybean	Ready-to-eat flaked soy	Rich in quality protein and fat, rich in micro-nutrients, rich in antioxidants and flavonoids
	Pusa soya nut	Rich in quality protein, iron, calcium and fat. Unique source of flavonoids, reduce cholesterol,
	Pusa nutriee cookies	Rich in protein (7.89%), iron and calcium
	Roasted soy nut	Rich in protein and antioxidants
Aonla, Jamun, Bels	Pusa fruit drink (jamun, amla and bel)	Rich in anti-oxidant, vitamins and minerals
Pearl millet	Pusa pearl puff	Rich in micro-nutrients, especially iron, zinc and calcium. Gluten free and can be a boon to people suffering from celiac disease
	Pusa pearl pasta	Consists of quality protein, low gluten load, contains minerals like iron & zinc
	Pearl pop snack	Rich in protein, fibre, antioxidants, iron and zinc. Helps in reduction in phytic acid content
Carrot	Dehydrated carrot shreds	Combat vitamin A deficiency

Source: Division of Food Science and Post-Harvest Technology: A profile (February 2014), Indian Agricultural Research Institute, New Delhi

and minerals which are essential for a healthy growth and development, kitchen gardening can act as an invaluable tool in increasing the adoption and consumption of fruits and green leafy vegetables. In addition to the nutritional value of kitchen gardens, it can also help in supplementing household income. Agriculture as a source of food is the most fundamental and direct pathway by which household agricultural production contributes to improved nutrition via consumption of crops cultivated by the household. This makes sense to promote kitchen gardening and good agricultural practices at the household and village level and building capacity of rural women in home food production for food and nutrition security in vulnerable communities. This approach can help in turning around the life of rural people.

Agricultural Extension interventions for promoting Nutrition Sensitive Agriculture

***Agri-Nutri (A2N) smart village model*:** Agri-Nutri Smart Village is a model integrating agriculture and nutrition that has been conceptualized by the scientists in the Division of Agricultural Extension, ICAR-Indian Agricultural Research Institute, New Delhi. It is a latest approach enriched with highly relevant and modern assets to achieve nutrition security. The focus has been on practical aspects such as the importance and role of local resources in bringing a positive change. Moreover, as gender dynamics play a crucial role in agriculture and how it impacts nutrition, primary focus of the model has been on promoting gender equity and closing the gender gap. Women being the agents of change at the household and community level, we have definitely entered the age of women. Many studies report that economic and political empowerment of women could transform the global landscape over the next 20 years. However, this trend is already evident on the economic front as the explosion in global economic productivity in recent years has been driven by fostering human resources and employment opportunities for women. For instance, in the Southeast Asia, the predominance of women in the export manufacturing sector has been the key driver of the region's economic success. In the agricultural sector also, women account for half of the world's food production even when they don't have the reliable access to land, credit, equipment, and markets. Owing to the global evidence of the role of women in transforming the world, A2N takes gender equality as the strongest stone of the pathway to reach the destination of a smart village. Another research priority in this new agenda is on improving the efficiency and effectiveness of the supply of nutritious foods, particularly fruits and vegetables; animal source foods, such as milk, meat, eggs, and fish; and pulses, which include various types of beans and peas, groundnuts, and lentils, in order to improve their quality and safety and reduce their relative prices.

This envisioned approach integrates agriculture and nutrition in a smart and unique way by targeting different components such as nutri farming system, agri-nutri education, capacity building and Self-Help Groups (SHGs) based nutri forums for social learning. It is a framework which includes various agriculture interventions, awareness campaigns and capacity building programmes, field days and field demonstrations on nutri rich crops and varieties, farmers-scientists interface, exposure visits, streaming of videos on healthy practices as well as on nutri rich varieties, minimal processing techniques of pulses, fruits and vegetables *etc.* The interventions target various stakeholders such as farmers, farm women, SHG members, anganwadi workers, school children *etc.*

Malnutrition is a multidimensional concept which is determined by a range of problems such as access to diverse and safe diet, WASH, disease burden, health services, environmental factors along with a myriad of socio-political factors. From this perspective, A2N smart village operates on the assumption that the achievement of nutrition goals are more likely if we leverage other development sectors like social protection, food safety and quality assurance and water

and sanitation. This concept has gained attraction, as evidenced by the A2N smart village bulletin that has been introduced under the project of Indian Agricultural Research Instituteas a great initiative to tackle malnutrition, and illustrates the importance of understanding and embracing multispectral partnership models if we have to achieve nutrition goals. This concept has gained attraction, as evidenced by the A2N smart village bulletin that has been introduced under the project of Indian Agricultural Research Institute as a great initiative to tackle malnutrition, and illustrates the importance of understanding and embracing multispectral partnership models if we have to achieve nutrition goals. "Agri-Nuti smart villages" can have following important 6 components.

1. Nutri-Farming System

Cultivation of nutri-rich varieties: Most of the farmers are cultivating same varieties of crop year after year. Diversification of agriculture has the potential to improve access to more diverse and nutritious foods, a key component of meeting the "Minimum Acceptable Diet" for nutrition of children. This necessitates synchronizing transitioning of food consumption with food production at farmer's field level. One of the farmers' most important tasks is to produce food of sufficient quantity (enough calories) and quality (with the vitamins and minerals needed by the human body) to feed the world population sustainably for healthy, productive lives. Evidence shows that diversification of agriculture has the potential to improve the quantity and quality of diets in households. It can also reduce income poverty through produce sales and agricultural labour. Further agriculture improvement decreases food price volatility by diversification and increases government revenues that can be used to finance health care, education, and nutrition interventions. In order to integrate nutrition and agriculture or livelihood security the Farming System for Nutrition (FS4N) model should be followed which will target the problem of malnutrition through mainstreaming nutritional criteria in the selection of the components of a farming system involving crops, livestock, poultry and aquaculture wherever feasible. The need of hour is to diversify the cropping pattern and to include such varieties of crops which are rich in nutrients. The cropping pattern at village level needs to be analyzed and according to climatic conditions of a particular village, nutria-rich varieties can be grown. ICAR-IARI, New Delhi has developed such varieties which are rich in nutrients as shown in Table 3.

Cultivation of traditional crops: Traditional nutritive crops like coarse cereals, jowar, bajra and pearl millets have lost their places from kitchens; however, they are very rich in nutrients and other essential minerals. They not only ensure nutritional security but also cure many diseases like diabetes. The cultivation of traditional crops needs to be inculcated in cropping pattern of villages; in fact, they are now renamed as Nutri-cereals (M.S. Swaminathan)

Fruit and vegetable cultivation: Fruits and vegetables are the richest source of vitamins, minerals and other micro nutrients. The farmers concentrating only on rice-wheat cropping pattern must be motivated to cultivate fruits and vegetables for at least home consumption. Table 2 indicates nutri rich varieties of vegetables developed by ICAR-IARI. New Delhi.

Forage and fodder crop cultivation for nutritional security: Proper training should be provided to farmers to plan their animal feed like berseem, lettuce etc. along with crops. Proper animal feeding practices should be taught to farmers so that animals of farmers remain healthy and give good yield of milk. Farmer must be counselled to retain milk for their family members rather than marketing it as whole. For this purpose, dual purpose varieties of maize (fodder plus feed), improved varieties of berseem, lucern, alfa – alfa, bermuda grass etc can be adopted by farmers.

Nutri-kitchen garden: Most of the farm families have backyard which mostly remain fallow. The

Table 3: Nutrient rich varieties developed by ICAR-IARI, New Delhi

Crop	Name of varieties	Rich in nutrient
Cereals		
Wheat	HI 8627 (Malavkirti)	Rich in vitamin A
	HI 8663 (Poshan)	High quality for preparation of *dalia,suji* and pasta making
	HD 4672 (Malavratna)	High quality for preparation of *dalia* and *suji*
	HD 2932 (Pusa Wheat 111)	High zinc content
	HI 8498 (Malavshakti)	Good quality for *suji* and *dalia*
	HI 8713 (Pusa Mangal)	Rich in nutrients like Beta-carotene (precursor of Vitamin A) and essential micronutrients like iron and zinc
	HI 1563 (Pusa Prachi)	Rich in micronutrients like iron, zinc and copper
Pulses		
Chick pea	Pusa 372 (Desi)	Dal and *besan* making
	Pusa Chamatkar (BG 1053) (Kabuli)	Good cooking quality
Lentil	Pusa Vaibhav	Rich in iron
Vegetables		
Carrot	Pusa Vasudha	Rice in total carotenoid and lycopene, TSS and minerals
	PusaRudhira	Rich source of total carotenoids
	PusaNayanjyoti	Roots possess high B-carotene content (7.552 mg/100g fresh weight
Radish	PusaJamuni	Higher anthocyanins (8.04 mg/100 g) and ascorbic acid (44.8 mg/100 g).
	PusaGulabi	High total carotenoids (15.6 mg/100 g), anthocyanins (4.41 mg/100 g) and optimal ascorbic acid (39.2 mg/100 g).
Vegetable Mustard	Pusa Sag 1	Higher carotene and ascorbic acid
Oilseeds		
Mustard	Pusa Mustard 29 (LET 36)	low erucic acid
	Pusa mustard 21 (LES-127)	<2% erucic acid
	Pusa Karishma (LES- 39)	<2% erucic acid
	Pusa mustard 30 (LES-43)	Low erucic acid
Fruits		
Mango	Pusa Shreshth	Vitamin C (40.3 mg/100 g pulp) and -carotene content (10,964 g/100 g pulp).
	Pusa Pratibha	Vitamin C (34.9 mg/100 g pulp) and -carotene content (11,474 g/100 g pulp).
	Pusalalima	Vitamin C (34.7 mg/100 g pulp) and high -carotene content (13,028 g/100 g pulp)
	PusaPeetamber	Rich in vitamin C (39.8 mg/100 g pulp) and -carotene content (11,737 g/100 g pulp).
Grape	Pusa Navrang	High antioxidant content

Source: ICAR-IARI (2014), Technological Options for Enhanced Productivity and Profit, Indian Agricultural Research Institute, New Delhi

backyard can be converted into kitchen garden where vegetables, fruits and flowers cab be grown for domestic purpose. Also, farmers can maintain apiculture and can practice mushroom cultivation. This will not only reduce family expenses but also help in securing nutrition among family members. The technical knowhow and demonstration of kitchen garden can be organized in village with the help of resource person from research institute and nutria-club of the village. ICAR-IARI has developed kitchen garden kit (comprising of seeds of nutria rich varieties of vegetables) which can be disseminated and demonstrated. Kitchen gardening does not talk about new concepts and instead emphasizes home food production such as fruits and green vegetables on a small patch of land. It is one of the most cost-effective ways to produce non staples which can significantly contribute to household nutritional security through the supply and consumption of diverse vegetables in rural households. As vegetables and fruits provides vitamins and minerals which are essential for a healthy growth and development, kitchen gardening can act as an invaluable tool in increasing the adoption and consumption of fruits and green leafy vegetables. In addition to the nutritional value of kitchen gardens, it can also help in supplementing household income. This approach can help in turning around the life of rural people.

2. Nutri-Club

A nutri-club comprising of adults, women, youth and children can be constituted at village level. The main activities under this club will be carrying out nutritional campaigns in schools and aganwadi, weekly rallies, exhibitions and nutri-quizzes for children, youth and mothers. As like Media Forums originated in Canada where farmers receive mass media and personal communication on agricultural practices, separate nutri-forum can be made at village level, where all villagers can meet on weekly basis and receives information regarding nutrition and Government ongoing schemes in nutrition through mass media and personal communication. Also just like in ICDS where discussion forums were organized (sas-bahu sammelan, mangal diwas, mamta diwas etc.), Nutri-forum can be utilized to organize local ceremonies of villages especially which have relevance to mothers and children like godh-bharai, annaprashan etc where all villagers can participate and SHG's can discuss about nutrition.

A separate nutri-health checkups can be initiated in collaboration with ICDS –aganwadis health center where regular anthropometric checkup of mothers, youth and children can be carried out on monthly basis along with specific checkups on immunization, anemia, height and weights of mothers, youth and children. This initiative will require initial startup with medical experts but later on self-help groups can be formulated and trained for taking anthropometric check and keeping proper records. This will involve mothers, youth and children themselves for monitoring their own health on monthly basis. This may also involve para dieticians and nutritionists for health nutrition counselling. The structure and functioning of nutri-club can be decided by villagers themselves and weekly meetings can be organized.

3. Agri Nutri Education

The best nutritional practices and other nutritional information can be disseminated into villages through e-modules. The nutri club members can explain them to village women, men and children during their meet at nutri-forum. Also, various text, voice and video-based SMS can be sent to target population to enhance their knowledge regarding nutrition. Agricultural research Institutes, Krishi Vigyan Kendra's and State agricultural universities will play a crucial role in developing content for e-modules and messages along with nutrition experts which address agriculture and nutrition.

4. Agri-Nutri Capacity Building

Capacity Building of rural youth can be done through

trainings and workshops intended for behavioral change intervention. For this skill gap analysis in field of agri-nutrition can be done under various projects of state agricultural universities, state Government and other agricultural institutes in India. Special Trainings focused on agri-nutrition can be designed and Nutri modules can be formulated to impart training at village level. ATMA, KVK and research institutes can work in collaboration to design and impart training. Entrepreneurship development is another area where nutrition needs to be strengthened. Youth of villages have to be trained in preparing nutri-rich foods. ICAR-IARI has prepared various nutri-rich post-harvest products which can be produced and distributed at village level in very low cost. Table 3 summarizes various post-harvest products developed by ICAR-IARI, New Delhi, in which youth can be trained in production and distribution. These may also be taken up by self-help group and anganwadis.

Women empowerment and education

More than 80% of rural women engaged in the labor force work in the agriculture sector which provides a significant opportunity to unleash the gender dimensions of agriculture-nutrition linkages. Strengthening women's position both within the agricultural sector and within the household can significantly improve households' nutrition and health. There is evidence that women's employment does have a beneficial effect on household nutrition, female education also has a strong inverse relationship with IMR, educated women have greater roles in household decision making, particularly those relating to nutrition and feeding practices.

Use of Information and Communication Technology (ICT)

Awareness creation about the problem of nutrition and need for diversified diet is essential for the change in dietary habit of the consumers and production pattern of the farmers. In this scenario, ICT can play an important role right from the production to marketing for the farmers and for the price, information, and awareness among the consumers.

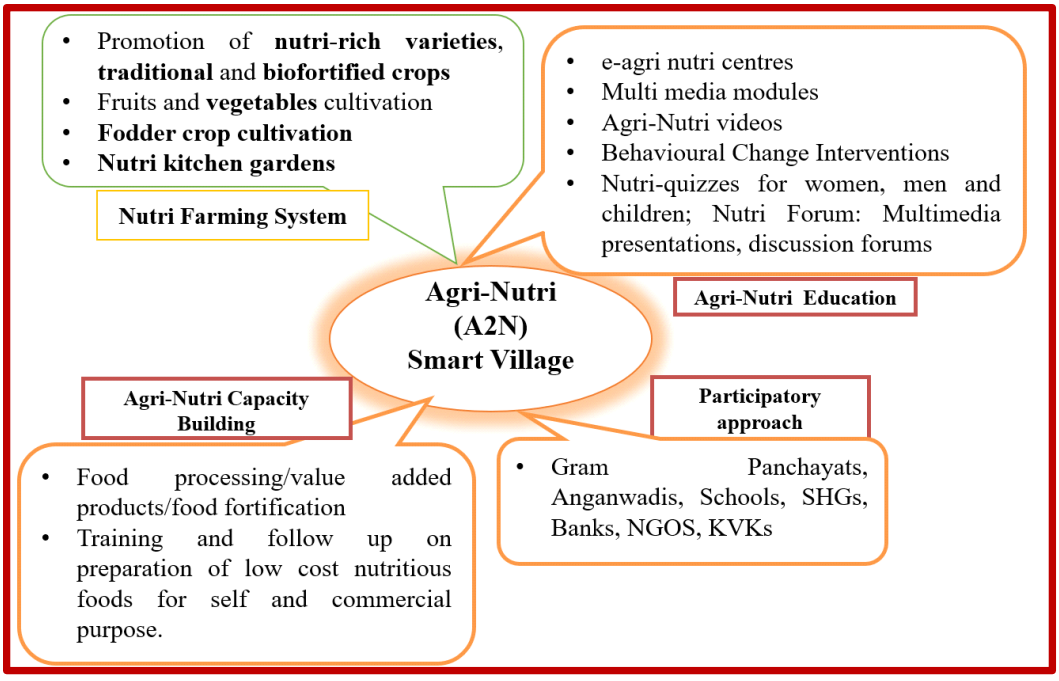

Figure 1: Agri-nutri (A2N) smart village Model

Collective approach

To protect small and marginal farmers in India (about 86%) from national and international price volatility, collective marketing viz. Self-help group model, cooperative model, contract farming can be used. Through such group actions, farmers can increase their bargaining power, economies of scale and income from agriculture. They can market their produce collectively, reducing their transaction cost, reducing the price of the commodity to consumers, transferring benefits to the consumers also. Thus, the affordability component of nutrition security can be fulfilled by collectives of farmers.

Farmer led and Market led Extension

Agriculture being the primary source of income for farmers and rural people, these extension approaches can impact nutrition and health through the income pathway. In recent years, there has been a reduction in the number of cultivator households implying that the proportion of households for whom agriculture was the source of income has declined and this brings forth the weakness of the pathway which focuses on agriculture as a source of income. Agriculture has not been a viable source of income especially for the vast majority of smallholders and women, as they lack an effective voice in influencing research and extension priorities. Thus farmer led extension can be started by organizing farmers into functional groups, such as Self Help Groups (SHGs), Farmer Interest Groups (FIGs), Commodity Associations (CAs) and/or other types of Farmer Organizations (FOs). These FOs can provide an effective channel for both dissemination of technology to smallholder and feedback to research and extension. Maharashtra State Grape Growers Association (MRDBS) is an excellent example of such an approach. Moreover, in post-WTO regime, marketing extension so far a peripheral issue in the extension scenario needs to be brought to center stage since production is significantly dictated by market requirements and farmers most of the time fails to get a good price for their produce.

Income pathway is of huge importance as the effect of income on nutrition is neither direct nor easily predictable. The allocation of income for expenditure on different food and non-food items is always modified by what is available, affordable, and convenient to purchase. The decision is driven by a myriad of other factors like who gets to decide what to purchase and how much to purchase. Thus increasing farmers' income can help in increasing dietary diversity and social consumption greatly influences nutritional outcomes and health.

Enhancing economic security through nutrition sensitive agriculture

Identifying critical entry point for promoting nutritious crops, varieties, technologies and practices very important for successful adoption and integration into the existing agro-food system. Ruel and Alderman (2013, 2018) identified six pathways through which agricultural interventions can impact nutrition out of which income from the technologies or commodities is most vital factor beside the dimension of nutrition security. It is because of the fact that income is widely seen as a major motivating factor for adoption of any technology and used as a welfare measure as it is strongly correlated with an improved standard of living, such as food, clothing, shelter, health care, education, and recreation. Therefore, nutrition sensitive agriculture has to be economically viable both to the producer as well as consumer for its adoption among the farming communities and consumer society as well. On many occasion, the traditional extension system found to highlight the technological aspect only like yield, nutritive value of crops or varieties only for its promotion ignoring the economic dimension and end up with limited adoption. Several past studies found that nutritious crops and varieties are not successful in addressing specific nutritional crisis but also helps to raise the income of farmers more than from conventional farming system. Number of studies on role of kitchen gardening in livelihood security admits that it not only ensured the nutritional

security but also guaranteed the additional income. Brun and colleagues (1989), Rowe (2009), Mitchell and Hanstad (2004) and Dilrukshi Hashini Galhena etal 2013 provided ample evidences on how kitchen gardening contribute to income generation, improved livelihoods, and household economic welfare as well as promoting entrepreneurship and rural development.

Dilrukshi Hashini Galhena *et al.* 2013 reported that Families in mountain areas of Vietnam were able to generate more than 22% of their cash income through home-gardening activities. A study from Southeastern Nigeria reported that tree crops and livestock produced in home gardens accounted for more than 60% of household income (115). ICAR-IIHR reported that Out of which 650 kg was consumed by her family and 250 kg was sold in local haat to earn gross income to the tune of approximately 'Rs. 11500 in a year. The fact that home production is less cost-intensive and requires fewer inputs and investment is extremely important for resource-poor families that have limited access to production inputs. Yet it has been assessed that moderately rigorous crop and livestock production in home gardens can generate as much revenue per unit area as field crop production. Similarly it is found that farmers can earn from revenue from cultivation of nutritious varieties of major crops or nutritious crops. For example, Chetia P (2020) reported that cultivation of nutritious black rice which is rich in anthocyanin antioxidant was more remunerative than growing traditional rice. The farmers in Assam earned Rs. 200 to Rs. 250 per kg for non-organic variety of black rice and Rs. 500/kg for organic black rice. Sharma (2019) found that cost benefit ration of black paddy is 1.78 and for rice 1.87 indicating both the cases is favorable to the farmers and farmers can earn more revenue from black rice. Similarly, Deb U (2016) in his study calculated the value of return from cultivation of nutritious golden rice under optimistic and conservative scenario. The internal rate of return (IRR) was 70.50 percent for optimistic scenario and 69.86 percent for conservative scenario. Under the Optimistic Scenario, the Benefit Cost Ratio (BCR) is 751 when the benefits and costs are discounted at 3 percent indicating that each dollar investment on Golden Rice research and development will generate a social return which wills be 751 dollars. The adoption of nutritious breed of poultry that is Kadaknath chicken proved to be highly remunerative than the conventional breed. it contains more protein (approx 25%) than white chicken meat (approx 18%). Rich in vitamins B1, B2, B6, B12, C and E, niacin, calcium, phosphorus and iron, the inky fowl has a lower fat content of only 0.73-1.03% as opposed to the approx 25% in other chicken breeds. Kadaknath meat contains 18 amino acids of which, eight are essential for the human body. Black meat is also considered healthier as it contains 24% linoleic acid, as opposed to the 21% in white chicken. Furthermore, the cholesterol content in Kadaknath is only 184.75 mg/100 gm as opposed to the white meat. Mishra A *et al.* reported that the chicken sold for Rs 400-900 a piece, at the farm level against Rs 150- 300 for a regular chicken and farmers were earning additional income of Rs 90,000-1,00,000 per year by rearing of 100 birds generating employment of 460 man days/unit/year. Gizaki LG (2019) in a study on Socioeconomic Impact of SG 2000 Quality Protein Maize (QPM) Technology Delivery on Beneficiaries found that the farmers who adopted the technology had more income, better living standard and accumulated more wealth from cultivating QPM.

Recently, the consumer preferences shifted towards intake of nutria crops specially vegetables and fruits. Therefore, farmers should tap this opportunity for their income security. The increasing health consciousness among the citizen added a new vista for cultivation of nutritional vegetables and fruits among the farming communities. Joosten etal (2015) in this aspect showed that the profits per hectare are 3–14 times higher in vegetable production than in rice production while profits per labor-day are double. But public and private investments in agriculture are

still largely focused on staple crops and oil crops, not on commodities rich in micronutrients (Haddad et al., 2016, Pingali, 2015). Ebert A W (2014) reported that even a small plot of 500 m2 traditional nutria leafy vegetables of amaranthus can earn a farmer in to a supplementary income of US$250 a year. The acceptance of nutria-farming system also depends on the consumers as they are the demand generator and their preferences, economic capacity and purchasing behaviour are determining factor for the success of nutria-sensitive agriculture. In this regard, Talsma EF *et al.* (2017) reported that in India, a survey of rural and urban households (n = 602) as well as students, academicians, and businesspersons (n = 110) showed that 70% and 28%, respectively, were willing to consume genetically engineered nutritious crops and were willing to pay a premium of 19.5% for golden rice. De Steur *et al.* (2010) found similar results in China with 62% of respondents (n = 944) willing to accept folate-rich rice biofortified through genetic engineering and willing to pay a premium of 34% for it. Factors influencing acceptance of biofortified crops vary largely by type of crop and country but also by characteristics of consumers, such as age, sex, socioeconomic status, and being a disliker or liker of biofortified crops. Hence, the policy makers as well as farming community should keep these facts in mind and accordingly shape their farming system for successful promotion of nutrition sensitive agriculture.

CONCLUSION

Competing and complementary theories on nutrition sensitive agriculture has been provided by researchers from different disciplines and literature is growing in recent years. The above essay tries to refresh our understanding on the linkages between agriculture and nutrition and highlights some of the key interventions that can help in improving the synergies between agriculture and nutrition. Furthermore, it brings to notice the need to have a multisectoral and multidisciplinary approach that brings together extension workers, economists, nutritionists, policy makers, and other stakeholders to address key knowledge gaps and drive a change in India's agriculture and nutrition policy and program processes.

The focus of present policy concern has shifted from food security to nutrition security in developing countries and India is no exception. Beside facing the challenge of feeding growing population, the region is also confronting the nutritional challenge of high incidence of stunted and wasted children, high infant mortality rate. Micro-nutrient malnutrition is the rising concern for whole region. The present food production system mainly focusing on production aspect ignoring its nutritional aspect. The past research indicates that increased food production does not automatically get translate into nutritional security. This indicates a missing link in the present food production system and raised the need of revised agricultural policy and farming system focusing on human health and nutrition. Nutrition sensitive agriculture plays an important role in improving the livelihood and farm income of small-scale farmers in Indian context. We have to understand the connect and disconnect between agriculture and nutrition in present policy system to reorient the agri-nutri pathways for achieving nutrition sensitive agriculture and food system. The contribution of agriculture in nutritional output could be more significant through interventions like bio-fortified foods, diversifying the existing cropping pattern, promoting post-harvest value addition technologies and processes, devising new farming system for nutrition and adopting kitchen-gardening by farm women.

REFERENCES

Bhaskar, A. V. V., Nithya, D. J., Raju, S., & Bhavani, R. V. 2017. Establishing agriculture-nutrition programmes to diversify household food and diets in rural India. *Food Security* 9(5): 981-999

Bouis, H. and R. Welch. 2010. Biofortification—a sustainable agricultural strategy for reducing micronutrient malnutrition in the Global South. *Crop Science* 50: 20–32.

Brun, T., Reynaud, J., Chevaussus-Agnes, S. 1989. Food and nutrition impact of one home garden project in Senegal. *Ecology of Food and Nutrition* 23:91–108.

Chetia, P. 2020. Black Rice Cultivation: Success Story of Local Farmers Who Earn Good Income in Assam. https://krishijagran.com/agriculture-world/black-rice-cultivation-success-story-of-local-farmers-who-earn-good-income-in-assam/

Das, P. K., Bhavani, R. V. and Swaminathan, M. S. 2014. A farming system model to leverage agriculture for nutritional outcomes. *Agricultural Research* 3(3):193–203

De Steur, H. , Gellynck, X. and Storozhenko, S. 2010. Willingness-to-accept and purchase genetically modified rice with high folate content in Shanxi Province, China. A*ppetite* 54118–125

Deb, U. 2016. Returns to Golden Rice Research in Bangladesh: An Ex-ante Analysis. Technical Report. https://www.researchgate.net/publication/344222671

Dixit, A. 2011. Poverty and Food Security in Gujarat, India. *European Journal of Development Research* 23 (1): 129–150

Ebert AW. 2014. Potential of Underutilized Traditional Vegetables and Legume Crops to Contribute to Food and Nutritional Security, Income and More Sustainable Production Systems. *Sustainability* 6: 319-335; doi:10.3390/su6010319

Fan, S., and Pandya-Lorch, R. 2012. Reshaping agriculture for nutrition and health. Washington DC: International Food Policy Research Institute (IFPRI)

FAO. 2013. The state of food and agriculture. Rome: Food and Agriculture Organization of the United Nations

FAO. 2019, FAO in India. http://www.fao.org/india/fao-in-india/india-at-a-glance/en/ Accessed on: 20 January 2021

Galhena, D.H., Freed, R. and Maredia, K. 2013. Home gardens: a promising approach to enhance household food security and wellbeing. Agriculture and food security. *Agriculture and Food Security* 2:8

Gillespie, S., J. Harris and S. Kadiyala. 2012. The agriculture nutrition disconnect in India: what do we know? IFPRI Discussion Paper 1187. Washington, DC: International Food Policy Research Institute.

Gizaki, L. J., and Madukwe M C. 2019. Socioeconomic Impact of SG 2000 Quality Protein Maize (QPM) Technology Delivery on Beneficiaries in Bauchi and Gombe States. *European Scientific Journal* January.15(3) http://dx.doi.org/10.19044/esj.2019.v15n3p169

Global Nutrition Report. 2019. India Nutrition Profile. Accessed on: 10 February 2021 https://globalnutritionreport.org/resources/nutrition-profiles/asia/southern-asia/india/

Gulati, A., A. Ganesh-Kumar, G. Shreedhar and T. Nandakumar. 2012. Agriculture and malnutrition in India. *Food Nutrition Bulletin* 33, 74–86.

Haddad, L. and Zeitlyn, S. 2009. Lifting the curse: overcoming persistent undernutrition in India. *IDS Bulletin* : 40 (4)

Haddad, L., Hawkes, C., Webb, P., Thomas, S., Beddington, J., Waage, J., Flynn, D. 2016. A new global research agenda for food. *Nature* 540: 30–32.

Headey, D. 2011. Pro-Nutrition Economic Growth: What Is It, and How Do I Achieve It?", Background Paper for the Conference – Leveraging Agriculture for Improving Nutrition and Health, organised by the International Food Policy Research Institute, New Delhi, 10-12 February.

IFPRI. 2016. Global Nutrition Report 2016: From Promise to Impact: Ending Malnutrition by 2030. Washington: International Food Policy Research Institute.

IFPRI. 2018. Global nutrition report 2018: Shining a light to spur action on nutrition. Washington: International Food Policy Research Institute.

Joosten, F., Dijkxhoorn, Y., Sertse, Y., Ruben, R. 2015. How does the Fruit and Vegetable Sector contribute to Food and Nutrition Security? LEI Nota 2015–2076, June 2015. LEI Wageningen UR, Wageningen.

Joshi, P. K., Pratap Singh Birthal, and Nicholas Minot .2006. Sources of Agricultural Growth in India: Role of Diversification towards High-Value Crops." International Food Policy Research Institute Markets, Trade and Institutions Division Discussion Paper 98

Kadiyala, S., J. Harris, D. Headey, S. Yosef, & S. Gillespie. 2014. Agriculture and Nutrition in India: Mapping Evidence to Pathways." *Annals of the New York Academy of Sciences* 1331:43–56

Kadiyala, S., Joshi, P.K., Dev, S.M., Kumar, T.N., Vyas, V. 2012. A nutrition secure India: role of agriculture. *Economic and Political Weekly* 47(8) :21-26.

Kotwal, Ashok, Bharat Ramaswami and Wilima Wadhwa. 2011. Economic Liberalization and Indian Economic Growth: What's the Evidence? *Journal of Economic Literature* 49(4): 1152-99.

Ministry of Agriculture and Farmers Welfare, Government of India. 2018. Agricultural Statistics at a Glance, Department of Agriculture and Cooperation, India

Mishra A., Singh S.R.K. and Raut A.A. Kadaknath Farming for Farmers' Livelihood and Empowerment. http://www.zpd7icar.nic.in/download/Kadaknath%20Farming%20for%20Farmers%E2%80%99%20Livelihood%20and%20Empowerment.pdf Accessed on 10.3.2021

Mitchell R., Hanstad, T. 2004. Small Homegarden Plots and Sustainable Livelihoods for the Poor. Rome, Italy: LSP Working Paper 11

Pingali, P. 2015. Agricultural policy and nutrition outcomes – getting beyond the preoccupation with staple grains. Food Secur. 7, 583–591.

Rowe W.C. 2009. "Kitchen gardens" in Tajikistan: the economic and cultural importance of small-scale private property in a post-soviet society. *Human Ecology* 37(6):691–703.

Ruel M.T., Quisumbing A.R. and Balagamwala M. 2018. Nutrition-sensitive agriculture: What have we learned so far? Global food security 17:128-153.

Ruel, M.T., Alderman, H., Meternal. 2013. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? *Lancet* 382: 536-551.

Sharma S.K. 2019. Cost Benefit analysis of Black Rice Cultivation in Padumani Development Block of Golaghat District of Assam, India. International journal of basic and applied research, 9(6).

Subramanyam, M.A., Kawachi, I., Berkman, L.F. and Subramanian S.V. 2011. Is Economic Growth Associated with Reduction in Child Undernutrition in India? *PLoS Med* 8(3), e1000424. https://doi.org/10.1371/journal.pmed.1000424

Talsma E.F., Boonstra A.M., Brouwer, I.D. 2017. Acceptance and adoption of biofortified crops in low- and middle-income countries: a systematic review. *Nutrition Reviews*75(10):798–829.

Von Braun, J, Gulati, A., Hazell, P., Ruel, M. and Rosegrant, M. 2005. Indian Agriculture and Rural Development Strategic Issues and Reform Options, *IFPRI Strategy Paper.*

World Bank. 2007. From agriculture to nutrition: Pathways, synergies and outcomes. No. 40196- GLB. Agriculture and Rural Development Department, The World Bank: Washington, DC

Lead Paper-3

Awareness on Utilization of Insects as Livestock Feeds

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The world population is expected to be more than 10 billion by 2050, and the livestock population is going hand-in-hand with the human population explosion (IFIF, 2019). We need to feed this increasing number of livestock, and it is becoming increasingly difficult due to the alternate use of farmland and conventional feed ingredients. Alternatives to conventional feed ingredients are certainly a way to sustain the livestock sector's growth rate (Mottet *et al.*, 2017).

There are more than 1,900 identified species of edible insects (Van Huis *et al.*, 2013). Insect farming promises to be the epitome of a circular economy as it can be used to eliminate organic waste at a mega level. Insects have a short life cycle, fast growth and can be reared on organic wastes such as manure and garbage (Veldkamp *et al.*, 2012). This reduces pollution by converting fermentable waste to frass, which can be further used as a fertilizer. This mitigates nitrogen and methane emissions, reduces waste mass by about 80% (Chavez and Uchanski, 2021), and has a low carbon footprint (Mlcek *et al.*, 2021). They have proven to be a good protein (350 to 700 g/kg of DM) and fat source for animals with high digestibility values (Hong and Kim, 2022), making them a sustainable alternative for ingredients such as soybean meal (SBM) and fish meal. The *in-vivo* amino acids digestibility of insect diets in poultry is 89 - 95%, which is equivalent to fish meal.

Interestingly, insects are natural foods for poultry and, therefore, should be a prime candidate for protein sources in the diet. The essential amino acids proportion of insect meal is higher than in conventional feedstuffs (Al-qazzaz and Ismail, 2016). Further, the secondary effects of using insects as a feed component include improved palatability of diet (Al-qazzaz and Ismail, 2016), immune-modulatory effects (Gasco *et al.*, 2018) and increased shelf-life of meat (Sun *et al.*, 2013). In addition, insects are known to produce antimicrobial peptides for self-defence. These peptides could also have a functional role in poultry (Joìzefiak and Engberg, 2017) and may act as replacer of growth-promoting antibiotics (Choi *et al.*, 2013). It has been suggested that insect meal inclusion in the diet could improve the amino acids transportation by regulating the sensing gene and the mammalian target of rapamycin (mTOR) signal pathway in the intestinal mucosa (Liu *et al.*, 2020).

The insects reared for use in animal feed ingredients are processed after harvesting by slaughtering through temperature shock (heat or cold) and then converted to a miscible meal through processes like drying and grinding or extraction or hydrolyzation (Hong *et al.*, 2020). The insects can be fed in fresh, dried, or paste form (Khan *et al.*, 2018). However, dried meal is usually preferred for livestock diets due to shelf-life concerns. The meal may be further processed through blanching and then freezing or drying to increase shelf-life. The moisture level is usually restricted to 4 - 5% to avoid spoilage (Makkar *et al.*, 2014).

Insects studied as most promising for industrial production and animal feed ingredient in the world are the BSF (*Hermetia illucens*), mealworm (*Tenebrio molitor*, TM), and common house fly (HF; *Musca domestica*). Earthworm, silkworm, and locust swarms can also be effectively utilized in poultry feed (Elahi *et al.*, 2022). China and South Korea are the major

countries extensively exploring the nutritional value of various insect meals in livestock diets. Research in Western countries is mainly limited to BSF larvae meal (Hong and Kim, 2022). Products used are mainly full-fat larvae meal or defatted larvae meal.

Black Soldier Fly (*Hermetia illucens*) Meal

Black soldier fly (BSF) larvae originate in cattle, pig, and poultry manure but can also be reared on organic waste materials (Cullere *et al.*, 2016). BSF meal is a good source of protein and energy. BSF larvae rearing reduces manure mass by 50% and total nitrogen concentration by 62% (Newton *et al.*, 2005). Rearing BSF larvae on animal manure could also reduce the house fly population (by repelling ovi-position) (Veldkamp and Bosch, 2015). BSF is also relatively safer than other insects as it is not a carrier of any known bacteria or fungus (Eilenberg *et al.*, 2015).

The average nutritive value of BSF larvae is DM (27.40%), CP (56.10%), CF (23.20%), ash (9.85%), Ca (2.14%), P (1.15%), Mg (0.39%), K (1.35%), Zn (13.10 mg/kg), Cu (11.20 mg/kg), Mn (23.20 mg/kg), and Fe (20.40 mg/kg) based on DM (Shah et al., 2022). The crude fat in BSF meal ranged from 7% to 42%. They are used directly or are dried, chopped, and ground into shapes. The DM substance in fresh BSF larvae is much higher (34.9% to 44.9%), which makes BSF larvae easier and less expensive than other fresh products. BSF contains higher lauric and palmitic acid concentrations (Moula *et al.*, 2018). Methionine in BSF meal ranged from 0.08% to 0.90%, with methionine + cysteine levels at 1.30% (Mwaniki *et al.*, 2018). The concentration of lysine ranged from 0.34% to 3.30%, and threonine ranged from 0.22% to 2.26%. BSF larvae contain 3 to 10 times higher calcium and magnesium content than other insects. Dried full-fat BSF larvae meal has an average of 42% crude protein and 42.5% ether extract. The partially defatted BSF larvae meal showed an average of 59% CP and 9% EE contents (Vilela *et al.*, 2021), and the defatted BSF larvae meal showed an average of 51% CP and 10% EE contents (Elahi *et al.*, 2022).

BSF meal is a better protein source to improve growth performance, carcass composition, and meat quality in broiler chickens as compared to other insect meals (Elahi *et al.*, 2022). It can be used to replace fish meal and soybean meal or even soybean oil in broiler diet. The BSF larvae or prepupae products have a good quality amino acid profile compared to the SBM and other animal proteins (Hong and Kim, 2022). Diet containing 5% BSF meal improved feed efficiency, 7.5% improved meat quality, and 10% also resulted in better growth (Dahiru *et al.*, 2016). Diet containing 20% BSF meal in broiler chickens diet improved the meat quality (Vilela *et al.*, 2021). Diet containing 15% BSF meal increases the body weight, abdominal fat percentage, meat redness, meat protein percentage, breast meat monounsaturated fatty acids (MUFA), and reduced breast meat PUFA (Schiavone *et al.*, 2019).

The effects of feeding BSF meal depends on the dietary ratio between methionine and cysteine as diets with a 50:50 methionine cysteine ratio improved feed efficiency and net protein utilization; however, diet with 40:60 methionine cysteine ratio reduced the growth performance, methionine pre-caecal digestibility, & net protein utilization (Brede *et al.*, 2018).

Fish meal can be replaced by BSF meal in the diet of domestic chickens. At 33% replacement of fish meal dressing percentage and protein deposition in meat is increased (Mohammed, 2017), whereas, as a complete replacer of SBM, the performance of birds may be affected negatively if methionine supplementation is not done. Positive effects on growth performance and carcass characteristics were observed up to a 10% inclusion level as a replacer of SBM and fish meal; however, a 15% level reduced the aroma and taste of cooked pectoral muscle (Onsongo *et al.*, 2018). Soybean oil was successfully replaced with 100% BSF fat for broiler chickens, although this increased the total saturated fatty acids in breast and leg meat (Cullere *et al.*, 2019).

Laying hens fed on BSF meal (3-10% level) improved the feed intake and growth performance,

nitrogen and energy metabolizability, apparent digestibility of crude fat, egg quality, immune performance and antioxidant status, however, higher levels (17-24%) BSF meal resulted in reduced DM digestibility, poor growth, and production (Elahi *et al.*, 2022).

In weaning pigs, 50% of animal proteins, replaced with full-fat BSF larvae had no impact on the final body weight and average daily gain but improved gain to feed (G:F) ratio (Crosbie *et al.*, 2021). Inclusion of partially defatted BSF larvae meal at 10% to replace SBM increased average daily feed intake (ADFI) of weaned pigs due to increased diet palatability (Biasato *et al.*, 2019).

In finishing pigs, increasing the BSF larvae meal from 9% to 14% inclusion level in diet as a replacer of 50% to 100% of fish meal improved the final BW, ADG, and feed conversion ratio (Chia *et al.*, 2021).

Altmann *et al.* (2019) found that supplementation of partly defatted BSF larvae meal in finishing pigs' diet as a replacer of SBM (50-100%) improved overall flavour and juiciness of pork loin. BSF larvae meal (10%) positively influenced cecal microbiota and gut maturity in weaned pigs (Biasato *et al.*, 2020) as compared to SBM (Kar *et al.,* 2021). Even at inclusion level of 4%, BSF meal increased *Lactobacillus* and butyrate-producing bacteria in swine gut, and up-regulated the gene expression of anti-inflammatory cytokine (interleukin 10) and intestinal barrier function (zonula occludens-1, occludin, and mucin-1) compared with the control group in mucosa of the colon (Yu *et al.*, 2019).

Yellow Mealworm(*Tenebrio molitor*) Meal

Yellow Mealworm (MW) is grown on dried and cooked waste material of fruits, grains, and vegetables. Larvae typically measure about 2.5 cm or more, while adults typically range between 1.25 and 1.8 cm (Bovera *et al.*, 2016). MW can be found throughout the world. It is usually fed as larvae meal (dried full-fat larvae meal), however defatted larvae meal (68% CP) has also been used in some studies. The average chemical composition of the MW larvae consist of DM 94.6%, CP 55.83%, CF 25.19%, ash 4.84%, calcium 0.21% and phosphorous 1.06%, DM basis (Shah *et al.*, 2022). The MW are considered a good protein and fat sources for animal feed with high levels of essential amino acids especially Lys (4.51%) and Meth (1.34%) (Hussein *et al.*, 2017). Ravzanaadii *et al.* (2012) reported that the MW meal contained a very small concentration of Ca (434.59 mg/kg) and a higher concentration of P (7,060 mg/kg). This ratio of Ca:P is not sufficient for poultry production especially for chickens, however, such problems can be solved by feeding WM with a Ca prepared diet.

Broiler chickens fed on diet containing MW meal (2.5-7.5%) improved the weight gain in pre-starter and starter phase with better FCR (Elahi *et al.*, 2020), however higher levels (10-15%) may improve the weight gain and feed intake but affect the FCR negatively (Khan *et al.*, 2018a). Free range chickens fed on 7.5% MW meal as a replacement of corn gluten meal increased the oleic acid and α-linolenic acid concentrations in meat (Oonincx and De Boer, 2012). Full fat MW meal can be fed as a partial replacement of soybean meal, corn gluten meal and soybean oil with positive effects on growth performance. In addition, MW meal may also have secondary positive effects over immunity as broiler chickens infected with *Salmonella* enteritidis and *Escherichia coli*, fed on the diet containing 0.4% MW meal resulted in increased feed intake, serum IgA, and reduced mortality and cecal *Escherichia coli* (Islam and Yang, 2017). Meal worm meal has shown better results in comparison to BSF meal higher levels as its inclusion at 25% in diet increases ileal digestibility coefficient for essential amino acids compared to the chickens fed on the diet containing 25% BSF meal in diet (De Marco *et al.*, 2015). Mealworm meal can also be used to improve the meat quality.

The inclusion of MW meal from 0% to 6% in the diet of weaning pigs positively affected the feed

intake, ADG and feed utilization efficiency with improved utilization of protein (Jin *et al.*, 2016). It can be fed as a complete replacer of fish meal and partial replacer of SBM. It could be included in swine diets up to 20% without detrimental effects on the growth and health of pigs (Hong and Kim, 2022).

Broiler chickens fed the diet containing MW meal have better disease resistance, and immune response due to prebiotic effect of chitin (Bovera *et al.*, 2015). Chitin in diet inhibits the *Escherichia coli*, *Salmonella*, and *Salmonella enterica* in broiler chickens (Menconi *et al.*, 2014). Furthermore, hypolipidaemic and hypocholesterolaemic properties of chitin produce leaner meat by decreasing body fat in broiler chickens (Gasco *et al.*, 2018).

Housefly (*Musca domestica*) Meal

The HF are ubiquitous and are found breeding on animal manure and food wastes. The formation of adult from egg takes about 10 days in warm climate and 40-50 days in cold climate. The older HF larvae contain less CP and more lipids as compared to young HF larvae. Its amino acid profile is comparable to fish meal with high concentration of lysine, and methionine. Sun drying reduces its CP% and increases the lipids content (Aniebo and Owen, 2010). On average, Housefly larvae include ash (6.25%), DM (83.47%), CP (33.29%), CF (6.20%), Ca (0.49%) and P (1.09%) on DM basis. The HF larvae have apparent metabolic energy of 3,618.51 kcal/kg (Makkar *et al.*, 2014), which is higher than SBM. Linoleic acid concentration was found to be 36.3% of the whole fat in diet containing HF larvae. The larval protein quality was similar to bone and meat meal and fishmeal (FM), and better than SBM. The FM larval meal containing diet had more pronounced digestion of protein (98.5%) and EAA (94.8%) than SBM diets (Bosch *et al.*, 2014). HF meal amino acid digestibility were better than BSF meal (Tan *et al.*, 2020).

HF meal can be used as a substitute for FM or SBM, and it can improve the production performance and meat quality of broilers (Elahi *et al.*, 2022) and weaned pigs (Dankwa *et al.*, 2000). Diet containing 20-60% HF meal as a replacement of fish meal (Hall *et al.*, 2018) or 60% HF meal as a replacement of SBM (Khan *et al.*, 2018) in broiler diets increased the body weight, feed intake, FCR and dressing percentage (Okah and Onwujiariri, 2012). However, its dietary inclusion at 8% level affect the broiler growth negatively (Elahi *et al.*, 2020). Housefly live larvae feeding may also improve the clutch size and hatchability in free range chickens (Dankwa *et al.*, 2002).

Cricket / Grasshopper (*Orthoptera*) Mal

The nutrient composition of grasshopper (GH) meal fluctuates depending on species, developmental phase, and processing technique. On an average, grasshoppers consist of DM (35.00%), crude protein (CP, 50.50%), crude fiber (CF, 15.30%), ash (6.40%) on DM basis along with calcium 146.0 parts per million (ppm) and phosphorous 153.0 ppm (Shah *et al.*, 2022). It is rich in cysteine (3.5%), isoleucine (2.85%), lysine (4.29%), leucine (2.53%), and threonine (3.75%) (Ghosh *et al.*, 2016). It digestibility is however reduced by drying (Kinyuru *et al.*, 2010).

The inclusion of GH meal into the diet of chickens has enhanced feed conversion and protein digestibility (Elahi *et al.*, 2022). Although, it did not change the meat's physical properties. It can be fed as a replacer of fish meal in broiler diets without compromising growth performance (Brah *et al.,* 2017; Sanusi *et al.,* 2013), with improved antioxidant status (Sun *et al.*, 2012) and egg quality (Brah *et al.,* 2017). Live grasshoppers fed to free range broiler chickens also improved the carcass composition, and meat quality (Sun *et al.,* 2013). However, its chitin and chitosan may negatively affected intestinal morphology in broilers and a downregulate mRNA expression of some nutrient transporters (Ibitoye *et al.*, 2019).

Silkworm Meal

Silkworm (SW) (*Bombyx mori)* is available as a by-product of silk production and is the only insect meal

discussed here that is available as an industrial by-product. SW meal has a CP content ranging from 52 to 80% on a DM basis. It contain about 20.1% crude fat (Acay, 2011) and is a source of healthy lipids, as omega-3 can account for up to 35-40% of its total fatty acids (Makkar *et al.*, 2014). Silkworm pupae also contain chitin (3-4% of the DM) that contains approximately 25% indigestible CP (Acay, 2011).

Silkworm meal can be used to replace fish meal or SBM in poultry (Elahi *et al.*, 2022) or swine feed. Its inclusion at 25-75% replacement level of SBM increased the weight gain, feed intake and carcass characteristics (Miah *et al.*, 2020; Ullah *et al.*, 2017), however, 100% affected the performance negatively. It can be used as full fat dried form or as a defatted meal. It can also be included by replacing 30% of SBM in cattle diet without affecting rumen fermentation pattern and nutrient utilization (Rashmi *et al.*, 2022).

Earthworm Meal

Earthworm (EW) meal is rich source of protein, energy, and amino acids but is available in combination with vermi-humus. The CP in EW meal ranged from 41 - 66%, and crude fat from 3.5 - 18% (Elahi *et al.*, 2022) and the composition is related to the freshness of the earthworms. Contradictory reports are available regarding feeding of earthworm meal. Zang *et al.* (2018) reported negative effect of feeding EW meal in broilers, however, Chashmidari *et al.* (2021) reported improved performance and increase relative weight of immune organs, intestinal length, and intestinal lactic acid bacteria count even at higher level than Zang *et al.* (2018). Positive effect on meat quality on feeding EW meal as a partial (15%) replacer of FM and SBM has also been reported (Jankovicì *et al.*, 2020; Loh *et al.,* 2009). EW meal also improved FCR (Nalunga *et al.,* 2021), antioxidant status (Bahadori *et al.*, 2017) and lipid profile (Gholami *et al.,* 2016) of broiler chickens.

Termite Meal

Termite (*Sclerotized macropterous*) can be grown easily on waste wood and are a unique lignin to protein convertor, Their meal contains on an average 45% CP on DM basis, and 41% crude fat (Musa *et al.,* 2004). Termite meal can be included in dry or fresh form in the diet of chickens without any negative effect (Pousga *et al.*, 2019). They can also be used as a source of feed grade fibre degrading enzymes such as glucanase, mannanase, xylanase and glucosidase (Purwadari *et al.*, 2003).

Challenges in the use of Insect as a Feed Ingredient

Operational and quality control procedures in the insect farming, harvesting, and post-harvest processing and storage should be standardized to mass produce edible insects as feed ingredients. Insect digestibility is affected by breeding substrate and processing techniques. Interventions for value addition, hazard control and cost reduction during their life cycle and post-processing are required and demand extensive R&D efforts.

Insects are considered disease carriers and unhygienic, in general. Consumers and farmers perception regarding insects is also not favourable. There is no legislation on the use of insects as feed so far. Extensive processing to reduce risk of biological hazards (Van Broekhoven *et al.,* 2017 and Wynants *et al.,* 2019), and improve acceptance may go a long way in increasing adoption of insect meals as a feed ingredient. Protein isolates and function ingredients from processed insects may also help in addressing these concerns.

Another factor is the present high cost of insect farming at present. The insect-farming entities are relatively small organizations producing insects for exotic birds or for harvesting pharmaceuticals or for other insect produce such as silk and honey. Conventional high quality protein sources of fish meal and SBM are fairly cheaper as compared to insect meal (Hong *et al.*, 2020). However, this issue will resolve itself with capacity expansion and widespread adoption by commercial feed makers. Utilization of

organic waste for insect farming will further reduce the cost. Extensive research is required to identify the nutritional and functional bottlenecks of using insects as a feed component. The harvesting stage, type of growth media, and processing are all known to affect the nutritive value. Limited data from digestibility and growth trials in poultry and swine are available, however, extensive studies on inclusion levels, nutrient trail, health effects, functional effects, and effects on livestock product quality are required with respect to insect meal. Studies in terms of identifying specific insect species and controlled breeding to ensure uniform product quality is another task ahead. Other potential safety concerns associated with edible insects include biomagnification of heavy metals (Mlcek *et al.*, 2017) and other toxicants (Lis *et al.*, 2011) and even presence of transferable antibiotic resistance gene (Vandeweyer *et al.*, 2019).

CONCLUSION

As per International forum of insects for food and feed, the insects use as food and feed in the European Union is exploding with projected increase to 1 million tons in 2025 and 3 million tons by 2030 from meagre 500 tons in 2020. This suggests that its production is certainly economically feasible at commercial level. Its inclusion in mainstream poultry and pigs commercial feeds need to be promoted and simultaneously carefully monitored to avoid health hazards. The black soldier fly meal, yellow mealworm meal, housefly meal and silkworm meal can substantially spare soybean meal, soybean oil and fish meal and can also provide secondary health benefits. The processing conditions, optimal inclusion level, functional effects and produce quality and safety of insect meals need further research and validation.

REFERENCES

Acay RP. 2011. Silkworm pupa meal as feed supplement for growing-finishing broilers. Benguet, Philippines: Benguet State University.

Al-qazzaz MF and Ismail DB. 2016. Insect meal as a source of protein in animal diet. Anim Nutr Feed Technnol; 16: 527-547.

Altmann BA, Neumann C, Rothstein S, Liebert F and Morlein D. 2019. Do dietary soy alternatives lead to pork quality improvements or drawbacks? A look into micro-alga and insect protein in swine diets. Meat Sci; 153: 26-34.

Aniebo AO and Owen OJ. 2010. Effects of age and method of drying on the proximate composition of housefly larvae (*Musca domestica* Linnaeus) meal (HFLM). Pak J Nutr; 9: 485-7.

Bahadori Z, Esmaielzadeh L, Karimi-Torshizi MA, Seidavi A, Olivares, J, Rojas, S, Salem AZM, Khusro A, and López S. 2017. The effect of earthworm (*Eisenia foetida*) meal with vermi- humus on growth performance, hematology, immunity, intestinal microbiota, carcass characteristics, and meat quality of broiler chickens. Livest Sci; 202:74-81.

Biasato I, Ferrocino I, Colombino E, Gai F, Schiavone A, Cocolin L, Vincenti V, Capucchio MT and Gasco L. 2020. Effects of dietary Hermetia illucens meal inclusion on cecal microbiota and small intestinal mucin dynamics and infiltration with immune cells of weaned piglets. J Anim Sci Biotechnol; 11:64.

Biasato I, Renna M, Gai F, Dabbou S, Meneguz M, Perona G, Martinez S, Lajusticia ACB, Bergagna S, Sardi L, Capucchio MT, Bressan E, Dama A, Schiavone A, Gasco L. 2019. Partially defatted black soldier fly larva meal inclusion in piglet diets: effects on the growth performance, nutrient digestibility, blood profile, gut morphology and histological features. J Anim Sci Biotechnol; 10:12.

Bosch G, Zhang S, Oonincx DGAB, Hendriks WH. 2014. Protein quality of insects as potential ingredients for dog and cat foods. J Nutr Sci; 3:E29.

Bovera F, Loponte R, Marono S, Piccolo G, Parisi G, Iaconisi V, Gasco L, Nizza A. 2016. Use of Tenebrio molitor larvae meal as protein source in broiler diet: Effect on growth performance, nutrient digestibility, and carcass and meat traits. J Anim Sci; 94:639-47.

Bovera F, Piccolo G, Gasco L, Marono S, Loponte R, Vassalotti G, Mastellone V, Lombardi P, Attia YA, Nizza A. 2015. Yellow mealworm larvae (*Tenebrio molitor*, L.) as a possible alternative to soybean meal in broiler diets. Br Poult Sci; 56:569-575.

Brah N, Issa S, Houndonougbo F. 2017. Effect of grasshopper meal on laying hens' performance and

eggs quality characteristics. Indian J Anim Sci; 87:1005-10.

Brede A, Wecke C, Liebert F. 2018. Does the optimal dietary methio- nine to cysteine ratio in diets for growing chickens respond to high inclusion rates of insect meal from *Hermetia illucens*? Animals; 8:187.

Chashmidari Y, Esmaielzadeh L, Karimi-Torshizi MA, Seidavi A, da Silva Araujo CS, Araujo LF. 2021. Feed supplementation with vermi-humus and earthworm (Eisenia foetida) powder on broiler productivity. Ital J Anim Sci; 20:1054-62.

Chavez M, Uchanski M. 2021. Insect left-over substrate as plant fertiliser. J Insects Food Feed; 7:683-694.

Chia SY, Tanga CM, Osuga IM, Alaru AO, Mwangi DM, Githinji, M, Dubois T, Ekesi S, van Loon JJA and Dicke M. 2021. Black soldier fly larval meal in feed enhances growth performance, carcass yield and meat quality of finishing pigs. J Insects Food Feed; 7:433-47.

Choi YC, Park KH, Nam SH, and Jang BG. 2013. The effect on growth performance of chicken meat in broiler chicks by dietary supple- mentation of black soldier fly larvae, *Hermetia illucens* (Diptera: Stratiomyidae). J Sericult Entomol Sci; 51:30-35.

Crosbie M, Zhu C, Karrow NA, Huber LA. 2021. The effects of partially replacing animal protein sources with full fat black soldier fly larvae meal (*Hermetia illucens*) in nursery diets on growth performance, gut morphology, and immune response of pigs. Transl Anim Sci; 5:057.

Cullere M, Schiavone A, Dabbou S, Gasco L, Dalle Zotte A. 2019. Meat quality and sensory traits of finisher broiler chickens fed with black soldier fly (*Hermetia Illucens* L.) larvae fat as alternative fat source. Animals; 9:140.

Cullere M, Tasoniero G, Giaccone V, Miotti-Scapin R, Claeys E, De Smet S, Dalle Zotte A. 2016. Black soldier fly as dietary protein source for broiler quails: apparent diges-tibility, excreta microbial load, feed choice, performance, carcass and meat traits. Animal; 10:1923-30.

Dahiru S, Azhar B, Anjas AB. 2016. Performance of Spring chicken fed different inclusion levels of black soldier fly larvae meal. Entomol Ornithol Herpetol; 5:185.

Dankwa D, Oddoye EOK, Mzamo KB. 2000. Preliminary studies on the complete replacement of fishmeal by house-fly-larvae- meal in weaner pig diets: Effects on growth rate, carcass characteristics, and some blood constituents. Ghana J Agric Sci; 33:223-7.

Dankwa DF, Nelson SEO, Oddoye K, Duncan JL. 2002. Housefly larvae as a feed supplement for rural poultry. Ghana J Agric Sci; 35:185-7.

De Marco M, Martiìnez S, Hernandez F, Madrid J, Gai F, Rotolo L, Belforti M, Bergero D, Katz H, Dabbou S, Kovitvadhi A, Zoccarato I, Gasco L and Schiavone A. 2015. Nutritional value of two insect larval meals (*Tenebrio molitor* and *Hermetia illucens*) for broiler chickens: Apparent nutrient digestibility, apparent ileal amino acid digestibility and apparent metabolizable energy. Anim Feed Sci Technol; 209:211-218.

Eilenberg J, Vlak JM, Nielsen-LeRoux C, Cappellozza S, Jensen AB. 2015. Diseases in insects produced for food and feed. J Insects Food Feed; 1:87-102.

Elahi U, Ma Y, Wu S, Wang J, Zhang H, Qi G. 2015. Growth performance, carcass characteristics, meat quality and serum profile of broiler chicks fed on housefly maggot meal as a replacement of soybean meal. J Anim Physiol Anim Nutr; 104:1075- 84.

Elahi U, Wang J, Ma Y, Wu SG, Wu J, Qi GH, Zhang HJ. 2020. Evaluation of yellow mealworm meal as a protein feedstuff in the diet of broiler chicks. Animals; 10:224.

Elahi U, Xu CC, Wang J, Lin J, Wu SG, Zhang HJ, Qi GH. 2022. Insect meal as a feed ingredient for poultry. Anim Biosci.; 35(2):332-346.

Gasco L, Finke M, van Huis A. 2018. Can diets containing insects promote animal health? J Insects Food Feed; 4:1-4.

Gholami H, Shargh MS, Zarabi M, Zerehdaran S. 2016. Effect of different levels of earthworm meal (*Eisenia Fetida*) on performance, carcass characteristics and blood parameters of broiler chickens. Anim Prod Res; 7:70-6.

Ghosh S, Parimalendu H, Dipak KM. 2016. Evaluation of nutrient quality of a short horned grasshopper Oxya hyla hyla Serville (Orthoptera: Acrididae) in search of new protein source. J Entomol Zool Stud; 4:193-7.

Hall HN, O'Neill HVM, Scholey D, Scholey D, Burton E, Dickinson M, Fitches EC. 2018. Amino acid digestibility of larval meal (Musca domestica) for broiler chickens. Poult Sci; 97:1290-7.

Hong J, Han T, Kim YY. 2020. Mealworm (*Tenebrio molitor* Larvae) as an alternative protein source for monogastric animal: a review. Animals; 10:2068.

Hong J, Kim YY. 2022. Insect as feed ingredients for pigs. Anim Biosci; 35(2):347-355.

Hussein M, Pillai VV, Goddard JM, Park HG, Kothapalli KS, Ross DA, Ketterings QM, Brenna JT, Milstein MB, Marquis H, Johnson PA, Nyrop JP, Selvaraj V. 2017. Sustainable produc-tion of housefly (*Musca domestica*) larvae as a protein- rich feed ingredient by utilizing cattle manure. PLoS ONE; 12: e0171708.

Ibitoye EB, Lokman IH, Hezmee MNM, Goh YM, Zuki AB, Jimoh A, Danmaigoro A, and Nicholas NP. 2019. Gut health and serum growth hormone levels of broiler chickens fed dietary chitin and chitosan from cricket and shrimp. Poult Sci; 98:745-52.

IFIF. 2019. What is the global feed industry. International Feed Industry Federation Factsheet. Wiehl, Germany: Inter- national Feed Industry Federation (IFIF); https://ifif. org/wp-content/uploads/2019/06/ IFIF-Fact-Sheet-October- 11th-2019.pdf

Iqbal A, Qudoos A, C'etingul IS, Shah SRA, Bayram I. 2019. Insects as alternative feed materials for poultry nutrition. J Anim Sci Prod; 2:30-37.

Islam MM, Yang CJ. 2017. Efficacy of mealworm and super meal- worm larvae probiotics as an alternative to antibiotics challenged orally with Salmonella and E. coli infection in broiler chicks. Poult Sci; 96:27-34.

Jankovicì LJ, Petrujkicì B, Aleksicì N, Vuèinic M, Teodorovic R, Karabasil N, Relic R, Draškovic V and Nenadovic K. 2020. Carcass characteristics and meat quality of broilers fed on earthworm (*Lumbricus rubellus*) meal. J Hellenic Vet Med Soc; 71: 2031-40.

Jin XH, Heo PS, Hong JS, Kim NJ, Kim YY. 2016. Supplementation of dried mealworm (*Tenebrio molitor* larva) on growth performance, nutrient digestibility and blood profiles in weaning pigs. Asian-Australas J Anim Sci; 29:979-86.

Joìzefiak A and Engberg RM. 2017. Insect proteins as a potential source of antimicrobial peptides in livestock production. A review. J Anim Feed Sci; 26:87-99.

Kar SK, Schokker D, Harms AC, Kruijt L, Smits MA, Jansman AJM. 2021. Local intestinal microbiota response and systemic effects of feeding black soldier fly larvae to replace soybean meal in growing pigs. Sci Rep; 11:15088.

Khan M, Chand N, Khan S, Khan RU, Sultan A. 2018. Utilizing the house fly (*Musca Domestica*) larva as an alternative to soybean meal in broiler ration during the starter phase. Braz J Poult Sci; 20:9-14.

Khan S, Khan RU, Alam W, Sultan A. 2018a. Evaluating the nutritive profile of three insect meals and their effects to replace soya bean in broiler diet. J Anim Physiol Anim Nutr; 102: e662-8.

Kinyuru JN, Kenji GM, Njoroge SM, Ayieko M. 2010. Effect of processing methods on the in vitro protein digestibility and vitamin content of edible winged termite (*Macrotermes subhylanus*) and grasshopper (*Ruspolia differens*). Food Bioproc Tech; 3:778-82.

Lis, LB, Baku³a T, Baranowski M, Czarnewicz A. 2011. The carcinogenic effects of benzoquinones produced by the flour beetle. Pol J Vet Sci; 14:159-64.

Liu H, Tan B, Kong X, Li J, Li G, He L, Bai M, Yin Y. 2020. Dietary insect powder protein sources improve protein utilization by regulation on intestinal amino acid-chemosensing system. Animals; 10:1590.

Loh TC, Fong LY, Foo HL, Thanh NT, Sheikh-Omar AR. 2009. Utilisation of earthworm meal in partial replacement of soybean and fish meals in diets of broilers. J Appl Anim Res; 36:29-32.

Makkar HPS, Tran G, Heuzeì V, Ankers P. 2014. State-of-the-art on use of insects as animal feed. Anim Feed Sci Technol; 197:1-33.

Marono S, Loponte R, Lombardi P, Vassalotti G, Pero ME, Russo F, Gasco L, Parisi G, Piccolo G, Nizza S, Di Meo C, Attia YA, Bovera F. 2017. Productive performance and blood profiles of laying hens fed *Hermetia illucens* larvae meal as total replacement of soybean meal from 24 to 45 weeks of age. Poult Sci; 96:1783-90.

Menconi A, Pumford NR, Morgan MJ, Bielke LR, Kallapura G, Latorre JD, Wolfenden AD, Hernandez-Velasco X, Hargis BM, Tellez G. 2014. Effect of chitosan on Salmonella Typhimurium in broiler chickens. Foodborne Path Dis; 11:165.

Miah MY, Singh Y, Cullere M, Tenti S, Dalle Zotte A. 2020. Effect of dietary supplementation with full-fat silkworm (*Bombyx mori* L.) chrysalis meal on growth performance and meat quality of Rhode Island Red × Fayoumi crossbred chickens. Ital J Anim Sci; 19:447-56.

Mlcek J, Adamek M, Adaìmkovaì A, Borkovcovaì M, Bednaìrovaì M, Skaìcel J. 2017. Detection of selected heavy metals and micronutrients in edible insect and their dependency on the feed using XRF spectrometry. Potravinarstvo Slovak J Food Sci; 11:725-30.

Mlcek J, Adaìmkovaì A, Adaìmek M, Borkovcová M, Bednárová M, Kourimská L and Hlobilová V. 2021. Selected aspects of edible insect rearing and consumption–A review. Czech J Food Sci; 39:149-59.

Mohammed A. 2017. Evaluation of black soldier fly (*Hermetia illucens*) larvae meal as an alternative protein source in broiler chicken diets: effect on carcass and eating quality of broiler chicken. Research & Reviews: J Food Sci Technol; 6:18- 21.

Mottet A, de Haan C, Falcucci A, Tempio G, Opio C, Gerber P. 2017. Livestock: On our plates or eating at our table? A new analysis of the feed/food debate. Glob Food Sec; 14:1- 8.

Moula N, Scippo ML, Douny C, Degand G, Dawans E, Cabaraux JF, Hornick JL, Medigo RC, Leroy P, Francis F and Detilleux J. 2018. Performances of local poultry breed fed black soldier fly larvae reared on horse manure. Anim Nutr; 4:73-78.

Musa U, Yusur J, Haruna ES, Karsin PD, Ali UD. 2004. Termites as possible animal protein supplement for Japanese quail (*Coturnix coturnix* Japonica) chicks feed. Nigerian J Biotechnol; 15:48-51.

Mwaniki Z, Neijat M, Kiarie E. 2018. Egg production and quality responses of adding up to 7.5% defatted black soldier fly larvae meal in a corn–soybean meal diet fed to Shaver White Leghorns from wk 19 to 27 of age. Poult Sci; 97:2829- 2835.

Nalunga A, Komakech AJ, Jjagwe J, Magala H, Lederer J. 2021. Growth characteristics and meat quality of broiler chickens fed earthworm meal from *Eudrilus eugeniae* as a protein source. Livest Sci; 245:104394.

Newton GL, Sheppard DC, Watson DW, Burtle G, Dove CR, Tomberlin J and Thelen EE. 2005. The black soldier fly, Hermetia illucens, as a manure management / resource recovery tool. In: Symposium on the state of the science of Animal Manure and Waste Management; pp. 57.

Okah U, Onwujiariri EB. 2012. Performance of finisher broiler chickens fed maggot meal as a replacement for fish meal. J Agric Technol; 8:471-7.

Onsongo VO, Osuga IM, Gachuiri CK, Wachira AM, Miano DM, Tanga CM, Ekesi S, Nakimbugwe D and Fiaboe KKM. 2018. Insects for income generation through animal feed: effect of dietary replacement of soybean and fish meal with black soldier fly meal on broiler growth and economic performance. J Econ Entomol; 111:1966-1973.

Oonincx DGAB, de Boer IJM. 2012. Environmental impact of the production of mealworms as a protein source for humans a life cycle assessment. PLoS ONE; 7:e51145.

Pousga S, Sankara F, Coulibaly K, Nacoulma JP, Ouedraogo S, Kenis M, Chrysostome C and Ouedraogo GA. 2019. Effects of replacement of fish meal by termites (Macrotermes sp.) on the weight evolution and the carcass characteristics of local poultry in Burkina Faso. Afr J Food Agric Nutr Dev; 19:14354-71.

Purwadari T, Ketaren PP, Sinurat AP, Sutikno I. 2003. Identification and evaluation of fiberhydrolytic enzymes in the extract of Termites (*Glyptotermes montanus*) for poultry feed application. Indonesian J Agric Sci; 4:40-7.

Ramos-Elorduy J, Gonzaìlez EA, Hernaìndez AR, Pino JM. 2002. Use of *Tenebrio molitor* (Coleoptera: Tenebrionidae) to recycle organic wastes and as feed for broiler chickens. J Econ Entomol; 95:214-20.

Ravzanaadii N, Kim SH, Choi WH, Hong SJ, Kim NJ. 2012. Nutritional value of mealworm, *Tenebrio molitor* as food source. Int J Indust Entomol; 25:93-8.

Sanusi M, Garba A, Saidu I, Ali YZ. 2013. Performance of broiler chickens fed graded levels of grasshopper meals. Int J Appl Res Technol; 2:235-40.

Schiavone A, Dabbou S, Petracci M, Zampiga M, Sirri F, Biasato I, Gai F, Gasco L. 2019. Black soldier fly defatted meal as a dietary protein source for broiler chickens: effects on carcass traits, breast meat quality and safety. Animal; 13:2397-2405.

Shah, AA, Totakul P, Matra M, Cherdthong A, Hanboonsong Y, and Wanapat M. 2022. Nutritional composition of various insects and potential uses as alternative protein sources in animal diets. Anim Biosci; 35(2):317-331.

Sun T, Long RJ, Liu ZY, Ding WR, Zhang Y. 2012. Aspects of lipid oxidation of meat from free-range broilers consuming a diet containing grasshoppers on alpine steppe of the tibetan plateau. Poult Sci; 91:224-31.

Sun T, Long RJ, Liu ZY. 2013. The effect of a diet containing grass- hoppers and access to free-range on carcase and meat physicochemical and sensory characteristics in broilers. Br Poult Sci; 54:130-137.

Tan X, Yang HS, Wang M, et al. 2020. Amino acid digestibility in housefly and black soldier fly prepupae by growing pigs. Anim Feed Sci Technol; 263:114446.

Ullah R, Khan S, Hafeez A, Sultan A, Khan NA, Naila C and Ahmad N. 2017. Silkworm (*Bombyx mori*) meal as alternate protein ingredient in broiler finisher ration. Pak J Zool; 49:1463-70.

Van Broekhoven S, Gutierrez JM, De Rijk TC, De Nijs WCM, Van Loon JJA. 2017. Degradation and excretion of the Fusarium toxin deoxynivalenol by an edible insect, the Yellow meal-worm (*Tenebrio molitor* L.). World Mycotoxin J; 10: 163-9.

Van Huis A, Van Itterbeeck J and Klunder H. 2013. Edible insects: future prospects for food and feed security (No. 171). Rome, Italy: Food and Agriculture Organization of the United Nations.

Vandeweyer D, Milanovicì V, Garofalo C, Osimani A, Clementi F, Van Campenhout L, Aquilanti L. 2019. Real-time PCR detection and quantification of selected transferable antibiotic resistance genes in fresh edible insects from Belgium and the Netherlands. Int J Food Microbiol; 290:288-95.

Veldkamp T and Bosch G. 2015. Insects - a protein rich feed ingredient in pig and poultry diets. Anim Front; 5:45-50.

Veldkamp T, Van Duinkerken G, Van Huis A. 2012. Insects as a sustainable feed ingredient in pig and poultry diets: a feasibility study (No. 638). Wageningen, The Netherlands: Wageningen UR Livestock Research.

Vilela J de S, Alvarenga TIRC, Andrew NR, McPhee M, Kolakshyapati M, Hopkins DL, Ruhnke I. 2021. Technological quality, amino acid and fatty acid profile of broiler meat enhanced by dietary inclusion of black soldier fly larvae. Foods; 10:297.

Wynants E, Frooninckx L, Van Miert S, Geeraerd A, Claes J, Van Campenhout L. 2019. Risks related to the presence of Salmonella sp. during rearing of mealworms (*Tenebrio molitor*) for food or feed: Survival in the substrate and transmission to the larvae. Food Control; 100:227-34.

Yu M, Li Z, Chen W, Rong T, Wang G, Ma X. 2019. *Hermetia illucens* larvae as a potential dietary protein source altered the micro- biota and modulated mucosal immune status in the colon of finishing pigs. J Anim Sci Biotechnol; 10:50.

Zang YT, Bing S, Zhang YZ, Sheng XW, Shu DQ. 2018. Effects of dietary supplementation with earthworm powder on production performance, blood characteristics, and heavy metal residues of broiler Pullets. J Appl Poult Res; 27:609-15.

Theme 1: 01
Soil-Less Vertical Farming Technique for Income Generation to the Indian Farmers

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Vertical farming is a part of soil less farming under protected cultivation and GAP protocol then save surface land and utilized vertical space with the help of stick, ropes and pipe based structures support like flat and 'A' type hydroponic cum soil less system in the protected structures. With increase in urbanization, industrialization and nuclear families, the land holdings are decreasing day by day. Therefore, this study was conducted under NASF project to explore possibility for year round production of cucurbits and leafy vegetables under protected conditions (Hi-tech polyhouse, naturally ventilated polyhouse, Shed net house and IP-net-house) under NASF project 2023-24 at Center for Protected Cultivation Technology (CPCT), ICAR-IARI, New Delhi. One can produce above 50% more marketable quality and 50% yield potential of produce by using vertical space technique of hydroponic and soil less, vegetables which have spreading growth habits like; cucumber, bottle gourd, bitter gourd, ridge gourd, sponge gourd, pointed gourd, rounded gourd, Beans, Tomato and Leafy vegetables like Lettuce, Pokchooi, Chinese cabbage, Mint, Basil, Spinach can be grown by using vertical space cultivation technique. In traditional system, the number of plants or seeds per unit area is reduced by 30-40% as these vegetables need more space to spread on ground due to which it is difficult to carry out all the cultural practices. The crop gets severely affected during rainy season when the whole crop is immersed in water and the crop is highly infected by diseases and the mortality rate is very high, therefore, the vertical space cultivation is the best technique to overcome these problems under open and protected structures. Vertical space cultivation technique helps the farmers to harvest quality produce for longer durations per unit area by protecting the crop from all biotic and abiotic stresses.

Keywords: Vertical farming, Vegetables, Protected cultivated technology, Income

Theme 1: 02
Cloud Computing

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The cloud computing environment is an offshoot of the traditional common computing environment with a mission. The aging of the current IT infrastructure and changes in the IT landscape are the factors driving cloud computing. The lack of capital investments restricts the ability to update the infrastructure. Virtualization and cloud computing have transformed how IT services are delivered at a reduced cost by migrating the services to cloud computing. Precision farming and other IT-enabled agricultural farming are information-intensive, which may affect the rural economy. Therefore, the adoption of new technologies like cloud computing with an emphasis on farmer requirements will determine how agriculture grows in the future. The use of appropriate technologies should help a farmer in terms of accessibility and affordability. Cloud computing in agriculture provides an enabling environment for innovation and services with a flexible regulatory environment.

Keywords: Cloud computing, Agriculture, Precision farming

Theme 1: 03
Determinants of Adoption of Solar Pumps by the Farmers in Jodhpur District of Rajasthan

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A solar pump function or operates on electricity generated by solar photovoltaic panels available from collected sunlight as opposed to grid electricity or diesel run water pumps. The operation of solar powered pumps is more economical mainly due to the lower operation and maintenance cost. The present study on adoption status of solar pump was conducted in Jodhpur district of Rajasthan mainly to examine the farmer's awareness level and explores the factors, which influence their adoption intension for solar powered pumps. There are total seven tehsils in Jodhpur district of Rajasthan, out of which, two tehsils namely Osian and Balesar were selected on the basis of maximum number of installed of solar pumps. Ten villages from each selected tehsil were selected on the basis of maximum number of solar pumps beneficiaries. Total one hundred twenty-five (125) respondents were selected from twenty selected villages for data collection. Data and information were collected by investigator through personal interview technique with the help of interview schedule. Thereafter, data were tabulated and various statistical measures viz. per cent, mean, mean per cent scores, standard deviation, ranking and correlation were used to arrive at specific inferences. The study clearly showed that majority of respondents (69.60%) of overall respondents were in the medium level of adoption group, followed by 22 respondents (17.60 per cent) with low adoption and only 16 respondents (12.80%) with high adoption level about solar pumps.

Keywords: Adoption, Solar pump, Awareness

Theme 1: 04
Big Data Technology: Game Changer in Agriculture

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Agriculture has always been regarded as an intuitive domain where wisdom is passed down from generation to generation. But today's problems are more intricate and serious, such as climate change and the scarcity of arable land. Big data applications in agriculture are addressing several important areas, including more efficiency, safety, sustainability, and global food security. Huge volumes of data are produced every day, hour, and minute; they are referred to as big data. Variability, volume, and velocity are the metrics used to measure these data. To support data-driven farming, big data applications in agriculture are becoming more and more popular. Examples of this technology include drones, soil sensors, and animal monitoring systems, which produce enormous volumes of data. Helping farmers, agriculturists, and scientists implement sustainable agricultural techniques is the ultimate objective. Traditional instruments are being replaced by sensor-equipped machines that can gather information from their environment and control their behavior. Examples of these devices include thermostats for controlling temperature or crop protection algorithms. Smart agriculture is developing more quickly because of technology and external big data sources including weather, market, and farm standard data.

Keywords: Sustainability, Food security, Climate change, Velocity, Smart agriculture

Theme 1: 05
Government Initiatives and Market Insights Regarding Smart Agriculture in India

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Governments around the globe are supporting sustainable farming practices with subsidies, tax incentives, and other measures designed to promote smart agriculture. India's priority in meeting the challenges posed by climate change on agriculture is focused on the development of adaptation and mitigation strategies. This paper incorporates literature review of existing research papers, documents, reports, and academic literature. The data sources provided relevant information, evidence, and practices on smart agriculture, where support has been offered to all its' stakeholders through numerous initiatives. The Government of India introduced several initiatives to encounter these challenges. In 2015, the government set up the NAFCC and identified agriculture as the key area among eight national missions. The projects under the NAFCC prioritize building climate resilience in the areas identified under the SAPCC and the relevant missions under the NAPCC. Launched in 2011 under the ICAR, NICRA is a network project which has strategic cross-disciplinary research components on adaptation and mitigation providing demonstrations of technologies on farmers' fields while also creating awareness among farmers and other stakeholders on how to minimize the impacts of climate change on agriculture. Odisha climate change action plan identified 11 critical sectors for intervention and agriculture was one among them. Moreover, schemes such as Digital Agriculture Mission (DAM), India Digital Ecosystem of Agriculture (IDEA), National e-Governance Plan in Agriculture (NeGP-A), Unified Farmer Service Platform (UFSP), National Animal Disease Reporting System (NADRS) and many more are being implemented by government to boost up the smart agriculture in India. By 2022, the global smart farming market had reached USD 19.5 billion and is projected to surpass 53 billion in 2032. The Indian smart agriculture market growth is anticipated to progress at a CAGR of 13.38 per cent during the forecast period, 2022-2028, and is expected to garner revenue of $886.21 million by 2028.

Keywords: Smart-agriculture, Climate-change, Initiatives, Digital, Market

Theme 1: 06
Simplifying Agriculture: Drone Technology

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Since its independence, India has made immense progress towards food security. Indian population has tripled, and food-grain production more than quadrupled. There has been a substantial increase in available food grain per capita. In this sanctuary, agriculture innovations like drones have an important role in simplifying agriculture work. In recent years, drone technology has become increasingly popular in the agriculture sector. The government of India launched schemes that provide facility of Drone for farmers on a rent basis. It counts as a great opportunity for the whole farming community to simplify their work, fatigue, spraying, and irrigation. Agriculture Development of Rajasthan and KVKs (SAUs) work together for Drone technology demonstration. Drones offer farmers a range of benefits, including increased efficiency, improved yields, and reduced costs. While the adoption of drone technology in rural India is still in its early stages, there are efforts underway to address these

challenges and promote the use of drones in agriculture. It is important for farmers to understand the potential benefits of this technology and to receive the necessary training and support to use it effectively. The adoption of drone technology in the agriculture sector has the potential to transform the way that farmers manage their crops and improve their yields. Drones can cover large areas of land quickly and efficiently, allowing farmers to gather data and monitor crops more effectively. Drones can capture high-resolution images and data, providing farmers with a detailed view of their crops. This can help to identify issues early, leading to faster and more effective interventions. Drones can be used to gather data on crop health, allowing farmers to identify areas that require attention, thus helping to reduce the costs of manual labour, and the use of pesticides and other chemicals.

Keywords: Drone, technology demonstration, innovation

Theme 1: 07
Role of Artificial Intelligence (AI) for Smart Farming Agriculture

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Technology is rapidly evolving today, and we are constantly in contact with new technologies. These days artificial intelligence is all around us. AI has the potential to make a machine work like a human. Artificial intelligence exists when a machine can do human-like functions such as learning, thinking, and problem-solving. Artificial intelligence can handle complex problems in a wide range of disciplines such as healthcare, entertainment, education, agriculture, and so on. In this paper, the information was collected from secondary data, and the role of AI in agriculture was analyzed. Artificial intelligence technology helps in the production of healthier crops, and pest management, monitors soil nutrients and enhances crop growth, organizes data of the crops and soil for farmers reduces workloads, and improves agriculture-related tasks throughout the food supply chain. Drones play an important role in spraying pesticides and fertilizer to enhance crop quality and help in the identification of bacteria and pests, enabling farmers to apply pest control techniques on time and take necessary action. Further, drones assist in gathering data from fields. It assists the farmers in crop rotation, timely harvesting, and providing weather information so that farmers may plan their crop planting accordingly. Overall, artificial intelligence is a popular and developing technology that is becoming a widely wanted technology in agriculture due to its great performance and ability to make farmers and rural life easier. However, techniques must be utilized in moderation to be useful and without causing harm. This paper discusses the use of AI in the development of agriculture, challenges, and the way forward.

Keywords: Artificial intelligence, Drones, Pest management, Gathering data

Theme 1: 08
Digital Agricultural Extension and Advisory Services for Empowering Farmers

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In order to give more pertinent, advice or create an extension that is informed by data, the Extension and Advisory Services (EAS) need to know more about how various digital platforms and applications created for farmers are using the data and information they collect. Face-to-face agricultural extension is effective throughout the conventional era. Regretfully, we also understand that face-to-face methods necessitate resources that neither

public nor private extension programmes possess. Even though digital technologies have been widely adopted for extension services by rural smallholder farmers, particularly in developing nations, there are still obstacles that need to be solved for greater success. Digital education, limited internet connectivity, and affordability of digital services can undermine rural farmers' capacity to fully benefit from the digital revolution. To improve communication and information sharing within the agriculture sector, digital extension uses modern approaches. These modern approaches replace the traditional methods, offering farmers timely access to relevant data, expert advice, and market trends through digital platforms. Utilizing mobile apps, SMS services, and online portals, farmers can receive real-time updates on weather conditions, crop management techniques, and pest control measures. The digital extension also facilitates interactive learning through webinars and virtual workshops, fostering a community of knowledge sharing among farmers.

Keywords: Extension and Advisory Services (EAS), Digital platforms, Digital extension

Theme 1: 09
Impact of Digital Technologies in Agricultural Extension

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The emergence and widespread adoption of digital technologies have reshaped the landscape of agriculture extension services, fostering increased efficiency, accessibility, and sustainability. A new era of agricultural extension services has been brought about by the widespread use of digital technology including cellphones, the internet, data analytics, and sensor-based devices. Real-time communication, data-driven decision-making, and access to an extensive library of agricultural knowledge have all been made possible by these technologies. With so many tools and apps at their disposal, farmers, extension workers, and policymakers may now make well-informed decisions that will boost agricultural productivity and sustainability. Digital tools have completely changed how farmers receive and distribute information, having a significant impact on agricultural extension services. A brief examination of the ways in which data analytics, digital platforms, and mobile apps have revolutionized agricultural extension, given farmers more authority, and raised productivity. Farmers are now equipped with the most recent techniques thanks to the widespread distribution of agricultural knowledge made possible by mobile applications and web-based platforms. ICT-based extension services foster fair access to knowledge by narrowing the digital divide, which raises agricultural output and sustainability. Digital technologies improve agricultural production, profitability, and sustainability by bridging the information gap. The tool's usefulness and impact are increased by local language support, which guarantees that farmers with different linguistic backgrounds can comprehend and profit from the information offered. Agricultural information that is tailored to a particular location tackles a range of farming techniques and issues, increasing its relevance and uptake. Digital technologies have the potential to close the digital divide and provide farmers with invaluable insights for sustainable agricultural development by fostering linguistic and regional adaptation.

Keywords: Agriculture extension, Agricultural knowledge, Agricultural practices, Digital agriculture, Digital tools, Advisory services, Empowering farmers, Sustainable agriculture

Theme 1: 10
Exploring the Potential of Hydroponic Vertical Farming for Enhancing Agricultural Sustainability

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Global issues including population increase, climate change, and resource scarcity require agriculture to adapt in order to supply the increasing demand for food while reducing its environmental impact. In the fields of agriculture and related sciences, hydroponic vertical farming has become a viable option that adheres to the concepts of sustainable development. In order to investigate the novel uses, advantages, and possibilities of hydroponic vertical farming as a driving force behind agricultural sustainability, an experiment was carried out at Centre for Protected Cultivation Technology, IARI, New Delhi. To produce mint crops vertically, a hydroponic system utilizing the nutrient film technology was constructed. Along with an electrical conductivity and pH-based nutrient management system, a customized nutrient recipe which was developed for the local conditions modifying the Hoagland solution was employed. The vertical hydroponic arrangement maintained 272 plants in about 3 m^2 area, representing an 8-fold improvement in crop density over conventional methods, where we can grow roughly about 33 to 40 plants in the same area. After 30 days of transplanting, the crop was ready to be harvested with a remarkably high water-use efficiency of almost 113 kg/m^3 of water. This experiment underscores the transformative potential of hydroponic vertical farming as a sustainable solution to address the complex challenges facing modern agriculture.

Keywords: Crop density, Hydroponics, Vertical farming, Water use efficiency

Theme 1: 11
Factors Affection the Utilization of Kisan Credit Card by Card Holders in Subtropics of Jammu Region

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The Kissan Credit Card (KCC) scheme was launched in 1998 with the aim of providing short-term formal credit to farmers. Owner cultivators as well as tenant farmers can avail loans to meet their agricultural needs under this scheme at attractive rate of interest. The government has also simplified the application process to increase interest among farmers. KCC is a scheme specifically designed by NABARD to provide farmers with financial support. The short-term loan is intended to help farmers receive timely financial aid and support from the banking system. The money can be used for multiple purposes. To find out the Factor affecting the Utilization of KCC, a study entitled "Factors affection the Utilization of Kissan Credit Card by Card Holders in Subtropics of Jammu Region" was undertaken. Based on the feasibility, nonequivalent static group comparison design was applied for the study. Out of the 10 district in Jammu region, three of them was selected i.e. Jammu, Kathua and Samba because of having maximum rice growing area. A list of rice growing KCC holder farmers (having at least 5 kanal each land) in each selected districts were prepared from these blocks which are having maximum rice growing areas. From the prepared list, 200 number of rice growing KCC holder were selected by proportionate sampling method.

Keywords: Kisan credit card, Utilization, KCC holders, Subtropics

Theme 1: 12
Development of an AI-Powered Chatbot for Small Ruminant Farmers

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India ranks second globally in goat population and third in sheep population, with approximately 33 million rural households involved in their rearing, contributing to 4% of rural employment. India holds the top position in the export of small ruminant meat, having exported 9532.31 metric tons valued at 66.92 million USD. Despite the substantial economic and agricultural importance of this sector, small ruminant farmers face significant challenges in enhancing production due to information gaps in scientific management, marketing, and farm economics. Only 6.8% of farmers receive extension services due to staff shortages. Increase in mobile phone penetration in rural areas and cheaper internet services, ICT tools have the potential to make up for this shortage. However, small ruminant farmers encounter obstacles in utilizing ICTs, including language barriers, complicated user interfaces, etc. To address these challenges, the present study was undertaken to develop an AI-powered chatbot as a digital companion for small ruminant farmers. The AI powered chatbot, IVRI-Sheep & Goat SHRIA has been developed in 10 regional languages and is enabled with speech input and audio output. It was placed on Google Play store on 18th December 2023. The collective CUQ score stood at 79.1, signifying that most participants had a positive encounter with the chatbot. The linguistic, technology, and information retrieval scores of IVRI-Sheep & Goat SHRIA's responses were 4.15, 3.89, and 4.26 out of 5.0 in expert evaluation of chatbot, and also yielded 51.5 percent overall score on Turing test. The IVRI-Sheep & Goat SHRIA offers a single package solution for all stakeholders, providing need-based information from credible sources in a user-friendly manner, available 24/7.

Keywords: AI, Chatbot, ICT, IVRI-Sheep & Goat SHRIA, Small ruminant

Theme 1: 13
Climate Smart Agriculture: The Key to Sustainability

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Climate-smart agriculture (CSA) is an approach that combines multiple sustainable techniques to solve the specific climate challenges that a given agricultural community faces. CSA assists in mitigating the consequences of climate change by lowering greenhouse gas emissions from agriculture and, when feasible, adapting agricultural techniques, livestock, and crops to its effects. The goal of this Climate-Smart Agriculture approach is to make climate change a factor in the creation and use of sustainable farming practices. The review study outlined the different technologies that support sustainable development and climate-smart agriculture. Further, it also identified numerous challenges associated to the adoption of climate wise practices which included gender-related hurdles and technology farmers have adopted, including marriage structures, land location and ownership, cropping systems, climate change, and CSA technologies. It also put light on if female smallholder farmers in different parts of world were using CSA technology. The results of the study revealed significant heterogeneity in CSA adoption, impact and agroforestry adoption pathways, suggesting a potential link between CSA programs and food security in varying climates.

Keywords: Climate, Food Security, Sustainable

Theme 1: 14
Extent of Adoption of Vegetable Cultivation Practices among the Farmers under Polyhouse in Southern Rajasthan

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Climate change, land fragmentation, water scarcity, urbanization, reduced crop productivity, plummeting market prices, biodiversity loss, and a growing population all these factors affecting severely on Indian agriculture. In the face of these challenges, the demand for food, particularly vegetables, has surged. Protected cultivation has emerged as a promising solution, allowing for increased production within confined spaces. During the period of 2021-2022, a comprehensive study was carried out in the districts of Bhilwara and Chittorgarh, chosen for their high concentration of polyhouses. The study findings unveiled that a majority of respondents (67.00%) exhibited a moderate level of technology adoption. Meanwhile, 21.00% of the respondents had a low level of technology adoption, and 12.00% demonstrated a high level of technology adoption. Notably, the study also revealed that the adoption of various components of polyhouses was the most prominent, ranking first with MPS 74.20. This trend was consistent across Bhilwara and Chittorgarh, where it secured MPS scores of 75.40 and 73.00, respectively. The study also highlighted a prevalent issue of low adoption of nematode control methods due to insufficient knowledge about nematode infestation within polyhouses.

Keywords: Polyhouse, Adoption, Vegetable

Theme 1: 15
Climate Smart Agriculture: A Need of Present Scenario

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The demand for food is rising due to changes in nutrition requirements and an increasing worldwide population. There are 690 million hungry people on the planet or 8.9% of the total population. With 9 billion people expected to be fed by 2050, the globe would need to produce almost 70% more food, making the problem of food security even more difficult to solve. Climate change will make the environmental effects of meeting this rising need for food much worse. The issue is also reciprocal. One of the main causes of the climate issue is agriculture. At the moment, it produces between 19 and 29% of all greenhouse gas emissions. The globe wastes around one-third of its overall production, which has a significant carbon footprint. This has made it more important than ever to adopt the idea of Climate Smart Agriculture (CSA) in order to lessen the detrimental effects of climate change on agricultural systems while dealing with climatic whims. Climate-smart agriculture (CSA) refers to a broad variety of agricultural approaches that modify agricultural systems to ensure food security in the face of climate change. A CSA method aims to integrate climate change into planning and implementation of sustainable farming practices. It also seeks to lessen agriculture's impact to global warming and improve agriculture's resistance to climatic variability through improved climate change adaptation. It is imperative that the agricultural sector undergo a transition that encompasses crop and animal production, fisheries and forests in order to effectively address climate change and provide sustainable increases in agricultural output and incomes.

Keywords: Climate change, Environmental effects, Sustainable farming practices

Theme 1: 16

Constraints Faced by Paddy Farmers in the Adoption of Climate Smart Agricultural Practices in Eastern Zone of Haryana

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Climate-smart agriculture (CSA) is an integrated approach to managing landscapes which includes cropland, livestock, forests, and fisheries, which addresses the interlinked challenges of food security and accelerating climate change. Climate smart agricultural practices focus on attaining triple objectives of increasing productivity, enhancing resilience, and reducing greenhouse gas emissions. The paper tries to identify the major constraints faced by paddy farmers in the adoption of climate smart agricultural practices in the eastern climacteric zone of Haryana. Karnal and Kaithal districts were chosen based on the highest productivity of paddy crops in eastern Haryana. Two villages, one climate smart village, and one non-climate smart village were randomly selected from two blocks of each district. Further, a sample of 15 farmers was randomly interviewed from each of the eight villages. The constraints were divided into three categories i.e., economic constraints, socio-personal constraints, and technological constraints. The analysis of responses from 120 farmers revealed that decreased yield followed by the high cost of adopting climate-smart agricultural practices were the major economic constraints while communication gap among the farmers followed by the inability to take risks were the major socio-personal constraints faced by the paddy growers. In terms of technological constraints, lack of awareness regarding climate smart agriculture was ranked first followed by lack of extension support to the farmers. Further analysis revealed that economic constraints were observed to be more profound in climate smart villages while technological constraints were the major factor behind lack of adoption of climate smart agricultural practices in non-climate smart villages. The study concludes that there was a subsequent failure of different extension agencies to create awareness and provide technological support to farmers for the adoption of climate smart agricultural practices in paddy crops. The study further recommends the use of a participatory approach for better communication between extension agencies and farmers to increase the adoption of climate smart agriculture by paddy growers.

Keywords: Adoption, Climate change, Climate smart agriculture, Constraints, Paddy

Theme 1: 17

Artificial Intelligence: A Sustainable Technology to Improve Indian Agriculture

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Agriculture is the largest sector in the world. Unquestionably, it is the largest livelihood provider in India; more so in the vast rural India. Agriculture is the backbone of Indian economy. Government of India has set a target of doubling of farmer's income by the year 2022 as well as Agriculture export policy has set a target to increase agricultural exports. The digital technology can play a transformational role in modernizing and organizing how rural India performs its agricultural activities. The technologies like Artificial Intelligence, Internet, Large Data Analytics, Block Chain Technology etc. The Artificial Intelligence provides accurate and timely information regarding crops, land, weather and insect-pest etc. to the farmers. Therefore, it may improve the crop productivity with reduced risk resulting the improved income of the farmers. Artificial Intelligence and Robotics can be

helpful for social need, agriculture and mainly for increasing agriculture production and productivity for fulfillment of the ever-growing demand of food requirements of burgeoning world population and to prevent starvation. Artificial Intelligence can propose efficient and practical solution for the problem and challenges of agriculture like increasing labor costs, raising cost of cultivation and crop failures associated with unpredictable yield due to diseases, unpredictable rainfall, climatic changes and degradation of soil fertility, fluctuating market price in agriculture commodities. In such condition for improving socioeconomic status of Indian agriculture. Artificial intelligence can develop advance farming procedures to reduce loss of farmers and provide them with high yield. Using artificial intelligence platforms, one can collect huge amount of data and information from government and public websites or real time monitoring of large data is also possible by using IoT (Internet of Things) by using advanced technology machinery and app of artificial intelligence we can solve the uncertain issues faced by farmers in the agriculture sector.

Keywords: Artificial intelligence, Internet, Agriculture, Crops, Weather, Advancement, Farmers

Theme 1: 18

Predictive Modelling for Employment Opportunities among Agricultural Migrants in Northern India: A CART Approach

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The agricultural sector in Northern India plays a crucial role in supporting the livelihoods of farmers. However, migrants face challenges due to limited accessible employment opportunities. This research aimed to develop predictive model for sustainable agricultural employment options in Rajasthan and Uttar Pradesh (UP). The study deliberately selected these states and employed a stratified multistage sampling design to gather data from 480 resident and migrant farmers each. Employing a machine learning algorithm based on classification and regression tree (CART) analysis, the study identified factors and prospects for migrant farmers in the agricultural sector. The classification tree found that milk yield, operational land holding, and rabi crop yield were significant predictors. Meanwhile, the regression tree highlighted milk yield, rabi crop yield, and kharif crop yield as essential factors contributing to profitable ventures. To enhance and sustain revenue for migrant workers, the government and policymakers should focus on increasing and supporting these contributing factors. The study demonstrated viable avenues for profitable ventures tailored to the agro-climatic conditions of the migrants. Recommendations provided by KVK professionals led to the identification of key income-generating activities such as livestock management, vegetable production, and organic farming, these prospects are tailored to the location-specific context where migrant farmers reside. Overall, this research shed light on viable and sustainable employment opportunities, ultimately contributing to the well-being and prosperity of migrant workers in the Northern India.

Keywords: CART, Classification tree, Income-generating activities, Regression tree, Stratified multistage sampling

Theme 1: 19
Constraints Faced by Farmers in Adoption of Climate Resilient Technologies

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The main focus of the study was to identify the constraints faced by the beneficiary and non-beneficiary farmers in Jhunjhunu district of Rajasthan state. Mandawa tehsil was selected purposely for the present research study on the basis of highest number of registered farmers under NICRA project. Further, three villages were selected namely Bharoo, Chakwas and Madansar. Total 120 respondents *i.e.* 60 beneficiary and 60 non-beneficiary respondents were selected from selected villages for the present investigation through proportionate random sampling method. The total sample size from the selected three villages was 120. Findings of the study indicated that illiteracy of the farmer, lack of awareness about climate change, inability to take risk, inability to accept new practices, small size of the farm, more interested to follow conventional practices, increasing labour scarcity, poor economic status of the farmer, high cost of inputs, higher investment cost on farm implements, inadequate institutional financial support, lack of credit/capital, lack of market access, lack of savings, lack of timely weather based information, lack of effective advisory system on climate change, lack of availability of improved seed, inadequate services through CHCs, lack of access to irrigation water, lack of knowledge on adaptation methods were emerged as important constraints faced by the beneficiary and non-beneficiary farmers.

Keywords: CHCs, Beneficiary, Non-beneficiary, Climate, Constraints

Theme 1: 20
Emerging Technologies in Agricultural Sciences: Agriculture and Rural Development Digital Agriculture

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The agriculture sector forms only about 18 percent of India's GDP despite employing almost 65 percent of the total work force. Despite significant improvement in food grain production, there are several challenges to tackle as the government aims to increase agricultural production as a share of GDP. Agriculture in India is largely dependent on nature, but climate and global warming issues make farming unpredictable. The need of the hour is to educate farmers in the use of modern technology and innovative approaches to increase productivity and raise profitability. Technology has a major role in farming and agriculture practices; and with the advent of digital technology, the scope has widened. Innovation in agriculture is leading an evolution in agricultural practices thereby that reduce losses and increase efficiency. This is positively affecting farmers. Use of digital and analytic tools is driving continuous improvement in agriculture, and the trend is here to stay, resulting in improving crop yields and helping increase the income of the farming community. Remote sensors, and satellites gather 24/7 data on weather patterns in and around the fields, providing farmers with vital information on temperature, rainfall, soil, humidity, etc. However, Artificial Intelligence finds slow acceptance in a country like India where marginal farming, fragmented landholdings, and other reasons act as impediments. However, there is no doubt that technologies based on AI can bring precision to large-scale farming and lead to an exponential rise in productivity. Technological advancements are today integral to attaining sustainability goals in agriculture. Satellite and GPS technologies, sensors, smart irrigation, drones, and automation, to list a few, provide the means for precision agriculture, which further aids in the effective resource utilization.

Keywords: Agriculture, Technologies, Farming, Digitalization

Theme 1: 21
Knowledge Test on Pest Management Practices of Vegetable Growers

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Vegetables are a key component of a healthy diet, but they are also exposed to a relatively high amount of pesticide usage in conventional growing systems. In addition to harming human health, excessive and careless pesticide usage has produced several dysfunctional outcomes. To mitigate these detrimental effects of pesticide use in agriculture, different pest management practices are integrated in a compatible manner, to keep pest population below economic injury level, in such a way that it is not only economically viable but also ecologically sound. Due to the destitution of a test to measure the knowledge on pest management practices of vegetable growers in Jammu region this study has been conducted. This study mainly contemplates to find out the knowledge of vegetable growers regarding brinjal, okra and tomato pest management practices. A total of 86 items were prepared based on the recommended pest management practices by SKUAST-Jammu. Pre-testing of knowledge test was done on 30 vegetable growers who are cultivating brinjal, okra and tomato, later difficulty index and discrimination index were worked out and the items having the values ranging from 30 to 80 and 0.33 to 0.55 were selected respectively. Out of 86 items a total of 77 items were finally selected. The reliability for the whole test was calculated by using Cronbach alpha whose values are 0.87, 0.89 and 0.87 for brinjal, okra and tomato.

Keywords: Knowledge test, Pest management, Vegetables, Vegetable growers

Theme 1: 22
Social Entrepreneurship for Sustainable Rural Development in India

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Social impact and entrepreneurship are deeply rooted in the Indian ethos. Opportunities for social entrepreneurship (SE) in India are countless. The huge population, unmatched youth demographics, the vibrant SE ecosystem and India's socio-economic issues are the main reasons for their rise. With this consideration, the present study was carried out to compare the landscape of SE at national and global levels along with different opportunities and constraints faced by them. For the 11 million SE at the global level, the average prevalence rate among nascent and operational entrepreneurs is 3.2 and 3.7 per cent respectively. There exists around 2 million SE at the national level. Among factor driven economies (India), higher prevalence rates of 3.8 and 5.8 existed respectively for start-up and operational SE in comparison to efficiency driven economy (South Africa) i.e. 1.6 and 2.3 per cent respectively. The gender gap remains much less pronounced for SE activity for most global regions. SE which is less than five years old identified attracting new customers as their top growth plan. In terms of new market creation, women had a lead over male led SE. Most of the SE operate in the skills development sector. Analysis of data for PAU trained SE in different fields for the years 2021-22 indicated that the number of female led SE were higher by 17 per cent. About 77 per cent of the SE got established 6 to 10 years back. The major source of finance was subsidies and grants for the start-ups. Major constraints included lack of skilled manpower, raising equity, lack of access to public facilities and services, issues with grant funding opportunities and lack of awareness from financial institutions.

Keywords: Social Entrepreneurship, Prevalence, Innovation, Gender, Constraints

Theme 2: 23

Soil Ecosystem Services through Nature-based Solutions in North Eastern Hill Region of India

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Soil ecosystem services are vital components to all aspects of life and they support the production of ecosystem goods and services. Soils variety also allows a diversity of soil ecosystem services, which benefit not only humans but also soil biota and the surrounding environment. Nature-based Solutions (NbS) covers diverse practices based on indigenous knowledge. Nature-based Solutions can offer triple benefits when deployed correctly, in terms of building agricultural production and resilience, mitigating climate change, and enhancing nature and biodiversity. In North Eastern Hill (NEH) region of India, the environment, local conditions, socio-economic and socio-cultural life of different tribal communities and their rituals associated with agricultural practices have given basis for development of many indigenous farming systems, which have in-built Nature-based Solutions. My presentation will deal with the soil ecosystem services like agricultural sustainability, food security, and climate resilience obtained from some of the important Nature-based farming practices of in NEH region of India such as *Zabo* farming system, *Alder* based farming system, and bun cultivation highlighting the fact that if any type of ecosystems is managed properly, they can provide effective soil ecosystem services to address the emerging challenges in agriculture.

Keywords: Soil, Ecological services, NbS, Agricultural sustainability, Food security, Climate resilience, NEH region

Theme 2: 24

Perception of Farmers towards Pradhan Mantri Fasal Bima Yojana in Samba District of Jammu and Kashmir

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The aim of the study is to ascertain the perception of farmers towards Pradhan Mantri Fasal Bima Yojana (PMFBY). The research design adopted for this study is an static control group design. A sample of 150 Pradhan Mantri Fasal Bima Yojana (PMFBY) beneficiary farmers was selected by proportionate random sampling technique from the nine blocks of Samba district. Based on judges' opinion and review of literature, the semi-structured interview schedule was prepared and used to collect data from the respondents. The collected data were coded, quantified, classified, tabulated and analyzed with the help perception index to get the inference. The statement 'It provides the financial support in case of crop loss' ranked I (perception index 0.75) followed by 'the premium which is to be paid by the farmers for PMFBY should be paid by the government' (perception index 0.71), 'In the PMFBY, there is area approach, it should be individual assessment' (perception index 0.67) were ranked II and III respectively. The overall perception of the PMFBY farmers was the perception index was 0.59, which is slightly favourable. Government needs to popularize the crop insurance scheme for scaling out and removing the negative perceived perception of the farmers.

Keywords: PMFBY, Perception index, Crop insurance

Theme 2: 25

Impact of Climate Change and Role of Climate Smart Technology in Harnessing Better Paddy Yield Under the Agro Climatic Condition of Barak Valley Zone of Assam

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Climate change is looming large towards humanity in the coming decades. Rise in temperature due to increasing concentration of CO_2 in the atmosphere indicates that climate change is happening in most of the places hampering agricultural production. Analysis of temperature data and rainfall data in Cachar district of Barak valley zone of Assam indicated an increasing tendency of maximum and minimum temperature during 1990-2022. The rate of increase of maximum temperature during rice growing season (June-November) is more than that of minimum temperature. Rainfall during monsoon season in the district is 1840 mm and it was observed that July rainfall showed an increasing trend by 30 mm/decade during 1990-2022 causing frequent floods in the district. As the district comes under low lying flood prone areas, heavy rainfall during monsoon season caused extensive damage to kharif paddy crop. To minimize crop losses from the extreme weather event, climate resilient technologies are to be adopted by the farmers. District Agromet Field Unit (DAMU) under IMD-ICAR is focusing on popularization of different climate resilient technologies to the farming community through agromet advisory services. Keeping this in mind, Ranjit Sub-1, a flood resistance variety was demonstrated by conducting one On Farm Testing (OFT) by transplanting the variety in three different dates at 10 days interval during 2019 and 2020 at two villages. The variety was transplanted on 15th June, 25th June and 5th July in both the years. Analysis of different agroclimatic indices showed that all the accumulated agroclimatic indices were higher on second transplanted crop (25th June) compared to the other two dates of transplanting.

Keywords: Climate change, Climate smart technology, Paddy yield

Theme 2: 26

Effect of Different Fertility Level and Bio-organics on Yield and Protein Content of Mungbean in Arid Region of Rajasthan, India

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A field experiment was conducted at Agronomy farm, MJRP College of Agriculture & Research, Achrol, Jaipur, Rajasthan during Kharif season of 2020 on loamy sand soil, which consisted four each of fertility levels (Control, 50%, 75%, 100% and 125% RDF) and bio-organics (Control, PSB, vermicompost and PSB + vermicompost) thereby making 20 treatment combinations were tested in a Randomized Block Design with three replications. Result showed that the application of 125% RDF gave significantly increased chlorophyll content, yield and protein content in seed followed by 100% RDF, 75% RDF, 50% RDF and Control. Application of bio-organics (PSB + vermicompost @ 2 t/ ha) significantly increased yield and protein content as compared to control.

Keywords: *Vigna radiata*, Bio-organics (PSB + vermicompost), RDF, Protein content

Theme 2: 27

Assessment of Front-Line Demonstration of Zero till Sowing of Wheat in the Eastern Part of Uttar Pradesh

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Krishi Vigyan Kendra (ICAR-IIVR) Deoria conducted front-line demonstrations (FLDs) on the zero-till sowing of wheat in the years 2000–2018. This practice is the most broadly adopted resource-conserving technology in the rice-wheat cropping systems in eastern plain of the sub-humid agro-ecoregion. The practice was initially adopted by rice growers, followed by wheat in Deoria district, Uttar Pradesh. In this respect, a lot of efforts have been made by national and international agencies in this region to insist on farmers adopting zero-tillage practices. This paper aimed to review and synthesize the current status of perception in the farming community of Deoria. Assessment of performance of FLDs is based on interviews with zero-till wheat growers to know their practical experience and subsequent impact on livelihood improvement. Under the study, we have at random selected 20 villages in Deoria district, and 10 farmers from each village were interviewed for sharing their practical experience, cost of cultivation, and impact on wheat yield. The information was recorded on standard Performa, and the data were compiled for interpretation. The study indicated that zero tillage in wheat after rice contributed significant benefits for the farming community, both in terms of significant yield gains (5–10% due to the sowing of wheat in the second week of November) and savings on the cost of cultivation (15–20% in all particulars). These benefits explain the widespread interest of the farming community and the rapidity of its diffusion across the district. It also showed the wide applicability of this mechanical innovation. An uninterrupted dissemination of innovative technology (zero till) through various extension agencies in the targeted region can impress the farming community.

Keyword: Front line demonstration, Cropping system, Resource, Zero tillage, Benefit, Community, Adoption and Potential

Theme 2: 28

A Social–Ecological Approach to Managing Multiple Agro–Ecosystem Services

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The sustainability of agro-ecosystems depends on their ability to deliver an entire package of multiple ecosystem services, rather than provisioning services alone. New social and ecological dimensions of agricultural management must be explored in agricultural landscape, to foster this ability. We propose a social – ecological framework for the service – based management of agro ecosystems, specified through an explicit and symmetric representation of the ecosystem and the social system, and the dynamic links between them. It highlights how management practices, with their multiple effects, could drive the provision of multiple services. Based on this framework, we have identified the design of collective multiservice management as a key research issue. It requires innovations in stakeholder organizations and tools to foster synergy between ecosystem functioning and social dynamics, given the complexity and uncertainties of ecological systems.

Keywords: Social–ecological, Agro-ecosystem, Multiple, Management

Theme 2: 29

Assessment of Climatic Vulnerability among Farming Communityy in Banda District under NICRA Project

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In developing countries like India, agriculture constitutes the primary source of income for the majority of rural and peri-urban population. Despite of excellent growth in past decades and significant share in economy, it faces significant challenges caused by climate change, such as rising temperatures, floods, droughts, frost, cyclones, heat waves resulting in yield losses of major crops and livestock. Indian Council of Agricultural Research has launched a network project "National Innovations on Climate Resilient Agriculture (NICRA)" in February, 2011. The project aims to enhance resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. Krishi Vigyan Kendras which are integral part of the National Agricultural Research System (NARS), have also been involved to assess the location specific climate resilient technologies in agriculture and allied sectors, through technology assessment, demonstrations and capacity building. Krishi Vigyan Kendra, Banda have been selected under NICRA during the year 2021-22 for demonstrating the proven technologies for adaptation of crop and livestock production systems to withstand drought as one of the climatic variability. A village namely Chaudhary Dera, Block Tindwari, Distt Banda have been selected under this project. The Climate Vulnerability Index (CVI) was calculated by using the Intergovernmental Panel on Climate Change's three-indicator approach (sensitivity, exposure and adaptive capacity). As per the results, farmers of the village are highly vulnerable to climate change (CVI 0.65). Specifically, the indices of vulnerability components showed that farmers have a high level of exposure (EVI 0.57) and sensitivity (SVI 0.54) to the climatic uncertainties with the least adaptive capacity (AVI 0.46). These findings implies that climate-smart adaptation strategies should be facilitated at the farm and regional levels through the implementation of location specific, appropriate and need based climatic resilient technologies in the following four modules; natural resource management, crop production, livestock and institutional interventions.

Keywords: Climate vulnerability, Technology demonstration, Exposure, Sensitivity, Adaptive capacity, Natural resource management

Theme 2: 30

Attitude of Respondents Towards Technology Demonstration Component of NICRA Project and its Correlates with Personal Variables

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Attitude is the degree of positive or negative affect associated with some psychological object. The success or failure of any extension programme would mainly depend upon people's attitude towards it. The present study was conducted in the year 2021-22 in Ratnagiri district from Konkan region and Aurangabad (*Chattrapati Sambhajinagr*) districts from Marathwada region of Maharashtra state. A total sample of 140 farmers (70 beneficiaries from Konkan region and 70 beneficiaries from Marathwada region) were selected. To know the

attitude of respondents towards the different aspects of the Technology Demonstration Component of the NICRA project, 20 statements were considered. The data were collected through an interview schedule to assess the attitude of farmers. Then correlation was found between the personal variables of respondents and their attitude. There are eleven statements which showed a strongly agreed attitude towards the Technology Demonstration Component of the NICRA project. In this category attitude statement entitled "technology Demonstration Component has very much added to the respondents's knowledge on use of climate resilient technology interventions" ranked first with mean score 4.39. This was followed by the statements namely "there is more work in development of farming instead of its propaganda only" and "there is impact of Technology Demonstration Component on adoption level of respondents" with 4.31 and 4.25 mean score and ranked second and third respectively. Also, there are nine statements which showed a strongly agreed attitude. Further, regarding relationship between personal variables and attitude of respondents revealed that, in both the regions i.e. Konkan and Marathwada region, relationship between the variables age and size of land holding with attitude was non-significant. It means these variables had not influenced the attitude of farmers. However, a significant relationship was observed between annual income and mass media exposure of both the region farmers and the attitude of beneficiary respondents. It means that annual income and mass media exposure had influenced the attitude of beneficiary farmers.

Keywords: Attitude, Demonstration, Farmer and NICRA

Theme 2: 31

Farmers Knowledge on Climate Change in Turmeric Cultivation in Thoubal District of Manipur

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Agriculture is extremely vulnerable to climate change because it is one of the sectors that will be hardest hit by adverse climate conditions. Climate change has a huge impact on turmeric since it prefers rich, wet soils in a protected, shady location. At the same time climate change has become major concern for turmeric growing cultivars in Manipur as its contribution in the production of the turmeric is decreasing. This research was carried out in the year 2003 in Thoubal district of Manipur to study the farmers' knowledge on climate change and its effect on turmeric cultivation. Data for the study were collected from 111 turmeric growing farmers through farmers group discussions and personal interview. The total research sampling was done purposively. The study found that 72.07 per cent of the farmers have medium level knowledge on climate change, 17.12 per cent and 10.81 per cent of farmers have high and low level of knowledge on climate change respectively. The changes in climatic variables like temperature, drought, rainfall timing etc., were found to have visible impacts on turmeric crop such as decreased rhizome formation, increased life span etc. Correlation and regression analysis were used in order to find the relationship and influence between independent variables like age, level of education, farming experience and so on along with the farmers knowledge on climate change. The study has shown that occupational engagement, level of education and mass media exposure have influenced the farmers knowledge on climate change positively.

Keywords: Climate change, Farmer, Knowledge, Turmeric

Theme 2: 32

Investigating the Knowledge Levels of Trained Farmers in Natural Farming: A Study of Tonk District of Rajasthan

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Natural farming is a type of farming that is pain-free, care-free, loan-free, and driven by passion, as described by Palekar, 2010. This study was conducted in the Tonk district of Rajasthan. A total of 120 trained farmers were selected from three blocks in Tonk district, which had the highest number of trained farmers. Two villages were chosen randomly from each block based on a preliminary survey, selecting those with a strong interest in natural farming. From each village, 20 respondents were randomly chosen to assess the knowledge of trained farmers regarding natural farming. Majority of farmers have medium level of knowledge (74.17%) and in component Jeevamart & Beejamarita have highest knowledge as compared to other components. To ensure the validity and reliability of knowledge statements, triangulation was employed, resulting in a Cronbach's Alpha value of 0.641, indicating that 64% of the statements were reliable for this study. For exploring relationships between variables, correlation and regression analyses were employed. In the regression analysis, the Durbin-Watson model was utilized. In terms of correlation, positive relationships were found between Education level, Land holding, Experience in natural farming, Mass Media Exposure, Age, Annual income, Extension contacts, Scientific orientation, and Risk orientation.

Keywords: Farmers, Knowledge, Natural farming, Triangulation

Theme 2: 33

Household Carbon Footprint: A Comparative Analysis of Rural and Urban Areas in Uttarakhand

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A significant disparity exists in the living conditions and lifestyles of people living in rural and urban India. Based on geographical location and lifestyle, an individual's contribution to the global carbon footprint has been estimated in this study. This study examines the household carbon footprint in different rural and urban areas of two selected districts of Uttarakhand state. It analyses the difference of contribution of the factors based on one's geographical location and how an individual's demographic profile affects carbon footprint. The data was gathered from 240 respondents through questionnaire. The average carbon footprint in rural areas is estimated to be 0.56 tones CO_2e per capita per year. In urban areas, it is 2.33 tones CO_2e per capita per year. A significant difference is found in the annual per capita carbon footprint (food, clothing, household, travel, and total carbon footprint) among the various income groups of rural and urban areas. Another significant difference is found among different monthly expenditure categories between urban and rural households. Based on the information given by the respondents of the rural and urban areas the difference regarding electricity consumption, travelling details, monthly expenditure category, type of energy used, cooking fuel, annual household, travel, and lifestyle carbon footprint have been discussed graphically. This study looked at the sectoral contribution (activity-wise, e.g., cooking, transportation, etc.) and the rural-urban disparity in the individual carbon footprint.

Keywords: Carbon footprint, greenhouse gas emission, rural, urban

Theme 2: 34

Knowledge Assessment of Climate Change and Adaptation Strategies among Vulnerable Farmers in the Bundelkhand Region, Uttar Pradesh, India

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The present study was purposively carried out in the Bundelkhand region of Uttar Pradesh because, historically, Bundelkhand region has been more vulnerable to climate change than any other regions i.e., Western, Central, and Eastern Uttar Pradesh. The study's objective was to assess the farmers' level of knowledge regarding climate change which includes climate extreme events such as temperature, rainfall, relative humidity, drought, and other climate change indicators; and adaptation strategies. Data was gathered from two purposively chosen, highly vulnerable districts in the Bundelkhand region: Mahoba and Hamirpur. For the responses, randomly 120 farmers from each district were chosen covering the total sample size of 240 respondents. A pre-tested structured interview schedule was used to gather data. A knowledge test was developed and pre-tested for its reliability and validity. According to study findings, the majority of farmers in districts that were extremely vulnerable to climate change had a high degree of climate change knowledge. Farmers also had a high level of knowledge about climate extremes, including temperature, relative humidity, rainfall, and drought, and a medium level of knowledge about other climate change indicators, such as government programs and food security. Further, majority of the farmers had medium level of knowledge about adaptation strategies. Overall, a large percentage of farmers had good amount of knowledge climate change, medium level of knowledge about climate extreme events and adaptation strategies but very few adaptation strategies were applied for combating climate change. Thus, it can be inferred that low-cost and local approaches like enhancing farmer extension services, introducing small-scale infrastructure projects, reinforcing informal safety nets, and protecting natural ecosystems could be viable cost-effective options. Moreover, it is suggested that extension activities prioritise teaching people about adaptation strategies so that rural Bundelkhand region residents can combat the threat that climate change poses.

Keywords: Climate change, Climate extreme events, Adaptation strategies, Knowledge

Theme 2: 35

Ecological Exploration of Lepidopteran Insect Diversity in Sitamata Sanctuary, Rajasthan

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Sitamata Sanctuary, located in the in the southern Aravalli Range, near the town of Pratapgarh (Rajasthan), India. It is renowned for its rich biodiversity and unique ecological features and covers an area of approximately 423 square kilometers. It serves has a rich variety of plant species, including various medicinal plants and trees like teak, tendu, and bamboo. This study presents an investigation into the diversity of Lepidoptera (butterflies and moths) within the sanctuary. Lepidopterans are vital components of terrestrial ecosystems, serving as pollinators, indicators of habitat health, and ecological connectors. This research aims to shed light on the Lepidopteran species composition, distribution, and ecological interactions in the Sitamata Sanctuary, Rajasthan. Our field work involved systematic butterfly and moth surveys conducted over a span of one year, covering diverse habitats ranging from dry deciduous forests to riparian zones. We employed standard sampling techniques, such

as sweep net, crown trap, light trap and visual observation, to document Lepidopteran species richness. Environmental parameters, including temperature, humidity, and vegetation types, were also recorded to assess their influence on Lepidopteran distribution. Preliminary results indicate a remarkable diversity of Lepidopterans in Sitamata Sanctuary, with numerous species. Key findings suggest a correlation between specific Lepidopteran species and certain plant species, emphasizing their role as essential pollinators in the ecosystem. Moreover, the study highlights the conservation importance of the sanctuary in preserving Lepidopteran diversity, as these insects are sensitive indicators of environmental changes. This research contributes to the broader understanding of biodiversity conservation in arid regions of Rajasthan and underscores the significance of protecting natural habitats like Sitamata Sanctuary

Keywords: Lepidopteran, Biodiversity, Sitamata Sanctuary, Species Richness

Theme 2: 36

Impact of IARI Crop Interventions for Doubling Farmer's Income in Bundelkhand Region of Central India

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In central India's Bundelkhand region, farmers aim to increase yield and income through strategies such as intensifying existing enterprises or diversification, value addition, and market linkages. Farmer Shri Akhilesh Pal exemplifies this, who was advised and convinced to go for diversified farming. The farmer was engaged in traditional farming with his father but he wanted extra income during lean months of crops season as they owned 3 acres of land under wheat - black gram rotation system. He was suggested to adopt Wheat, Chickpea, Green gram, Black gram, Onion, Bottle gourd, Cucumber and Tomato Cultivation at his farm with seed treatment, line sowing, raised bed sowing, improved seed sowing and vegetables at early sowing of improved seeds of IARI, Pusa varieties during the year 2018, with the technical support and encouragement he initiated vegetable cultivation of bottle gourd in the area of about one 1.5 acre. With the result, he earned up to Rs. 99,000/- per acre (net income) in four months which is far remunerative than contemporary Pulse crop. To improve the farm productivity, Sh. Akhilesh Pal has put 2 acres of land under short duration pulse crop i.e. green gram *(Pusa Vishal)* in the summer season. This cropping system provides him an annual net income of Rs. 51,520/- per cropping season. He started growing newly released high yielding varieties of wheat *(HD-3086)* in 3 acres and Mustard *(Pusa Vijay)* in one acre which gave him annual net return of about Rs. 1.64 lakh per cropping season. He has also grown Chickpea (*Pusa - 547)* in one acre of land. The average selling price of chickpea was Rs. 48/- per kg. and total production was 7.2 q/acre which gives him net return of about Rs. 34,560/- per cropping season. Diversification towards low input-high value crops/enterprises, cultivation of onion and bottle gourd through low-cost technology, off-season and before-season vegetable cultivation, mixed vegetable cropping system, effective management of crop, integrated nutrient management, intercropping and use of improved farm implements etc. have potentially increased net farm income from Rs. 2.6 lakhs in 2018 to Rs. 4.8 lakhs in 2019-20. He has diversified from the traditional crops to intensive vegetable crops combined with flowers (marigolds) and vegetable seed production to enhance income and ensure economic stability through farming on the basis of scientific and modern methods. The adopted model is serving as an integrated and sustainable farming model with optimum utilization of available resources through diversification of profitable units and marketing linkages which ultimately will help in doubling the farmer's income in the region of central India.

Keywords: Crop diversification, Doubling farmer's income, Market linkage, Sustainability, Value addition

Theme 2: 37
Impact of Climate Change on Food Security

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Climate change is our planet's greatest existential threat. As global temperature climbs, widespread shifts in weather systems occur, making events like droughts, hurricanes, and floods more intense and unpredictable. The stability of the world's food production systems is increasingly threatened by the impacts of a warming climate. Research shows that 3.6 billion people already live in areas highly susceptible to climate change. Between 2030 and 2050, climate change is expected to cause approximately 250000 additional deaths per year, from undernutrition, malaria, diarrhoea and heat stress alone. Agriculture and its related industries depend immensely on climate. Climate change has potentially large and alarming consequences for India, which is home to the largest number of hungry and deprived people in the world-to be precise 360 million undernourished and 300 million poor people. Food systems and food security are directly affected by climate change. It is becoming increasingly crucial to sustain the food supply. The production of crops, livestock, fisheries, and related industries are suffering from rising temperature driven by climate change. It affects food security by disrupting all components of global, national, and local food production systems, and it will ultimately impact all aspects of food security, like food availability; access to food and food utilization. It indicates to the necessity of making significant investments in mitigation and adaptation strategies in order to create a "climate-smart food system" that is more resilient to the effects of climate change on food security. This review study was planned to measure the impact of climate change on food security and agriculture. The paper also highlights the initiatives taken by the Government of India to mitigate the adverse impact of climate change.

Keywords: Impact, Climate change, Food security, Agriculture

Theme 2: 38
Challenges and Opportunities in Agro-Forestry in Punjab

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This study conducted in Punjab state aimed to identify and analyse the challenges faced by tree growers, specifically members of the PAU Tree Growers Association. Data were gathered from 80 association members, focusing on marketing, technical, credit, communication, and institutional problems. The results revealed that marketing issues were the most prominent, with a mean percent score (MPS) of 76.25, followed by technical problems (53.33 MPS), credit challenges (37.5 MPS), institutional issues (20.71 MPS), and communication difficulties (15 MPS). Notably, low product prices and the absence of a minimum support price were identified as severe marketing constraints. High-interest rates were the primary credit concern, while non-involvement of members in decision-making was the top communication challenge. Transportation difficulties ranked highest among technical problems, and maintaining partnerships with various agencies was a critical institutional issue. Additionally, operational land holdings and annual income positively correlated with overall benefits. Multiple regression analysis indicated that increased social participation led to higher overall benefits for association members. This study sheds light on the multifaceted issues faced by tree growers, providing insights for strategic interventions and improvements within the PAU Tree Growers Association.

Keywords: PAU, Tree growers, Association, Challenges, Members, Punjab

Theme 2: 39

Integrated Farming System for Increased Farm Income and Nutritional Security in Palwal District of Haryana

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Significant efforts have been taken in recent times to introduce innovative approaches like Integrated farming system to enhance risk coverage and produce diversified sources of farm income for the farmers. The Farmers First project of the Indian Council of Agricultural Research (ICAR) has also tried and tested various models of the Integrated Farming System (IFS), which is comparatively more remunerative and stable source of income and employment as compared to the conventional rice-wheat cropping system prevalent in the Indo-Gangetic plains. The Integrated farming system (IFS) model is a sustainable agricultural unit comprising a careful mix of enterprises like livestock, crop production, fish, poultry, tree crops, plantation crops and other systems that benefit each other. Here, the waste of one enterprise is utilized as an input for the other enterprise and thus, there is no or minimum wastage of farm resources. Under the Farmer FIRST programme, the IFS model was demonstrated and tested in farmer's field at Palwal, Haryana. The IFS model introduced in the project location included various farm enterprises like the cultivation of mung bean, vegetables, marigold, pisciculture unit, mushroom unit, and fodder cultivation along with paddy and wheat cultivation on one hectare of land and led to the successful annual income generation of Rs. 2.0–2.5 lakhs/ha, which is 43.98 per cent higher than the traditional cropping system. In addition to the remunerative returns and employment generation around the year, the IFS model has helped in the efficient utilization of the farm by-products and thus has led to reduced wastage. This has also resulted in increased food availability and thus, increased nutritional security for rural households. Thus, the IFS model is a sustainable and profitable way for farmers to diversify their crops within the given small piece of land and improve their livelihoods. It reduces the use of external inputs such as fertilizers and pesticides and is thus beneficial for the environment and the ecosystem. It helps in reducing pollution and conserving natural resources.

Keywords: Integrated farming System, Farm income, Nutritional security, Haryana

Theme 2: 40

Consequences of Climate Change on Fisheries

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Climate change is a global phenomenon that impacts nature. Human activities have significantly contributed to the warming of the upper ocean (above 700 m) observed since the 1960s. On a global scale, surface waters have experienced an average warming of 0.7 °C per century from 1900 to 2016. The rise in the Earth's surface temperature leads to elevated sea levels, resulting in the diminution of coastlines. Projections indicate a potential decline in oceanic primary production ranging from three percent to nine percent by the year 2100. In freshwater systems, observations vary across different regions, leading to high uncertainty in forecasts for both marine and freshwater environments. This uncertainty stems from the fact that primary production serves as an integrator of changes in light, temperature, and nutrient levels. The aquatic systems supporting fisheries and aquaculture are

experiencing notable shifts due to global warming, and projections suggest that these changes will intensify in the future. The impacts of climate change on fish and their habitats encompass alterations in abundance, migratory patterns, and mortality rates of wild fish stocks. Additionally, it will dictate the suitability of certain regions for farming specific fish species. Elevated ocean temperatures and heightened acidity pose challenges for marine organisms like shrimps and oysters in the formation of their shells, a crucial process known as calcification. This phenomenon extends to key animals like zooplankton, which, as foundational members of the marine food chain, also rely on calcium shells. As a result, the distribution, productivity and species composition of global fish production is changing, generating complex and inter related impacts on oceans, estuaries and sea grass beds that provide habitats and nursery areas for fish. These changes reverberate across oceans, estuaries, and sea grass beds, altering the intricate ecosystems that serve as crucial habitats and nursery areas for various fish species.

Keywords: Zooplankton, Coastlines, Calcification

Theme 2: 41

Assessment of Adaptive Capacity and Exposure to Climate Change of Dairy Farmers in the Coastal Low-lying Region of Kerala

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Climate change poses a significant global threat to humans, animals, crops, and ecosystems, including affecting the dairy sector directly and indirectly. The Low-Elevation Coastal Zone (LECZ), which counts for areas and populations within 10 meters of mean sea level, faces high vulnerability to climate change, driven by sea level rise, oceanic changes, and settlement losses. The present study was undertaken in coastal low-lying areas of Alappuzha district in Kerala state. A multistage sampling was followed in which 4 coastal low-lying region taluks were selected purposively in Alappuzha followed by random sampling in the subsequent stages, constituting in a total sample size of 120 farmers. Indices were developed to measure adaptive capacity and exposure to climate change. Adaptive capacity was assessed under 5 dimensions- human asset, social asset, natural asset, physical asset and economical asset which included 23 indicators selected based on communality values by factor analysis using Principal component analysis. Similarly, 7 indicators were selected for determining exposure to climate change. Primary data were collected using semi-structured interview schedule and secondary data were collected from various authentic sources. Results depicts that among the five different assets, social asset was found to be more significant, followed by natural asset and human asset in determining Adaptive capacity. Among the assets, economical assets found to have least mean index score, indicating the scope for the engagement of government officials and policymakers to improve economic support for farmers, thereby facilitating higher adaptive capacity. In the assessment of exposure to climate change, variation in THI, change in mean temperature and change in mean minimum temperature during the last 30 years showed substantial importance respectively, which were calculated using Mann-Kendal coefficient and Sen's slope. Index scores showed a medium level of adaptive capacity as well as exposure to climate change. The results depicted that even though the exposure was found to be substantial in the locale due to the geographic specifications, the farmers have developed notable adaptive capacity overtime with certain characteristics like higher community participation, community cohesiveness, extension contact, etc. possibly due to continuous exposure to climate change in the past. It could be concluded that despite the severity of climate change in an area, a collective and concentrated efforts of the community can make a positive impact in the farming sector.

Keywords: Adaptive capacity, Assets, Climate change, Exposure, Vulnerability

Theme 2: 42

Effect of Kolaghat Thermal Power Station Emission on Betel Vine Cultivation: Perception of Local Farmers

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Coal-based thermal power plants are one of the major contributors to the greenhouse gases that adversely affect the environment and climate. Harmful gases, particulate matter, fly ash, and heavy metals accumulated on soil, water, and air by burning coal adversely affect local flora and fauna. The environmental and ecological disturbances caused by these phenomena have impacted the crops as in the case of the Kolaghat thermal power plant (KTPP), which has affected the yield, quality, and productivity of betel vine, one of the most important cash crops of this region. In this context, the present study was designed to measure the perception of betel vine growers regarding the adverse effects of Kolaghat thermal power plant on betel vine cultivation. For this purpose, a 14-item Likert-type perception scale was formulated and administered to 60 randomly selected farmers from the 5 purposively selected villages of Kolaghat block, Purba Medinipur district of the state of West Bengal. The findings of the research illustrate that the majority of the farmers perceived that thermal power has affected the betel vine cultivation of this region. Resulting in shifting to the cultivation of paddy and flowers. Major findings from the study as per the results from the coefficient of correlation signified that larger the land under cultivation, greater the impact; while the stepwise regression revealed that farmers whose land under cultivation are large with closer proximity to the plant were greatly impacted. Whereas the results of path analysis showed that age recorded had the highest substantive effect and distance of villages from thermal plant had the highest indirect effect.

Keywords: Perception scale, Thermal plant emission, Betel vine, Ecological disturbances

Theme 2: 43

Exploring *Arbuscular mycorrhizal* species diversity in *Bambusa bambos* Voss Across Varied Agro-ecosystems in Rajasthan

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Arbuscular mycorrhizal (AM) fungi associated with *Bambusa bambos* (L.) Voss (Indian thorny bamboo) were assessed for their qualitative and quantitative distribution from four districts of Rajasthan. A total of thirty-one species of all genera *viz., Acaulospora*, *Gigaspora*, *Glomus*, *Sclerocystis* and *Scutellospora* were recorded. A high diversity of AM fungi was observed and it varied at selected study sites. Among these five genera, *Glomus* occurred most frequently. *Glomus fasciculatum, G. aggregatum*, and *G. mosseae* were found to be the most predominant AM fungi in infecting *B. bambos*. The AM spore population was varied between 174 to 423 propagules (100 g^{-1}) rhizosphere soil and per cent root colonization was varied (60 to 83%) from place to place. The soil moisture (%) of study area ranged between 2.97 to 7.06. The pH was ranged between 6.07 to 7.6; Electrical conductivity (EC) was recorded from 0.029 to 0.34 (dSm^{-1}); Per cent Organic carbon ranged from 0.51 to 1.70; organic matter ranged from 0.87% to 2.93% and available Phosphorous content varied from 0.89 to 4.29 (mg kg^{-1}) for *B. bambos*. A significant correlation of AM population was observed with no. of rainy days and rainfall while other variables studied had a non-significant correlation with total AM population.

Keywords: Agro-ecosystems, Arbuscular mycorrhiza, B. bambos, correlation, diversity

Theme 2: 44

Awareness Among Rural Youth in Punjab Towards Agricultural Schemes for Climate Resilience

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Punjab's agricultural sector faces the imperative of climate resilience. Amidst shifting climatic patterns, the state must innovate and adopt practices that ensure sustainable food production. Government initiatives both central and state sponsored schemes are aiming to mitigate the adverse effects in agriculture. However, awareness among rural communities, especially youth, remains a crucial concern. The present study highlights major schemes of the Department of Agriculture and Farmer Welfare towards making agriculture climate resilient through the lens of budget allocations in recent years. It also analyses the level of awareness among rural youth of Punjab towards these schemes. The results showed that the budgetary allocation towards *Rastriya Krishi Vikas Yojana* was the highest i.e. Rs. 998 crore (2023-24 BE) followed by National Mission on Sustainable Agriculture with an outlay of Rs. 200 crore (2023-24 BE) and *Paramparagat Krishi Vikas Yojana* with an outlay of Rs. 170 crore (2023-24 BE). The major state sponsored schemes is Intervention in Agriculture for Resource Conservation and crop diversification with an allocation of Rs. 10, 000 crore (2022-23 BE). In this year's interim budget, all the centrally sponsored schemes catering to climate adaptation are subsumed under the umbrella scheme of RKVY. Further, among the various components of these major schemes, less than half of the rural youth were found to be aware; however, a higher level of awareness was observed in plain areas of Punjab state and lesser in the sub-mountainous areas. To address the issue of low level of awareness, efforts are required to redirect rural youth's attention towards these programs, preparing them to combat climate change and ensure agricultural sustainability. Awareness campaigns, capacity building and training of rural youth, incentives and use of technologies for awareness generation may be some of the steps to engage young people in climate resilience initiatives within the agricultural sector, empowering them to become agents of change in building a more sustainable future.

Keywords: Climate resilience, Government schemes, Punjab, Agriculture budget

Theme 2: 45

Cluster Analysis-based Discernment of Farmers' Typologies and Climate Change Adaptation Strategies Among Rural Women

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Celebrating 75 years of independence with 'Azaadi Ka Amrit Mahotsav,' India emphasizes empowering women for a stronger nation. Despite higher rural female workforce participation (41.8% vs. 35.31% urban), challenges like financial instability, poor socio-economic conditions, and climate variability persist, pushing many into poverty. In India, rural women, constituting 80% of the agricultural workforce, are key drivers for social, economic, and environmental progress. Empowering them in agriculture can catalyse economic growth, enhance food security, and alleviate poverty, aligning with Sustainable Development Goals by 2030. Climate change disproportionately affects vulnerable populations, including both genders in natural sectors like agriculture. The impact of climate

change on gender is unequal, with women often more vulnerable due to their higher representation among the world's poor and greater reliance on threatened natural resources. In rural areas, women and girls spend considerable time collecting water and firewood, tasks exacerbated by climate-related events like droughts and floods. Vulnerability varies with rights, roles, and responsibilities, with climate change manifesting as a non-neutral phenomenon. It is crucial to recognize diversity within farming households, pinpoint the primary factors, and comprehend how it relates to the adaptation strategies adopted by these farming households. Constructing typologies offers an effective approach to grasp the diversity among farmers by categorizing them into groups with shared characteristics. A study was conducted the Uttar Pradesh and Haryana states of India to identify the underlying typologies of farmers and their adaptation strategies based upon their resource endowments, risk perception and adaptive capacity. The results of revealed diversified strategies for adaptation like crop diversification, focus upon natural resource management strategies, and integration of non-farm-based income generation opportunities. The study emphasized upon customization of the capacity building and advisory services to suit to the differential needs of the rural women groups for enhancing the adaptive capacity of rural women.

Keywords: Adaptation, Climate change, Cluster, Discernment, Rural women, Strategies, Typologies

Theme 2: 46

Identification of Natural Farming Practices Adopted among the Farmers' in Muzaffarpur District of Bihar, India

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Natural farming has always been India's inherent advantage and strength. The shift in the global consumption patterns, health awareness among the consumers and the increasing significance of sustainability is now putting natural products to the forefront locally, nationally and also at international level. A study was conducted in six blocks of Muzaffarpur districts of Bihar state. The number of villages was selected irrespective from each block on the basis of available of adopted natural farming farmers. Total 120 farmers selected as sample size. Dashparni ark natural farming practices got fourth rank. Results showed that the 96.3 per cent of the adopted natural farming farmers followed jivamrut practices. It is used to provide nutrient to plant and increase activity of beneficial microorganism in soil. Farmers make jivamrut which contains 10 kg of Gir cow dung, 10 liters of cow urine, 1.5-2 kg of jiggery, 1.5-2 kg of chickpea flour, 10 liters of water, 500 gm of soil near tree mixing in barrel of 200 liters and stay in shade. They mix it by shaking it for two minute in clock vise direction with wooden stick 2 times in a day for 3-4 days. All the larva and sucking pest are controlled with the use of this spraying. Dashparni ark containing 10 liter gir cow urine, 2 kg cow dung, 500 gm coriander, 500 gm ginger paste, 10 gm asafoetida, 1 kg spicy chilli paste, 500 gm garlic paste, 1 kg tobacco powder, 2 kg tender branches of neem tree. All these ingredients are mixed in a barrel for one day. After one day, 2-2 kg of any five plant leaf from karanj leaf, castor leaf, mango leaf, bael leaf, datura leaf, tulsi leaf, guava leaf, bitter gourd leaf, papaya leaf, coriander leaf, babul leaf, custard apple leaf is mixed in solution. It is mixed by shaking with wooden stick in clock wise direction for two minutes 2 times in a day for 3-4 days. Direct sunlight is avoided. Then it is covered with gunny bag. After 35-40 days, the mixture is ready for spraying and 5-6 liter of mixture is used in one.

Keywords: Farmers, Sustainable, Natural farming, Pest, Nutrient

Theme 2: 47

Assessing Farmers' Adaptation Behavior to Climate Change in Coastal Odisha: An Extended Protection Motivation Theory Approach

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Climate change exacerbates the frequency and severity of natural disasters, leading to diminished crop yields and overall income for farmers. However, farmers possess the capability to mitigate the impacts of climate change and natural disasters through the adoption of various adaptation strategies. This study aimed to comprehensively examine the adaptation behavior of farmers in the coastal regions of Odisha, India, utilizing an extended Protection Motivation Theory (PMT) model. Data were gathered from 240 farmers residing in the Puri and Khordah districts of coastal Odisha through the administration of structured interview schedules. A Structural Equation Model (SEM) was employed to assess the interrelationships among different constructs. The findings underscored the significant influence of risk evaluation, adaptation evaluation and mal-adaptation on farmers' decisions regarding adaptation strategies. Moreover, the study highlighted the importance of emphasizing the structural construct of social discourse to enhance adaptation promotion efforts. By discerning these influential factors, both researchers and policymakers can devise effective interventions and communication strategies aimed at fostering successful adaptation actions among Indian farmers. Nevertheless, it is imperative to note that further research is warranted to replicate the measurement model in diverse regions. Such endeavors are essential for refining and generalizing the proposed model, thus bolstering its applicability and efficacy in addressing the adaptation challenges faced by farmers across various geographical contexts.

Keywords: Climate change, Adaptation decision, Protection motivation theory, Structural equation model

Theme 2: 48

Management of Shoot and Fruit borer in Okra under Peri-urban Area in NCT, Delhi

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Okra is an important vegetable crop providing a good source of income to the farmers. The Intensive cultivation of Okra in peri urban areas of NCT Delhi is very common due to continuous demand and marketing opportunity. A participatory rural appraisal (PRA) survey was carried out and found the severe infestation of okra shoot and fruit borer, *Earias vitella* in Okra growing area. Considering the problem, Krishi Vigyan Kendra, Delhi designed an On Farm Trial (OFT) that is one of the key extension tools for transfer of technology in farming community. The five experiment trials were conducted at farmers' fields in Kanganheri and Badusari villages of South-West, Delhi in summer & spring session for four consecutive years (2018, 2019, 2021 and 2022) to assess the efficacy of management in Okra (variety Prerena) for shoot and fruit borer infestation. Two treatments were comprised

T1 farmer's practice (2 spray of Cartap hydrochloride (50 SP) @1g/L. of water as practiced) and T2 (recommended practice *i.e.* – 2 sprays of Spinosad (45 SL) @ 0.5 ml/L of water and 2nd spray 15 days' interval at fruiting stage) with five replications at farmers' fields. The results of the trial revealed that the attack of shoot borer and fruit was reduced (about 52.11% and 46.06 %) in recommended practice (T2) treatment and yield of okra was increase by 11.76% (198.00 q/ha) over farmer's practice (177.65.q/ha), earning net profit of Rs. 94582/ha as compared to others.

Keywords: Okra, Participatory rural appraisal, Shoot and Fruit borer

Theme 2: 49

Effectiveness of Climate Resilient Agriculture Technologies in Coastal Low-Lying Region of Kerala

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The present study was all about evaluating the effectiveness of climate-resilient agriculture (CRA) technologies adopted by the farming community in coastal low-lying region of Kerala under the technology demonstration component (TDC) of National Initiative on Climate Resilient Agriculture (NICRA) project of Indian Council of Agricultural Research (ICAR). Muttar was the only adopted village of NICRA in Kerala, where Krishi Vigyan Kendra (KVK) Alappuzha introduced a variety of CRA technologies to enhance the resilience of farming community towards climate change. In order to study the spill-over effects of CRA technologies, Chambakulam, a village with similar agro-ecological background of Muttar was selected as control village in this study. Hence, the study was purposively carried out in the Muttar and Chambakulam villages of Alappuzha district in Kerala. Additionally, a total of six CRA technologies, 100 beneficiary farmers, and 90 non-beneficiary farmers were selected at random from these villages for the purpose of completion of this study. Effectiveness of CRA technologies was evaluated in terms of farmers' awareness and vulnerability to climate change. Farmers' awareness was studied using a structured interview schedule and their vulnerability was assessed in terms of adaptive capacity and sensitivity to climate change. It was observed that the beneficiary farmers (19.50) of CRA technologies were having higher level of awareness on climate change and its impact on agriculture compared to the non-beneficiary farmers (10.40 and 6.67). Similarly, they were less vulnerable to climate change (0.17) compared to the non-beneficiary farmers (-0.07 and -0.09) of CRA technologies. The findings of spill-over effect revealed a positive relationship with farmers' awareness and vulnerability to climate change.

Keywords: Awareness, Climate change, Climate-resilient agriculture technologies, Spill-over effect, Vulnerability

Theme 2: 50

Productivity and Profitability of Mustard Genotypes Grown under Different Fertility Levels in Humi and Sub-humid Conditions

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Mustard is second most important edible oilseed crop after soybean and known as the name of Indian mustard. In this experiments different genotypes, fertilizer and biofertilizer are used. The objective of this experiment is to identify best performing genotypes and biofertilizers on yield of mustard. The experiment was conducted in *rabi* October 2020 in humid and sub humid condition of Rajasthan. The experiment used a factorial randomized block design with three replications and two factors. The first factor was four genotypes of mustard (Bio-902, Giriraj, RH-0749 and NRCHB-101) and second factor was four fertility levels (75% RDF, 100% RDF, 75% RDF + Bio-fertilizer and 100% RDF + Bio-fertilizer). The result revealed that maximum seed yield was significantly recorded under genotype 'Giriraj' as compare to other genotypes. Genotype 'Giriraj' recorded seed yield (1812 kg ha^{-1} followed by NRCHB-101(1557 kg ha^{-1}), Bio-902(1380 kg ha^{-1}). In fertility levels the maximum seed yield (1694 kg ha^{-1}), straw (5065 kg ha^{-1}) and biological yield (6759 kg ha^{-1}) were significantly recorded under 100% RDF+ Biofertilizer. Genotypes and fertility levels in terms of oil content was significantly increase oil content in genotype Gririraj (40.56%). In case of fertility levels, the maximum oil content (40.16%) was recorded with of 100% RDF + biofertilizer and it was statistically at par with 100% RDF (39.36%) and 75% RDF + bio-fertilizer (39.31%) but higher over 75% RDF (38.67%). The maximum gross return, net return and B-C ratio (103762 Rs./ha, 83347 Rs./ha and 4.09) were obtained under genotype 'Giriraj'. Hence, genotype Giriraj with the application of 100% RDF + Bio-fertilizer were proved economically viable in mustard crop under prevailing agro-climatic conditions of Rajasthan.

Keywords: Bio-fertilizer, Mustard, Genotypes, Oil content

Theme 2: 51

Impact of Climate Change on the Production Aspects of Cumin in Arid Region of Rajasthan

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Agriculture is the backbone of Indian economy. Agriculture and climate are mutually dependent. Agriculture in India is mostly dependent on the persisting weather conditions. Change in the rainfall pattern is a serious threat to agriculture, which in turn affects the country's' economy and food security. Agriculture in India suffers a lot from erratic weather patterns such as heat stress, longer dry seasons, uncertain rainfall and temperature. In this context the present research seeks to identify impact of climate change on the production aspects of cumin. The Study was carried out in Jaisalmer district of Rajasthan State. Four Panchyat samiti namely Jaisalmer, bhaniyana,

fathegarh and Pokran were selected purposely for the present investigation on the basis of highest area of Cumin cultivation in these four Panchyat samiti. Two villages from each Panchyat samiti were selected randomly. From each selected village a list of Cumin growers as small farmers (a farmer with 1 to 2 hectare of land holding) and large farmers (a farmer with 10 hectare or more land holding) were prepared with the help of patwaries of concerned village. Out of this list 10 small farmers and 10 large farmers were selected randomly from each village. Farmers shifted sowing time of Cumin so flowering time also shifted after the year 2015. Farmers perceived that, germination of seeds, crop growth, seed formation were good before the year 2015 as compared to after the year 2015 due to the impact of climate change on Cumin. After the year 2015 germination of seeds, crop growth and seed formation were affected due to the impact of variation in the parameters of climate change on Cumin.

Keywords: Climate change, Cumin, Arid region

Theme 2: 52

Resilience of Rice Farming Communities Against Natural Hazards: A Comparative Analysis of Andhra Pradesh and Kerala

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Globally, climate change is reported to increase the intensity and frequency of occurrence of natural hazards such as erratic rains, floods, droughts, and heat waves. Agriculture food systems, particularly farmers, depend on many such weather parameters throughout the agricultural production process, making them highly vulnerable. Under this context, it is imperative to improve the resilience of farmers, which is the ability to cope with any stresses and shocks while maintaining their existing structure and functions. In this work, the resilience of rice farming communities was assessed using an indicator-based Community Resilience Index (CRI). The index is comprised of four dimensions, namely, economic, social, technical, and physical. The study was conducted in two major rice-growing areas of Andhra Pradesh and Kerala states, which suffered higher losses because of natural hazards. Primary data was collected from the farmers of all four regions, with a total sample size of 180 rice farmers. The results revealed that the Palakkad rice farming community had the highest resilience with an index score of 0.78, followed by Thrissur with 0.64, Kurnool with 0.48 and East Godavari with the lowest score of 0.33. The differences in the CRI scores across the four communities were also found to be statistically significant at a 0.05 level of significance. Also, there were statistically significant differences between the CRI scores of landless farmers and farmers of other land-holding categories, indicating their dismal situation. The outcomes of the assessment reveal the underlying factors affecting resilience across four districts and the specific regional interventions that are necessary to enhance resilience.

Keywords: Resilience, Farmers, Rice, Climate change

Theme 2: 53
Perception of Adolscents on Balanced Diet in Ayodhya

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A balance diet is one which provides all the nutrients in required amounts and proper proportions. Eating a balanced diet is key in maintaining good health and keeping your body in optimum condition. A healthy diet has been recognized as one of the most important factors associated with the maintenance of human health as well as to help preventing the development of some chronic diseases. A balanced diet is made up of foods from the five food groups : starchy carbohydrates, fruits and vegetables, protein, dairy and healthy facts. Each provides the range of vitamins and minerals our bodies need to function efficiently. A balanced diet protects the body against all forms of malnutrition, provides immunity and also some non communicable chronic diseases, such as obesity, type-II diabetes, heart diseases, or cancer. In the current post covid era people have become more conscious of food and are now more aware of the positive or negative associations between diet and health. Nonetheless, even those consumers who are aware of these implications often end up making unhealthy food choices. How people interpret the concept of healthy eating is variable and reflects personal, social, and cultural involvements, along with the particular person's living environment. Therefore, this work aimed at studying the perceptions of a sample of adolscents of Ayodhya about balanced diet.

Keywords: Adolscents, Balanced, Diet, Perception

Theme 2: 54
An Investigation on Farmers' Cognizance of Climate Change and its Consequences for Dairy Farming

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Climate change is long-term modification of temperature and weather patterns. India is ranked as the seventh most vulnerable nation in the world by the German Watch Index (2020). The use of land, agriculture, industry, transportation, buildings, and energy are some of the sources of emissions, which have reached their highest levels in two million years. The results show that since the late 1800s, the Earth has warmed by about 1.1°C. The last 10 years (2011–2020) have been the warmest on record. India and other countries in South-Eastern Asia are expected to warm faster than the world average over the twenty-first century. India will also start to see more seasonal temperature variations, with winters being warmer than summers (Christensen, 2007). According to data from 1901 to 2009, the yearly mean temperature in India has risen by 0.56 degrees Celsius (IMD, 2010). Dairy production is vulnerable to climate change due to rising temperatures and changing rainfall patterns. Taking care of climatic variability is the main goal of initiatives to increase climate resilience. absorb strains, continue to operate in the face of external stresses brought on by climate change, adapt, and shift into more aesthetically pleasing forms that enhance climatic sustainability. The ICAR has started an initiative known as the NICRA project to promote resilient agriculture. The current study was conducted with the aforementioned scenario in mind in order to evaluate farmers' understanding of climate change and its effects on dairy production. According to the study, beneficiary villages had an overall climate change knowledge rate of over 70%, whereas non-beneficiary villages had an awareness rate of only 31.36%.

Keywords: Farmers' cognizance, Climate change, Dairy farming

Theme 2: 55
Change in Livelihood and Utilization Pattern of Farm Pond Owners in Drought Regions of Maharashtra, India

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The study aimed to assess the impact of farm pond adoption on the livelihood of beneficiaries in drought-prone regions of Maharashtra, India during 2022-23. Data from 160 beneficiaries and 160 non-beneficiaries were collected through a combination of quantitative and qualitative methods, including focus group discussions and semi-structured interviews. The results indicated a significant increase in various aspects of beneficiary activities, including the utilization of women's productive time (MS 0.43 to 2.47), the regular employment generation index (MS 81.54 to 151.04), the livestock composition index (MS 1.46 to 2.39), the enterprises cost-effectiveness index (MS 17.27 to 48.83), the cultivated land utilization index (MS 0.22 to 0.67), and the irrigability index (MS 2.17 to 16.88). In terms of investment, horticultural crops received the highest allocation (MS 401) followed by animal husbandry (MS 360) and agricultural crops (MS 236). Farm pond income was predominantly directed toward purchasing farm inputs (56.88%), with a smaller portion allocated to equipment (18.13%) and the least to non-agricultural businesses (1.25%). Overall, the findings showed a significant improvement in the livelihood component of farm pond owners (MS 84.09), with the employment component exhibiting the highest mean score of 81.33, followed by the economic component (MS 75.97). These findings underscore the transformative potential of farm pond adoption in drought-prone regions, as it enhances livelihoods, empowers gender roles, and promotes diversified and sustainable agricultural practices within the locale of the study.

Keywords: Farm pond, Livelihood, Sustainability, Utilization pattern

Theme 2: 56
Development of Knowledge test for NICRA Beneficiary Farmers

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Climate change is causing an increase in the number and intensity of extreme weather occurrences. Agriculture and climate change is mutually dependent. Appropriate extension interventions can reduce the climate change effect considerably and help the farmers to maintain the productivity in the midst of extreme climate variations. National Initiative on Climate Resilient Agriculture (NICRA) is the pilot project launched by Indian Council of Agricultural Research (ICAR), that correlate the climate variability and its impact on agricultural process and aims at development in agricultural strategies based on variability of temperature, humidity, dry land and other adverse condition. The study focused on the Technology Demonstration Component (TDC) of NICRA project and attempted to construct a knowledge test to measure the knowledge level of farmers. Items about Technology Demonstration Component of NICRA project was collected from relevant literature and through consultation with scientists. The study was conducted in Kathua district of Jammu region for item analysis during September

2023. Item analysis provided difficulty index and item discrimination index. One mark for each correct and zero mark for each wrong answer was assigned. Finally, the reliability of the test using split half method found to be 0.76. The reliability coefficient of the full test was worked out by using Spearman Brown formula and was found to be 0.86 indicating that the knowledge test is highly reliable. Content validly was assessed by CVR (Content validity Ratio), CVI (Content Validity Index) and Kappa statistic. The item content validity index (I-CVI) ranged from 0.63 to 1.0, the I-CVI value above 0.78 was considered fit or the instrument. The scale content validity index (S-CVI) was 0.92. The instrument was assessed with high content validity. A total of 18 statements were finally retained.

Keywords: Agriculture, Climate, Knowledge test, NICRA, Reliability, Spearman Brown, Split half, Validity

Theme 2: 57

Perceived Climate Change Impacts on Biodiversity and Agriculture in the Subtropical Region of Jammu and Kashmir, India

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The Indian Himalayan region is recognized as a hotspot for rapid climate change, with profound implications for the environment, society, and economy. Despite the limited availability of comprehensive data on the extent of these changes and their specific regional impacts and adaptations, our study employs local knowledge to discern shifts in climate and their consequences for biodiversity and agriculture. Through 300 household interviews across five districts-Jammu, Kathua, Samba, Udhampur, and Rajouri-in the subtropics of Jammu and Kashmir State, India, our study revealed that a prevailing sentiment among the local populace is the perceived warming of weather, accompanied by the diminishing of water sources such as rivers. Notable shifts in the onset of summer and monsoon seasons, occurring over the past decade, are reported, along with erratic or reduced rainfall patterns. Our findings align with local perceptions of climate change's impact on biodiversity, highlighting the use of new hybrid crop varieties to cope with a shortened growing season. Additionally, an upsurge in agricultural pests, notably the prevalence of the monkey menace, is noted. Further observation is the heightened sensitivity of high-altitude communities to climate change compared to their low-altitude counterparts. This underscores the need for nuanced and location-specific climate mitigation and adaptation strategies. Importantly, local knowledge emerges as a valuable and rapidly obtainable resource, facilitated by systematic tools. Such insights not only corroborate scientific data but also provide a foundation for hypothesis testing by scientists and inform policy-makers in crafting effective strategies to address the multifaceted challenges posed by climate change in this ecologically vital region.

Keywords: Perceptions, Climate change, Himalayas, Local knowledge, Biodiversity, Rainfall

Theme 2: 58
Identify the Constraints of Beneficiary and Non-beneficiary Farmers with Respect to the Adoption of Climate Resilient Technologies

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Abstract: The main focus of the study was to identify the constraints faced by the beneficiary and non-beneficiary farmers in Jhunjhunu district of Rajasthan state. Mandawa tehsil was selected purposely for the present research study on the basis of highest number of registered farmers under NICRA project. Further, three villages were selected namely Bharoo, Chakwas and Madansar. Total 120 respondents *i.e.* 60 beneficiary and 60 non-beneficiary respondents were selected from selected villages for the present investigation through proportionate random sampling method. The total sample size from the selected three villages was 120. Findings of the study indicated that illiteracy of the farmer, lack of awareness about climate change, inability to take risk, inability to accept new practices, small size of the farm, more interested to follow conventional practices, increasing labour scarcity, poor economic status of the farmer, high cost of inputs, higher investment cost on farm implements, inadequate institutional financial support, lack of credit/capital, lack of market access, lack of savings, lack of timely weather based information, lack of effective advisory system on climate change, lack of availability of improved seed, inadequate services through CHCs, lack of access to irrigation water, lack of knowledge on adaptation methods were emerged as important constraints faced by the beneficiary and non-beneficiary farmers.

Keywords: CHCs, beneficiary, non-beneficiary, climate, constraints

Theme 2: 59
Profile Characteristics of Farmers Using Mobile Phones in their Decision Making

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A study was conducted to study the profile characteristics of farmers using mobile phones in their decision making. Ex-post facto research design was followed. The present investigation covered three districts of the Saurashtra Region of Gujarat. A multistage sampling method was used with a sample size of 240 respondents. The statistical measures such as frequency, per cent, and one sample test of kurtosis, skewness and arbitrary method were used. In respect to profile characteristics, nearly half (49.58%) of the respondents were from middle age category, majority (65.00%) of the respondents were having high school level education, highest per cent (36.26%) amongst the respondents had small land holding, 60.83 per cent of the respondents were from income group of Rs. up to 1,00,000/-, about fifty per cent (48.75%) of the respondents had medium level of social participation, more than fifty (56.25%) of the respondents were in above 15 years category of farming experience, majority (61.25%) of the respondents had medium level of attitude towards social media use, 51.67 per cent respondents received short duration training, majority (77.08%) of the respondents had every day exposure of internet facility, majority (79.59%) of the respondents were in medium to high information needs category, nearly half (47.92%) of the respondents were from middle innovativeness category, more than fifty per cent (52.50%) of respondent were in medium category of scientific orientation, majority (65.42%) of the respondents were from medium risk orientation category and majority (62.91%) of the respondents were from high to very high knowledge about mobile features.

Keyword: Decision making, Farmers, Perception, Mobile

Theme 3: 60
Assessing the Occupational Health Hazards in Paddy Cultivation Practices in the Coastal Region of Andhra Pradesh

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India is one of the largest producers of rice and ranks second in the world in production. It is the staple food for the major part of Asia and the rest of the world population too. All the cultivation practices in paddy were done manually by the farm labour due to various reasons such as lack of money, small land holding size, lack of awareness, low availability, low operational cost, etc. All the cultivation practices involved so much drudgery which ultimately reducing the efficiency of their work and productivity of work. So, to assess the work-related health hazards, the present study was planned in the East and West Godavari districts of Andhra Pradesh. Sixty females and sixty males constitute the sample of present study based on the specific practices done by the males and females. A modified Nordic questionnaire was prepared to assess the work-related health hazards and assigned mean ranks by using appropriate statistical tools. Results found that in land preparation pain in the body (2.87), in irrigation tingling/ numbness in hand got the highest weighted mean (2.17), in manure and fertilizer application pain in the body (2.58), in pesticidal spray irritation in eyes/blurred vision (2.82), in threshing pain in the body (2.77), in load carrying pain in the body (2.82) has got the highest weighted mean which were the male-dominated activities. Whereas in uprooting tingling/numbness in hand (2.83), in transplanting tingling/numbness in hand (2.97), in weeding tingling/numbness in hand (3.00), in winnowing tingling/numbness in hand (2.37) have got highest weighted mean which were the female-dominated activities. It was concluded that if the farm workers continue to work manually, they may face serious health problems which finally affect various factors such as the efficiency of work, productivity of work, the standard of living, healthy life, etc. So, it was suggested that they could go for the improved tools such as drum seeder, conoweeder, improved sickle, pedal-operated thresher, power sprayer which are easily available and can reduce the drudgery to some extent.

Keywords: Health hazards, Drudgery, Work efficiency, Productivity of work

Theme 3: 61
Impact on Crop Yield Under Natural Farming Practices for Chemical-free Agriculture in Kaushambi, Uttar Pradesh

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Natural Farming (NF) is a one-of-a-kind chemical-free farming practice that is regarded as an agro-ecological approach. Though there are certain practices prescribed in natural farming, the most adopted practice is use of Ghanajeevamritha, Jeevamritha, Beejamritha and other plant protection materials. The present paper presents field-level farmers' experiences of Natural farming adoption in Kaushambi district of Uttar Pradesh. The study was conducted during Kharif & Rabi season 2022 by surveying 50 NF adopted and 50 non-NF adopted farmers. It was found that NF practice farmers have adopted during the recent past. It was observed that non-NF yields are higher to NF yields. There has been a decrease in the variable cost and a marginal increase in the market price of NF produce and also increase in microbial activities in natural farming field.

Keywords: Beejamritha, Ghanajeevamritha, Jeevamritha, Natural farming

Theme 3: 62
Quantification of Drudgery in Rice-Wheat Production System of Women Farmers

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For agricultural field operations to be completed, human energy is required. Because they lack access to improved agricultural technologies, farm women are forced to work in extremely dangerous conditions, making agricultural work one of the physically demanding jobs that requires good posture and physiological effort. In addition, it takes a lot of time, energy, and stress. However, the laborious and unusual postures the worker adopted throughout the task could be a threat to their safety. The purpose of the study was to assess and measure the labor-intensiveness of the rice-wheat production system for women living in rural areas. The research envisaged assessing and quantifying the drudgery in rice-wheat production system by rural women in which physiological and postural evaluation of agricultural activities was done for different activities by women farm workers with three replications of ten minutes work cycle without rest pause. Observations were recorded on farm women worker with normal health, without any major illness, regularly involved in farm operations. In the attempt to obtain and analyze the prioritized drudgery experiences in crop production activities through drudgery assessment and reduction, various ergonomically sound farm tools and implements were provided for crop cultivation and intercultural operations. In the attempt to obtain and analyze the prioritized drudgery experiences in crop production activities through drudgery assessment and reduction, various ergonomically sound farm tools and implements were provided for crop cultivation and intercultural operations. Data for indicating musculoskeletal disorders were analysed by ergonomics assessment of postural and biomechanical assessments using Human Physical Drudgery Index (HPDI) resulted in the maximum drudgery reflecting very high risk in transplanting (48.4%), followed by threshing (47.2%), load carrying (46.00%) and harvesting (45.14%). For physiological ergonomics quantification, these most drudgery prone activities in rice-wheat production system i.e. transplanting, harvesting, threshing &post-harvest, and load carrying were evaluated and it was found that drudgery is caused with different activities with reflects working energy expenditure rate ranges from ~7.00 to 12.00 (kJ/min) and TCCW ~ 331.00 to 524.00. Multivariate regression analysis was employed to drive relationships between energy expenditure rate and other independent variables as age, BMI, MUAC, CC, skinfold measurements, body density (D),% body fat, fat mass, fat free mass (kg).

Keywords: Biomechanical quantification, Hazard Analysis, Drudgery, Improved Tools and Postural Ergonomics

Theme 3: 63
Herbicide Adoption Patterns and Farmer Satisfaction in Weed Management: A Case Study of Wheat Cultivation in Sri Muktsar Sahib District, Punjab

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Weed infestation remains a formidable challenge in Punjab's wheat cultivation, particularly within the rice-wheat cropping system. This study, conducted during the *rabi* season of 2022-23 in Sri Muktsar Sahib District, aimed to assess herbicide usage patterns among wheat farmers and gauge their satisfaction levels concerning weed control. Interviews with 50 farmers across various blocks of the district, including Muktsar, Malout, Gidderbaha,

and Lambi, revealed crucial insights. All surveyed farmers predominantly engaged in the rice-wheat cropping system, with a mere 18 percent allocating land for alternative cropping systems. Herbicide adoption varied, with 40 percent of farmers employing single herbicides, while a significant majority (62.0%) opted for herbicide mixtures. Among those using single herbicides, 75 percent stuck to one, while 25 percent used two or more sequentially. For herbicide mixtures, the majority (74.2%) of farmers used a combination of two, and 25.8 percent used a combination of three. Farmers favouring herbicide mixtures highlighted poor results with single herbicides, especially in managing *Phalaris minor*, prompting the shift towards herbicide mixtures. The study also illuminated the adoption of herbicide rotation practices, with 70.0 percent of farmers incorporating this strategy. However, 30.0 percent of farmers remained unaware of the benefits associated with herbicide rotation. Approximately 80.0 percent of farmers expressed complete satisfaction with their weed management practices, while a small percentage (8.0%) reported dissatisfaction, and 12.0 percent indicated partial satisfaction. The overwhelming satisfaction levels underscore the effectiveness of the adopted practices, offering valuable implications for the development of sustainable weed control strategies in the region.

Keywords: Herbicide utilization, Weed management, Cropping systems, Farmer satisfaction, Herbicide rotation, Rice-wheat cropping system

Theme 3: 64

Intervention of Drudgery Reducing Farm Implements for Farm Women: Tool Acceptability Analysis in Kaushambi District

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Rural women labour force forms the backbone of Indian agriculture by contributing 79 percent of agriculture works and are engaged.in such field operations as sowing, transplanting, weeding, harvesting and post-harvest practices of winnowing, drying. and storing. Drudgery is conceived as physical and mental strain, agony, suffering and hardship experienced by women due to long hours of monotonous work. So, there is need to reduce their workload and drudgery and increase efficiency in order to ease their works. This can best be achieved through using appropriate drudgery reducing farm implements that can have higher efficiency, giving more work output and reduced drudgery and not cause any health problems. A study was conducted in six villages. Mohnapur, Chak-Tappur, Umarcha, Hathiyabheet, Ratgaha, and Begwa from three blocks (Muratganj, Chayal and Kaushambi) of Kaushambi district of Uttar Pradesh. Four implements were introduced as interventions among twelve self-help groups of rural women (sample of 120 women) to evaluate their acceptability and saving in time, energy and number of labour days. Naveen Sickle (for wheat harvesting) was accepted by 100 percent of rural women, wheel hand-hoe (accepted by 80%) for weeding in chilli and tomato crop fields, Bhindi cutter (accepted by 98%) for harvesting bhindi vegetables and hand transplanter (accepted by 70-80%) for transplanting vegetable seedlings. All the farm tools were reported to increase efficiency, reduce the number of labourers and labour days to nearly 50 percent and saved time, energy and money. All rural women respondents expressed a sense of relief from hard work, satisfaction and accepted the drudgery reducing farm implements. Sustainable management of human resources will help achieve transformation in agriculture sector. Better innovations and tools are necessary in a changing world and we need to rethink agriculture for better exploitation of our human resources for achieving sustainable development.

Keywords: Drudgery reducing, Farm implements, Farm women

Theme 3: 65
A Study on Analysis of Carbon Footprint of Rural Women of Rajasthan

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Rural communities play a vital role in sustainable development, whether it is farm, home or allied areas; thus, their role in keeping the environment healthy is to a great extent. It is known fact that women's major activity is related to home, so a study was undertaken to know how much carbon footprint is generated by their activities so that we can make them aware of clean and green environment. The findings highlighted that lack of awareness among respondents, as 68.75 per cent respondents practices had CO_2 emissions ranging from 76–100 kg of CO_2 annually through cooking fuels, 35.83 per cent respondents practices had Co_2 emissions from electrical appliances, 77.50 per cent of respondents practices are responsible for CO_2 emissions from kitchen waste and 41.67 per cent contribute to Co_2 emissions through plastic waste disposal. This depicts the necessity for initiatives aimed at promoting environmental friendly food preparation, proper disposal of kitchen waste and plastic waste. Notably, the study reveals a wide range of carbon footprints (0.6–5.5 metric tons per person per year) among rural women, surpassing the average of 1.32 metric tons per person/year. This disparity highlights the considerable potential for improvement, emphasizing the critical need for adopting environmentally sustainable lifestyle choices, particularly in rural communities. In conclusion, this research reveals the vital requirement for heightened awareness, education and collaborative efforts to mitigate carbon emissions and encourage environmental friendly practices.

Keywords: Carbon footprint, Rural women, Household activities, Cooking fuels, Kitchen waste, Plastic waste

Theme 3: 66
Assessment of Occupational Health Hazards during Vegetable Transplanting: An Ergonomic Approach

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During vegetable transplanting, most of the activities are performed by farm women are tedious, tiring as well as time-consuming. These tasks are performed manually or by traditional tools. During vegetable transplanting, drudgery prone conditions lead to various occupational health hazards which creates physical exhaustion, fatigue and low productivity among farm women. Keeping in view the importance of human drudgery and occupational health hazards in the present context, it is important to understand the term and generate awareness among the workers to reduce risk level and discomforts which is caused due to various activities of vegetable transplanting. The objective of the study was to assess the occupational health hazards among farm workers to reduce drudgery among them. The ergonomical evaluation of vegetable transplanting was conducted among 40 female agricultural workers of Banda District of Bundelkhand region. The results revealed that range of height of the respondents were varies from 135-161 cm with the mean value of 150.13±4.75 and the weight of the respondents ranged from 42-65 kg and the mean value of weight was found 52.18± 2.49 kg. Data regarding occupational risk assessment shows that after training and ergonomic measures, the level of health hazards was significantly reduced and the work capacity of the respondents were also increased.

Keywords: Health hazards, Occupational risk, Vegetables and women

Theme 3: 67
Yield Gap Analysis through Frontline Demonstration of Integrated Nutrient Management in Wheat Muzaffarpur District of Bihar, India

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Front line demonstration is an actual and suitable tool to determine recommended technologies among the farmer's field. Krishi Vigyan Kendra, Turki, Muzaffarpur conducted 30 demonstrations on integrated nutrient management in wheat during 2020-21, 2021-22 and 2022-23 in the villages of Muzaffarpur district. The study found, the yield of wheat in improved practice under irrigated conditions ranges from 51.6 to 59.3 q/ha whereas in farmers practices it ranges between 41.7 to 51.6 q/ha. The per cent increase in yield with improved practices over farmers' practices was recorded in the range of 18.9 to 22.8%. The technology gap, extension gap and technological index were ranging from 4.5 to 9.6 q/ha, 1.2 to 2.5 and 21.7 to 51.2 per cent, respectively. The trend of technology gap reflected the farmer's cooperation in carrying out integrated nutrient management demonstrations with encouraging results in subsequent years. The cost benefit ratio was 2.3 to 3.6 under INM demonstration, while it was 1.7 to 1.9 under control plots. By conducting front line demonstration of proven technologies, yield potential of cotton crop under INM could be enhanced to a great extent with increase in the income level of the farming community. The economic analysis under front line demonstrations in improved practices recorded higher productivity of yield (51.6 q/ha) over local check during the year of 2019-20 but% increase in yield (21.6%) higher over local check during the year of 2020-21. In case of gross returns (109800 ha^{-1}), additional net returns (25882 ha^{-1}) and B:C ratio (2.3) higher as compared to the local checks in the year 2021-22. This results clearly indicated higher productivity of cotton under improved technologies plots over the years compare to local check due to knowledge and adoption of full package of practices i.e. sowing of latest high yielding hybrids, adoption of improved nutrient, moderate disease resistant hybrid, adoption of improved weed and pest management techniques.

Keywords: Frontline demonstration, Wheat technology gaps, Extension gaps, Technology index

Theme 3: 68
Assessment of Pain Intensity of Agro Enterprise Workers

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Women in rural India play a major role in shaping the economy of the country. The rural plays a significant role in the agriculture and agro based enterprises due to poor socioeconomic status and poverty. An agro enterprise includes manual power to accomplish the job which causes fatigue and pain in the different parts of the body. The study was conducted in an agro enterprise of the Udaipur district on the 30 agro enterprise workers having no back medical history, no physical disability and normal physiological profile and who are employed for 7 hours/day. The findings of the study revealed that at the end of the day the intensity of pain was quite noticeable in the body of the respondents (mean=3.19). The highest pain was found to be stimulated in the neck (mean= 3.95), lower back (mean= 3.77), shoulders (mean= 3.54), upper arms (mean=3.38) and calf muscles (mean=3.50). However, minimum pain was found in wrist (mean= 2.66). Though the intensity of pain is found to be low for the overall body and different body parts but the perceived pain reported by the respondents was excessive.

Keywords: Agro-enterprise, Postures, Drudgery, Pain, MSD's

Theme 3: 69
A Study of Occupational Health Hazards Among Female Farm Workers in Paddy Cultivation

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Agriculture sector is backbone of Indian economy, and this economy grow day by day with the contribution of our Indian female farmers. But their role in farming sector has not yet been highlighted in India. Based on the data of 2012 "India is the place of fourth largest sector in the world. In this study female participation were 100% in sowing, transplanting, weeding and harvesting activity. This activity was mainly done by female farmers because in this section very time taking, repetitive movements and take faulty postures. To assess the prevalence of Musculoskeletal disorders and skin diseases among the farm women by analysing their work posture, physiological parameters and the posture assessment through the REBA and RULA and various load factors during traditional and hand operated seeding machine in paddy cultivation. The aim of this study was to know about the health problems faced by women in paddy cultivation and how to reduce the drudgery of farm women and their skin disorders and musculoskeletal disorders. After come out the MSDs and skin diseases, hand operated seeding machine was introduced and evaluated ergonomically with the traditional method of the paddy cultivation and waterproof shoes and skin care oil that is the most promising option to solve the associate problem.

Keywords: Women Health, Posture Discomfort, Musculoskeletal Disorder, Agricultural Activity, Yoga, safety management

Theme 3: 70
A Study on Popular Utensils Cleansers and their Potential Health Risks

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Utensils cleansers are available in the form of powders, gels liquid and bars. Different methods of utensils cleaning are followed in each household and accordingly the preference for cleanser varies. The present study was conducted to know the preference of utensils cleansers among respondents, factor affecting and problems experienced and possible health risks while using these cleansers. The study was conducted on the residents of Punjab Agricultural University Campus, Ludhiana. College of Community Science and College of Basic Sciences and Humanities, Punjab Agricultural University, total of 120 respondents comprised the sample of study. Data were collected through personal interview with the help of interview schedule. The results of the survey revealed that 51.67 percent of the respondents preferred vim liquid for utensils followed by vim bar (34.33%). The third and fourth preferred cleansing agents were pril (15.00%) and superdishwash wash gel (11.64%). However, Exo dish Bar was preferred by very small fraction of respondents (1.66%). Cleansing efficiency, past experience, price and brand were considered at top priority by the respondents while selecting cleansers. The problem of itching was also experienced by 30.84 per cent of respondents due to prolonged use of liquid commercial cleansers.

Keywords: Commercial cleansers, Health risks, Hygiene, Toxic

Theme 3: 71
Musculoskeletal Discomfort in Makhana Production System in Bihar

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Makhana, also known as foxnut or gorgon nut, is an aquatic plant endemic to South- East Asia and China that belongs to the Ferox species of the Nymphaeaceae family. Its scientific name is Euryale ferox. Fortunately, the majority of its commercial cultivation is restricted to India, primarily to the northern regions of Bihar. To evaluate musculoskeletal issues in Makhana production at the state or national level, very few studies have been undertaken. Considering this, the current study was carried out in the well-known Makhana-growing district of Madhubani, Bihar. The analysis of musculoskeletal symptoms like ache, pain, discomfort, numbness in an ergonomic or occupational health is done by using Nordic Musculoskeletal Questionnaire (NMQ). The NMQ is used to assess respondents' musculoskeletal problems over the previous 12 months and during the last 7 days. NMQ is a structured questionnaire administered to find out pain and discomfort related to musculoskeletal disorder in 9 parts of the body viz. neck, shoulders, elbows, wrist/hands, upper back, lower back, one of both hips/ thighs, one of both knees and one of both ankles/feet. The NMQ assessed in three sections, which are – trouble during the last 12 months, prevented from doing normal work over the last 12 months and trouble at any stage during the last 7 days. The study of respondents preventing from doing normal work at any time during the last 12 months; revealed that most of the respondents were affected by work related discomfort like pain at neck (80%), shoulder (50%), elbow (43.4%) and lower back (73.3%) followed by prevention of doing normal work at any time during the last 7 days; with only 1.6 percent of workers encountering pain in neck, upper back and one of both hips/thighs and that respondents face some kind of discomforts in the past 12 months like ache, numbness, pain in neck (67%), right wrist/hands (52%), and lower back (78%).

Keywords: Makhana, Musculoskeletal, Discomfort, Pain

Theme 3: 72
Constraints in Adoption of Recommended Production Technologies of Chilli Crop in Punjab

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Chilli (*Capsicum annum* L.) is one of the most important commercial vegetable cum spice crop grown in India. Area under chilli crop was 8.78 thousand hectare with production of 17.63 thousand tonne production during the year 2020. The present study was undertaken to know the constraints faced by chilli growers in adoption of recommended production technologies in Punjab. A sample of 120 chilli growers was selected randomly from four districts of Punjab. The data were collected by personally interviewing the chilli growers with the help of structured interview schedule. Majority of the respondents were matriculate, possessed medium operational land holding and medium level of extension contacts. Study revealed that almost half of the growers had 12-21 years of experience in chilli cultivation and only 18.33 per cent of them acquired training on vegetable cultivation. WhatsApp, YouTube and newspapers were emerged as important sources of information for chilli growers. Most of the respondents sought advice from progressive and pesticide dealers for acquiring farm information

on chilli cultivation practices. Study also found that prominent constraints encountered by chilli growers were scarcity of labour at the time of picking, costly hybrid seed, unavailability of recommended pesticides, deterioration of produce quality due to rains, problems in identifying the pests or diseases, inadequate knowledge on post-harvest practices and high expenditure on fertilizers and pesticides. Fluctuating market prices, no support price for the crop, lack of market information were main marketing constraints perceived by the chilli growers. Study suggests strengthening extension-farmer linkages and marketing mechanism to safeguard interest of farmers.

Keywords: Chilli growers, Adoption, Constraints, Marketing, Punjab

Theme 3: 73

Impact of Various Organic Nutrient Methods on Growth Parameters of Rice Varieties in the North Eastern Hill Region

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In the NEH region of India, rice is a major crop to the local economy and food security. However, organic farming faces limitations due to scarce readily available nutrients compared to inorganic farming that relies on chemical fertilizers. The goal of organic nutrient management is to optimize diversified nutrient sources and minimize losses. Thus, keeping the above facts in view, a field experiment entitled, "Nutrient management in organic rice under NEH region" was conducted during Kharif season of 2022 at the experimental farm of ICAR Research Complex for NEH Region, Umiam, Meghalaya, India to find out the appropriate combination of organic nutrient sources for enhanced growth, yield attributes, productivity, grain quality, soil health and net returns under organic rice cultivation under humid sub-tropical conditions of Meghalaya, India. The experiment was conducted using a factorial randomized block design with 12 treatment combinations. It consisted of two factors: FactorA, which included two rice cultivars (Shahsarang-1 and Lumpnah), and Factor B, which included five organic nutrient management practices *viz.* 100% of recommended dose of N (RDN) applied through farm yard manure (FYM),100% of RDN applied through vermi compost (VC) 50% of RDN applied through FYM +50% of RDN applied through vermicompost (VC), 75% of RDN applied through FYM, along with two sprays of vermiwash and cow urine, each at a concentration of 10%, at 30 and 60 days after transplanting (DAT), 75% of RDN applied through VC, along with two sprays of vermiwash and cow urine, each at a concentration of 10%, at 30 and 60 DAT and control. The growth parameters of rice, such as plant height, dry matter accumulation, leaf area index (LAI), crop growth rate (CGR), and relative growth rate (RGR), were significantly affected by organic nutrient management practices. During the crop growth period, all the parameters showed an increase until the maturity stage, except for LAI, which reached a plateau after the maximum tillering stage. Among the various organic nutrient management options, the treatment that involved applying 75% recommended dose of nitrogen through vermicompost (VC) along with two sprays of vermiwash and cow urine (10% each) at 30 and 60 days after transplanting (DAT) demonstrated the most favourable results in enhancing the growth of rice plants. That was followed by the treatments with 75% RDN through FYM + 2 sprays of vermiwash + cow urine (10% each) at 30 and 60 DAT, 50% N through FYM + 50% N through V C, 100% N through VC treatments and 100% N through FYM treatments. Among the varieties Shah sarang-1 had better performance under each organic nutrient treatments than the local cultivar, Lumpnah.

Keywords: Organic nutrient management, Farmyard manure, Vermicompost, Vermiwash, Cow urine, Rice

Theme 3: 74
Resource Conservation by Direct Seeded Rice: Evidence from Indian Punjab

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In India, 40–45 per cent of the total acreage used for cereal crops under rice, which is the primary food crop for more than 70 per cent of the country's population. Punjab State known as the 'food bowl of India' contributed about 25 to 30 rice and 35 to 40 per cent wheat to the central pool during the last one decade. Under the prevailing conditions of free electricity supply to the farm sector and assured marketing of paddy in the state that makes paddy the most remunerative *kharif* season crop, the farmers are reluctant to move towards crop diversification. When used as an alternative to the conventional puddled transplanted rice (PTR), direct seeded rice (DSR) saves money, resources, time, and energy without sacrificing the environment. With this backdrop the present study was carried out in Punjab during 2021–2022 in Sri Mukatsar Sahib district having the highest area under the DSR. The area under DSR was 84.9 thousand hectares only forming about 3 per cent of the total area under paddy. Use of all the farm inputs was lower on DSR farms as compared to PTR farms except seed, plant protection chemicals (PPC) and micro-nutrients. DSR generated significant savings in the use of human labour (41%), machine (12.63%), fertilizers (15.06%) and irrigation water (15.90%) in comparison to PTR. Groundwater productivity for PTR (Rs 7.33 per m^3) was also lower than for DSR (Rs 8.61 per m^3) as a result of much higher groundwater usage. In economic terms, the net returns over variable cost were higher by about 13 per cent in DSR than PTR because of lower variable costs for DSR. The cost in production of one kg grain using DSR was found to be lower by about 15 per cent than in PTR and the input energy involved in the same was Rs 7.84 MJ as compared to 8.86 MJ respectively. All this points to the fact that there is a strong need to generate more awareness of recommended DSR production practices among the farmers along with government initiatives like subsidizing the cost of DSR per acre and further research and development efforts which can help in rapid extension of area under the DSR.

Keywords: DSR, PTR, Punjab, Production technologies

Theme 3: 75
A Study on Perceived Drudgery of Women Involved in Agriculture in Assam

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Agriculture holds a crucial position in our country's economy, with the role of women in farming being of immense importance. Despite the transformative shifts in agriculture over the years, women in this sector continue to be underestimated, often labelled as the "Invisible workers" of our nation. This research aims to bring attention to the often-overlooked contributions of farm women, acknowledging their selfless acceptance of challenges, their resilience in undertaking demanding tasks, and their ability to endure both mental and physical hardships with humility. Given the demanding nature of the tasks undertaken by farm women, this purposive and randomly sampled investigation utilized a pre-tested schedule administered through a personal interview. The primary objective of this study was to assess the perceived level of drudgery among farm women in Jorhat District of Assam, involving a sample of 120 women respondents. The participants were selected randomly, with the criteria that they should be above 18 years old and possess a minimum of 3 years of

experience in farming activities. The study also revealed that 49.16% and 70.00% of them received a medium level of physical and mental support, respectively. Furthermore, it was found that they possessed a modest level of knowledge on paddy cultivation. It was also found that a majority of farm women perceived transplanting, harvesting, weeding, and carrying loads on their heads as tasks involving a "great extent of physical burden," deeming them "most painful" and "very exhaustive." In terms of the impact, they reported facing postural issues, manual fatigue, mental exhaustion, and irregular schedules due to their workload. It was evident from the findings that workload (CV =0.671) and irregular time (C V =0.589) had strong association with the activities of paddy cultivation performed by the farm women. Further, frequency distribution results of the different factors show that overall (40.00%) women experienced 'great extent of workload' in transplanting, harvesting, weeding and threshing. It was observed that 42.92 percent felt transplanting, harvesting, carrying headload and weeding as; most painful' activities. In case if manual exhaustion about 41.98 percent found transplanting, weeding, harvesting and winnowing as exhaustive in nature.

Keywords: Perceived drudgery, Women farmers, Paddy cultivation

Theme 3: 76

Knowledge of Conservation Agriculture Practices: An in-depth analysis of North Western Indo-Gangetic Plains

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In the context of increasing per capita income, globalization, urbanization, and climate change, Conservation Agriculture (CA) has emerged as a promising environmentally sustainable farming practice, garnering widespread recognition both nationally and worldwide. Despite its manifold advantages, the pace of its adopting has been impeded. The present research study aims at assessing the knowledge level of farmers regarding conservation agricultural practices. Knowledge test containing 20 items and knowledge index was developed for scoring the knowledge. The study was conducted in the states of Punjab and Haryana and 10 CA adopters and 10 CA non-adopter were selected from each of 12 villages covered under the study making the total sample size of 240. Majority of CA adopters had medium to high level of knowledge as compared with non-adopters. Although adopter farmers knowledge regarding CA, its principles, machineries needed was high, but they lacked clarity on the aspects of specific agronomic practices related to CA, nutrient management and relevant Government Schemes. This was one of the reasons why farmers reverted to conventional tillage practices even after adopting CA for one or two years. On the part of CA non-adopters, several misconceptions regarding package and practices of CA was the major barrier. Contact with field level extension agents, education, experience in practicing CA, ecological consciousness and higher opinion leadership quality were the prominent drivers in shaping the knowledge of the adopter farmers. Informal discussions with the farmers revealed that timely field visits and trainings conducted by CIMMYT, BISA officials, CSSRI scientists were crucial for motivating farmers for continuing with CA practices. Identifying the knowledge gaps will form a basis for the planners and scientific forum to chalk out need based locale specific extension advisory services and relevant policies on CA, which in turn will be a stepping stone towards a sustainable agriculture.

Keywords: Conservation agriculture, knowledge test, knowledge index, driving factors, sustainable agriculture

Theme 3: 77

Effect of Mulching Materials on Weed Incidence, Yield, and Economics of Brinjal in Koderma District of Chhota Nagpur Plateau of Jharkhand

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The experiment was conducted in the farmer's field at Sardarodih, Dandadih, Tarwan, Chehal and Lohadanda villages of the Koderma district of Jharkhand India to evaluate the effect of different types of mulching practices on weed population, moisture percentage in soil, yield and benefit-cost ratio of brinjal. The experiment consists of five types of mulching treatments Black colour polythene mulching, Black and silver colour polythene mulching, Transparent poly mulching, Mulching with Paddy straw (8-10 cm thick), and Without mulching (only 3 to 4 hand weeding). Results exposed that black with silver colour polythene mulch has recorded significantly higher yield per plant (2.5 kg) and yield per ha (56.5 t/ha) which was at par with black colour polythene mulch. Organic mulch was found to be the next best treatment with respect to yield per plant (1.5 kg) as well as yield per ha (46.0 t/ha). The same treatment also resulted the higher gross return (Rs. 349000/ha), net return (Rs. 211000/ha), and B:C ratio (2.52) followed by black polythene mulching and organic mulching practices. Weed suppression and moisture retention were higher with black polythene mulch. Results showed black with silver colour polythene mulch was recorded with a significantly higher yield per plant (2.5 kg) and yield (56.5 t/ha) which was at par with black colour polythene mulch. Organic mulch was found to be the next best treatment with respect to yield per plant (1.9 kg) and yield (43.5 t/ha). The same treatment also resulted in a higher gross return (Rs. 349000/ha), net return (Rs. 211000/ha), and B:C ratio (2.52) followed by black polythene mulching and organic mulching practices. Weed suppression and moisture retention were higher with black polythene mulch. However, organic mulch resulted in higher organic carbon and total biomass carbon.

Keywords: Mulching, brinjal, weed suppression, moisture retention

Theme 3: 78

Evaluating the Impact of Alternate Wetting and Drying Irrigation Practices on Crop Growth and Yield of Rice in Farmers' Fields Through Front-line Demonstrations

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Implementing the alternate wetting and drying (AWD) irrigation method in rice cultivation presents a substantial opportunity for conserving irrigation water. This technique involves alternating irrigation in rice fields based on specific triggering criteria, potentially influencing the soil-plant-water system. Over two years, multiple trials were conducted in farmers' fields by Krishi Vigyan Kendra, Ankushpur, Ghazipur, through front-line demonstrations. Perforated pipes were installed during the trials to improve crop growth, yield, and water use efficiency. Daily measurements of ponding water depth and agronomic parameters (including plant height, number of tillers, effective tillers, harvest index, and grain yield) were taken at regular intervals. The field data collected were then utilized to assess water use efficiency and establish crop production functions. The results

revealed that crop growth parameters significantly improved under AWD irrigation practices compared to traditional farming methods. Furthermore, AWD irrigation practices led to an impressive ~24% increase in grain yield while reducing irrigation water usage by approximately 21% compared to traditional practices. This approach resulted in almost a 45% increase in net returns for farmers. The trials strongly suggest that farmers can achieve reduced irrigation water consumption, increased grain yield, and enhanced water use efficiency by adopting AWD irrigation practices. This makes AWD irrigation more suitable for sustainable rice production.

Keywords: Alternate wetting and drying, Yield, Water use efficiency, Crop production function

Theme 3: 79

Cultivation of Vegetable Pea in Rice-Fallow for Higher Productivity, Profitability and Soil Health Improvement Under Zero-tillage System

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In India, about 11.7 m ha area of *kharif* rice remains fallow in subsequent *rabi* season due to number of biotic, abiotic and socio-economic constrains. Rice is the second most important cereal grown in Sikkim after maize, covering an expansive 10481 ha with a productivity 1856 kg/ha. The cropping intensity of the state is very low (118%) due to mono cropping of rice, which often leaves fields fallow due to moisture scarcity during the winter months. Hence, most of the area is remaining fallow in the state. Cultivation of garden pea under zero-tillage condition in rice-fallow may be an option, offering economic benefits to farmers while promoting ecosystem sustainability. Notably, vegetable crops, including garden peas, promise nearly quadruple the income compared to traditional food grain crops. In India, the area under garden pea cultivation is 420.90 thousand ha with a production of 3.20 million tonnes and productivity is 9.5 t/ha. Area under garden pea cultivation in Sikkim is 2020 ha with a production of 9270 tonnes. Productivity of garden pea in Sikkim is 4.59 t/ha, which is far below against national productivity. Thus, there exists significant potential for enhancing productivity in rice-fallow regions through garden pea cultivation. Employing zero-tillage technology not only boosts return for farmers but also conserves resources compared to conventional methods. This approach optimally utilizes residual moisture, facilitating timely crop sowing post-rice harvest. Keeping the above point in view, KVK took the initiative and conducted demonstration under NICRA-TDC over five consecutive years (2018-19 to 2022-23) on zero-tillage garden pea cultivation in rice-fallow under organic management during rabi season. Result revealed that the yield of rice ranged 19.6-22.6 q/ha during last five years with an average yield of 20.96 q/ha. Vegetable pea yield was ranged 45.3-65.3 q/ha with average yield 52.66 q/ha during the demonstration. Rice equivalent yield was recorded 20.96 q/ha and 105.32 q/ha with rice-fallow and rice-vegetable pea respectively. Mean net return and benefit cost ratio of five years were found Rs.15974.00/ha, 130555.00/ha and 1.60, 2.88 under rice-fallow and rice-vegetable pea respectively. Average (5 years) production efficiency, economic efficiency and land use efficiency were 13.91 kg/ha/day, 107.36 Rs/ha/day, 33.60% and 37.36 kg/ha/day, 462.43 Rs/ha/day and 72.27% respectively under rice-fallow and rice-garden pea respectively. Soil organic carbon (SOC), available nitrogen, phosphorus, and potassium was higher in rice-garden pea as compared to rice-fallow. It may be concluded that the cultivation of garden pea under zero-tillage in rice-fallow system in Sikkim condition not only increase the productivity, profitability but also enhanced the soil health, making it a cost-effective, labour-saving, and financially rewarding practice under organically managed conditions.

Keywords: Soil health management, Sustainable agriculture, Zero-tillage technology

Theme 3: 80
Vermicomposting: A Sustainable Solution for Waste Management and Resource Conservation

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Waste management is a critical aspect of environmental sustainability, and vermicomposting has emerged as a promising solution for converting organic waste into valuable resources. Vermicomposting is a natural process where worms, typically red wigglers, break down organic waste into nutrient-rich compost. This method harnesses the natural digestive abilities of worms to transform animal dung, feed and fodder residues, kitchen scraps, garden waste, and agricultural residues into a potent organic fertilizer. The present research work was conducted in two districts viz., Ludhiana and Pathankot of Punjab for an exploratory study on farm waste management practices followed by dairy farmers. The data were collected by using a well-structured interview schedule from 160 dairy farmers of Ludhiana and Pathankot (80 dairy farmers from each district). Vermicomposting was not adopted by the majority (88.75%) of farmers due to a lack of technical knowledge, more laborious, no specific training regarding vermicomposting, problems in quality assessment of vermicompost, and marketing problems. Among remaining 7.50 percent farmers adopted but discontinued due to a problem in the marketing of vermicompost, and only 3.75 percent of farmers adopted and continue with this because of proper training, knowledge, and also some financial help from the government. Among farmers who adopted vermicomposting only 1.87 percent, use animal dung, food and fodder residues, bedding materials, kitchen scraps, garden waste, and agricultural residues as raw material, remaining 1.87 percent use only animal dung. Farmers use vermicompost as organic fertilizer in their own fields as well as sell in the market mainly at the local level. Marketing of vermicompost was preferred by word of mouth and various social media platforms were also used by them. As communities and regions continue to grapple with waste management challenges, vermicomposting provides a tangible and eco-friendly pathway toward sustainable resource management.

Keywords: Adoption, Marketing, Sustainability, Vermicomposting

Theme 3: 81
Development of Knowledge Test of Sugarcane Farmers

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Sugarcane is a cash crop. Sugar demand is increasing day by day but sugar recovery of cane is decreasing. There are numerous factors responsible for this, but one of them is low adoption of recommended package of practices. Sufficient knowledge about package of practice helps in effective adoption. It is essential to determine sugarcane farmers' current knowledge level about the recommended package of practice to enhance their cognitive domain. A knowledge test was developed to assess the knowledge level of farmers regarding sugarcane cultivation. The relevant number of items was collected after reviewing the literature and discussion with subject matter specialist. For content analysis item were given to experts, after that 8 items were deleted and 57 remained for analysis. For item analysis statements were given to sugarcane cultivating farmers. Farmers were selected from all five agro-climatic zones of Punjab and from each zone one district was randomly selected. Thirty-two

sugarcane cultivating farmers were selected from each of the districts. Hence, a total of 160 respondents were selected from five districts. Item analysis was done by calculating item difficulty index and item discriminatory index. After item analysis only 28 items were selected for knowledge test, which had both item difficulty index ranges between 0.25 to .75 and discriminatory index more than 0.1. Reliability using Cronbach alpha, Guttman split-half, and Spearman brown and validity was calculated for standardizing the test. It was found to be significant for the knowledge test. This test can be used to determining the knowledge gap of sugarcane growers about the package of practices along with its appropriate intervention which can be given to increase knowledge level of farmers and turn sugarcane cultivation into more profitable farming.

Keywords: Sugarcane, Knowledge, Item difficulty index, Item discriminatory index and Reliability

Theme 3: 82
Impact of High Intensity Cropping on Soil Phosphorus Fractions in Himalayan Plains of Chenab-Ravi Basin

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Phosphorus is a major part of DNA, RNA, and ATP, and is essential for genetic information and energy transfer in cells. Soils contain inorganic, organic, and soil solution P, with organic P being the most common at 20-80%. P fractions in soil vary in mobility, bioavailability, and chemical behaviour, and can change in certain conditions. Cropping intensity has significant impacts on nitrogen and phosphorus pools. We studied the impact of intensified cropping systems (with long history of >4 years) under five diverse cropland ecosystems on nitrogen and phosphorus pools in relation to changed substrate availability and fertilizer application. The treatment details include: T_1-Basmati rice-Wheat -Cowpea, T_2- Basmati Rice-Potato—Wheat-Mixed Fodder (Maize+ Cowpea + Charni), T_3-Basmati Rice-KnolKhol-Potato-Greengram, T_4- Basmati Rice- Radish- Green onion-French bean vegetable-Okra and T_5-Rice- Fenugreek- KnolKhol- Green Onion-Dry Onion-Black gram. The samples were taken from three depths i.e. 0-5, 5-15 and 15-30 cm in *kharif* season. The value of available phosphorus and labile organic phosphorus showed significant difference at 0-5 cm soil depth with the highest value in T_2- Basmati Rice-Potato-Wheat-Mixed Fodder. Moderately labile phosphorus was highest under T_2 (156.08 mg kg^{-1}) at 0-5 cm and at 5-15 cm the highest value was also recorded in T_2(151.30 mg kg^{-1}). The maximum values of non–labile organic phosphorus was obtained in T_4- Basmati Rice- Radish- Green onion-French bean vegetable-Okra (37.02 mg kg^{-1}) at 0-5 cm soil depth. The maximum values of saloid phosphorus at 0-5 cm soil depth was observed under T_2 (37.02 mg kg^{-1}) with significant difference. Aluminium bound phosphorus content was highest under T_4 (46.73 mg kg^{-1}) while the lowest values were recorded in T_1 (41.26 mg kg^{-1}) at 0-5 cm depth. At 5-15 cm and 15-30 cm, the same trend was followed. The values of iron bound phosphorus content and reductant phosphorus content were maximum in T_4 and the lowest values were recorded in T_1. Highest values of calcium bound phosphorus was found in T_4 (184.95 mg kg^{-1}) at 0-5 cm soil depth. The similar trend was followed at 5-15 and 15-30 cm depth with significant difference at all depths. The values of reductant phosphorus were highest in T_4 (90.13 mg kg^{-1}) while the lowest values were obtained in T_1 at all the three depths. The application of organic manures along with fertilizers and their decomposition released organic acids and boost various phosphorus fractions. The results showed that were in the order Al-P > Fe-P >Ca-P. The major inorganic phosphorus fraction in alkaline soil was calcium bound phosphorus. At regional scale, more diversified cropping system appears to be promising cropping practices that sustains phosphorus availability.

Keywords: Fractions, Cropping intensity, Phosphorus fractions, Randomized, Labile phosphorus, Manures

Theme 3: 83
Logit Analysis of Adoption of Water Conservation Practices in Punjab State

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The purpose of the current study was to determine how socio-economic and psychological factors influenced farmers' adoption of water-saving methods. So, this study was designed to use the binary logistic model to explore the factors influencing the adoption of water conservation practises in Punjab. The multi-stage sampling strategy was used to collect data from the 500 farmers from five districts *i.e.* Sangrur, Hoshiarpur, Ropar, Fazilka and Bathinda, were selected based on the highest acreage under five major crops rice, wheat, cotton, maize, and sugarcane grown in Punjab. The adoption is a status of water conservation practices adopted by the farmers. It was measured for adoption and non-adoption with score 1 and 0 respectively. Majority of the respondents from all the districts had adopted laser leveller, more than half of the respondents from Sangrur district had adopted zero till in wheat, 61 per cent of the respondents from Hoshiarpur district adopted short duration varieties of paddy as water conservation practices. Adoption of short duration varieties, zero till in wheat and cover crops had been significantly influenced by the education. It was found that farmers who had higher extension contacts, participation in extension activities, innovativeness and risk orientation were more likely to adopt direct seeded rice as water conservation practices. Binary logistic regression validated that the farmers who had higher risk orientation ability have the probability to opt for adoption of water conservation practices (WCP). It is intended that these findings will advance the scientific knowledge in the adoption of water conservation practices and help researchers, extension personnel and policymakers.

Keywords: Adoption, Factors, Logistic analysis, Water conservation practices

Theme 3: 84
Adoption of Paddy Straw Management Technologies by Potato Growers of Jalandhar District of Punjab

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The research study, titled "Adoption of Paddy Straw Management Technologies by Potato Growers in Jalandhar District, Punjab," involved the selection of 200 potato growers from five blocks using the probability proportional to size sampling method. The distribution of participants included 73, 50, 31, 31, and 15 potato growers from Nakodar, Adampur, Bhogpur, Jalandhar East, and Jalandhar West, respectively. Data collection was carried out through personal interviews based on a prepared interview schedule. All surveyed potato growers are found to be aware of the PAU Super Straw Management System and Rotavator. In contrast, a majority of growers were aware of the Baler, Paddy Straw Chopper, Mulcher, and Mould Board Plough. The adoption pattern revealed that most potato growers embraced the PAU Super SMS, Rotavator, and Paddy Straw Chopper in 2017, while the adoption of Mulcher and Mould Board Plough peaked in 2018. Most growers followed the PAU-recommended sequence of paddy straw management technologies in their potato cultivation, with a preference for mulcher and mould board plough in 2018 and rotavator in 2017. The PAU Super Straw Management System has the highest adoption rate at 96.56%, closely followed by the Rotavator at 95.68%. Additionally, 75% of potato growers adhered to the incorporation practice of paddy straw in their potato fields.

Keywords: Adoption, Paddy straw, Potato, Paddy straw management, Stubble burning

Theme 3: 85
Effect of Biofertilizers and Fertility Levels on Nutrient Content, Uptake and Quality of Cowpea

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A field experiment was conducted in kharif season of 2022 at Instructional Farm, College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner to study the response of cowpea (*Vigna unguiculata* L.) to biofertilizers under different levels of fertility. The treatments comprising of four levels of fertility (control, N: P_2O_5 @ 10:20, 20:40 and 30:60 kg ha^{-1}) in main plots and six biofertilizers (control, Rhizobium, PSB, Rhizobium + PSB, VAM and Rhizobium + PSB + VAM) in sub plots making 24 treatment combinations, were laid out in split plot design with three replications. The results revealed that nutrient content, uptake and quality of cowpea were significantly influenced by different fertility levels. Results showed that application of 20 kg N ha^{-1} + 40 kg P_2O_5 ha^{-1} gave significantly higher nitrogen content in seed, nitrogen content in straw, phosphorous content in seed, phosphorous content in straw, nitrogen uptake by seed, nitrogen uptake by straw, total nitrogen uptake, phosphorous uptake by seed, phosphorous uptake by straw, total phosphorous uptake and protein content in seed as compared to control and application of 10 kg N ha^{-1} + 20 kg P_2O_5 ha^{-1}, but it was at par with application of 30 kg N ha^{-1} + 60 kg P_2O_5 ha^{-1}. Among biofertilizers treatments nutrient content, uptake and quality of cowpea were significantly influenced due to biofertilizers. Seed inoculation with Rhizobium + PSB + VAM recorded highest nitrogen content in seed, nitrogen content in straw, phosphorous content in seed, phosphorous content in straw, nitrogen uptake by seed, nitrogen uptake by straw, total nitrogen uptake, phosphorous uptake by seed, phosphorous uptake by straw, total phosphorous uptake and protein content in seed as compared to control, Rhizobium, PSB, Rhizobium + PSB, VAM.

Keywords: Biofertilizers, Cowpea, Fertilizers, Nutrient content, Quality, Uptake

Theme 3: 86
Designing a Sustainable Food Production Model through Utilization of Household Resources: Assam Context

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Availability of healthy food ingredients is a prime concern in today's world. Production of varieties of food staff has reached a new height across the globe. However, the aspect of quality, traceability and origin of produce creating concern among the consumers due to emergence of ever increasing food borne or food related diseases. Efforts are made to design a model household farm wherefrom a five to six member family can have their required food staff through sustainable way. Production of food ingredients covering cereals, pulse, oilseed, honeybee, vegetables, spices, fruits, mushroom, livestock and fish components are taken for the study. Scientific integration of these farm components will also act as a viable option for sustainable food production with minimum investment without risk of environment degradation. Economic analysis using Benefit Cost Ratio (BCR) and Cash flow statement revealed the economic sustainability of the model. Additionally the model helps in waste recycle, drudgery reduction, avoidance of health hazard and acted as eco friendly.

Keyword: Sustainability, House hold, Food, Integration, Traceability, Health

Theme 3: 87
A Comparative Analysis of Extent of Adoption of Improved Production Technology of Ajwain by Tribal and Non-Tribal Farmers of Rajasthan

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The present study was conducted to find out the difference in extent of adoption of improved production technology of Ajwain between the tribal and non-tribal farmers of Rajasthan. Pratapgarh and Chittorgarh districts of Rajasthan were selected among tribal and non-tribal districts of Rajasthan, respectively as they have the highest area and production of Ajwain. One tehsil from each of the selected districts were selected purposively due to highest area and production of Ajwain. From each of the selected tehsils 5 villages were selected randomly. 13 farmers were selected from each selected villages in this way a sample of 130 respondents (65 tribal and 65 no tribal farmers) was selected randomly. Data was collected using interview schedules in year 2022. From the study it was concluded that majority 51 (78.46%) of tribal framers were in medium adoption category followed by low 10 (15.38%) and 04 (6.16%) high extent of adoption categories. Further, majority 52 (80.00%) of non-tribal farmers were having medium extent of adoption followed by 08 (12.31%) farmers having high and 05 (07.69%) farmers having low extent of adoption. It was found that the tribal farmers had maximum adoption of "Harvesting" (76.92 MPS) and least adoption of "Fertilizer application" (51.23 MPS). While, in case of non-tribal farmers "Time of sowing" (87.69 MPS) was maximum adopted and "Plant protection measures" (59.23 MPS) was least adopted.

Keywords: Adoption, Ajwain, Tribal and Non tribal farmers

Theme 3: 88
Role of Integrated Farming Systems in Agricultural Sustainability

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The agricultural landscape is undergoing a paradigm shift and this transformation has brought along a set of multifaceted challenges including increase in number of small and marginal farmers. In India, the number of small and marginal farms rose by about 9 million between 2010-11 and 2015-16. This necessitates to suggest farmers having limited resources to adopt Integrated Farming Systems (IFS) for providing stability to the income and nutritional security. The adoption of IFS as a transformative agricultural approach aimed at enhancing productivity, optimizing resource utilization, and promoting environmental sustainability. The concept of IFS integrates various farming components, such as crop cultivation, livestock management, aquaculture, and agroforestry, into a cohesive and synergistic system. The benefits of adopting IFS are diverse and impactful, encompassing economic, environmental, and social aspects. The key drivers behind the adoption of IFS includes enhanced soil fertility, diversified income sources for farmers, reduced dependency on external inputs, and improved resilience to climate change. The IFS can play role in addressing contemporary challenges such as water scarcity, soil degradation, and fluctuating market conditions. But, there are challenges faced by farmers during the adoption process, emphasizing the importance of tailored strategies and supportive policies. Moreover, the integration of traditional knowledge with modern technologies in IFS plays a crucial factor in its successful implementation.

Keywords: Integrated farming system, Income, Food security

Theme 3: 89
Investigation, Propagation, Implementation of Ideas and Virtues: Delving Deep into the Ancient Dungeons

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From confronting the wrath, atrocious acts, and behaviors during the British rule to getting People of Indian Origin to hold top positions in Governments around the World, from struggling to become an independent nation to becoming the world's largest democracy, from facing a lack in nuclear development in India to the creation of the Department of Atomic Energy (DAE) and then gradually becoming the first nation to launch the atomic energy program. India has surely come a long way but so has the environment from 5177 cubic meters of water availability in 1951 to 1486 cubic meters in 2021, from India's greenhouse gas emissions at 4.7% in 2016 to India surpassing the European Union and becoming the third-highest Global Greenhouse gas emitter, from targeting 20%-30% reduction in PM2.5 and PM10 concentrations by 2024, as the base year 2017 to the air quality index (AQI) crossing the 900-mark at an industrial area in Delhi. Natural resources were nearly constant in the early days of ancient times, whereas economic resources grew and the difference reflected well-being. Various uprisings that took place over time resulted in a rise in human and financial capital at the expense of environmental capital. The objective of the paper is to address the issue of the environment's preservation and protection, which, is not just relevant to modern-day India; rather, it has a long history that demonstrates its importance and also to deeply observe, understand, and review the virtues based on generating a whole new ecosystem that aspires to shake the foundations of the sustainable environment, meet current energy demands and highlights the importance of youth in creating clear and observable benefits that can be seen on levels ranging from individual to international.

Keywords: Economy, Ecosystem, Energy efficiency, Sustainability, Vishwa Guru, Vedic Origin

Theme 3: 90
Effect of Biochar in Mitigating the Water Stress in Wheat

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A field was conducted at Instructional Farm, Rajasthan College of Agriculture, Udaipur during *rabi* season of 2021-22 to find out the effect of water stress at different physiological growth stages, to find the effect of biochar on growth and yield of wheat under water stress and to work out an economically viable treatment. The results revealed that water stress at grain filling produced wrinkled grains. Grain, straw and biological yields were significantly reduced with water stress at tillering, flowering and grain filling stages over no water stress. Grain yield is decreased by 14.09, 9.53 and 8.62 per cent by water stress at tillering, flowering and grain filling, respectively as compared to no water stress (5646 kg ha^{-1}). Application of biochar 2 t ha^{-1}, 3 t ha^{-1} and 4 t ha^{-1} proved effective in improving growth and yield attributes. Grain yield, straw yield and biological yield were significantly higher with biochar 2 t ha^{-1}, 3 t ha^{-1} and 4 t ha^{-1} over control. Application of biochar 2 t ha^{-1}, 3 t ha^{-1} and 4 t ha^{-1} increased grain yield by 3.97, 12.28 and 13.00 per cent, respectively over control (4837 kg ha^{-1}). Biochar 3 t ha^{-1} and 4 t ha^{-1} proved at par with each other in respect of most of the yield attributes and yield.

Keywords: Biochar, Water stress, Wheat

Theme 3: 91
Management Practices Followed for Pesticide Application by Vegetable Growers in Punjab

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Chemical pesticides are without a doubt the most efficient, short-term control tool for a number of agricultural pests and pathogens, but their negative impacts on human, animal and environmental health have also been extensively documented and over the years their indiscriminate use is a cause of concern. Vegetables are consumed in daily diet but are highly perishable and consumed shortly after harvest, thus knowing the practices related to pesticides used in the same becomes very essential. The present study was conducted in the state of Punjab and three districts having the highest area under vegetable cultivation i.e. Amritsar, Sangrur and Jalandhar were selected. A total of 210 vegetable growers were selected for the study. This paper examined practices followed by vegetable growers in six important vegetable crops i.e. Potato, tomato, Brinjal, Okra, Pea and Chilli. More than half of the vegetable growers applied the pesticide to vegetable crops after observing the pest population. Only few vegetable growers observed ETL level before pesticide application. Very few vegetable growers used pheromone/light traps for monitoring pests. Different pesticides were mixed at the time of application by eighty per cent of the vegetable growers. Around thirty-seven per cent of the vegetable growers agreed to have followed pesticide rotation regularly. Both chemical and non-chemical weed management were practiced by forty-four per cent of the vegetable growers while thirty-seven per cent followed only chemical weed management. Out of 172 vegetable growers who used weedicide, 87 percent used the recommended type of nozzle. Around 80 percent of vegetable growers used recommended type of nozzle for insecticide and fungicide application. The results reveal that the vegetable growers should be made aware of the benefits of observing ETL and adopting integrated pest management techniques.

Keywords: Management practices, Pesticide application, Vegetable growers, Punjab

Theme 3: 92
Eco-friendly Nutrient Management Interventions for Improved Yield and Income from the Tribal Farmlands of Madhya Pradesh

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Agro-ecosystems in the tribal pockets of Madhya Pradesh are mostly low input use rainfed systems, located along the hill slopes in association with forests. Surveys conducted during 2018-19 in six tribal villages of Betul district showed that the small and marginal tribal farmers though adopted chemical fertilizers and plant protection chemicals mostly practice subsistence agriculture using traditional implements for land preparation and sowing. Yield and income from the farmlands with shallow soils were low. In order to improve yield and income from tribal farmlands integrating eco-friendly technologies with their practices, ICAR-Indian Institute of Soil Science conducted evaluation-cum-demonstration trials in 200 farmers' fields for soybean, maize and paddy crops

during 2021-23. Liquid formulations of different bio-fertilizers (nutrient management) and bioagents (biotic stress management) were integrated @ 2.5 l ha^{-1} with their farming practices. Results of the three seasons showed the average yields from soybean, maize and paddy crops with intervention as 12 qha^{-1}, 42 qha^{-1} and 43 qha^{-1} respectively whereas from farmers' practice yields of the respective crops were 7 qha^{-1}, 35 qha^{-1} and 38 qha^{-1}. The cost involved with implementation of intervention was around Rs. 6500.00 ha^{-1} $year^{-1}$. Estimations showed that the average annual net income increase with intervention over the years could be in the range of 14700-18200 Rs. ha^{-1} from soybean crop was, 6300-7800 Rs. ha^{-1} from paddy crop, and 4700-6100 Rs. ha^{-1} from paddy crop if the farmers sell their produce at the minimum support price. Unfortunately, the remoteness of the locality forces them to sell their produce at a relatively low price at the farm gate or in the nearby markets. This demands some immediate interventions to develop proper marketing facilities in the tribal dominated areas of the state. However, use of bio agents helped tribal farmers to keep chemicals away from their farmlands to a greater extent.

Keywords: Eco-friendly, Income, Intervention, Nutrient management, Tribal farmlands

Theme 3: 93
Workload and Ergonomic Investigation for Female Farm Workers in various Farm Operations in Udham Singh Nagar

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The workload and ergonomic evaluation for female respondents was governed in Udham Singh Nagar of Uttarakhand. Ergonomically designed implement supports drudgery reduction and ensures safety of agricultural farmers. The study prioritized the use of manually operated safe implements/tools mainly ergonomically designed for hilly and plain regions of Uttarakhand viz. Pant hill-khurpi, Knapsack sprayer and Pant Sickle for performing uprooting weeds (weeding operation), plant protection operation and harvesting operation respectively by 180 female farm workers of different age groups having range between 20 to 50 years with 30 female workers in every age interval. The anthropometric strength data was initially reported for the purpose of effectively design farm equipment/implements to enhance efficiency, safety and comfort of the operator. Based on anthropometry of farm operators, the implements were designed the selected female subjects. The physiological responses were evaluated prior to and post accomplishing various farm operations for certain time domain based on work-rest cycle. The findings revealed that the average working heart rate during weeding, spraying and harvesting were reckoned as 107.8, 119.6 and 111.5 (bpm) respectively. The mean values of EER and OCR values for the corresponding farm operations were assessed as 7.01, 9.12 and 7.37 (kJ/min) and 0.49, 0.61 and 0.52 (L/min) respectively. The exertion perceived by respondents was measured by Borg's RPE (Rated Perceived Exertion) scale and Visual Analogue Discomfort Scale. The BPDS (Body part Discomfort Score) values for determining postural discomfort were ascertained as 26.45, 29.35 and 25.50 respectively. The findings reflects that the workers were more compatible and experienced less drudgery and workload in conducting weeding operation by Pant sickle followed by Pant sickle and knapsack sprayer. The exertion perceived by respondent was maximum in spraying operation and least for weeding operation. The ergonomics needs to be incorporated in all activities to achieve effectiveness for a human operator to pursue an objective systematically.

Keywords: Ergonomics, Anthropometric data, Work Physiology, BMI, BMR, Heart rate, Oxygen rate

Theme 3: 94
An Assessment of Water Footprints of Major Crops in Punjab State and Policy Implications

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Groundwater has become a predominant source of irrigation in the Indian farming system. The excessive use of water for irrigation raises concerns about sustainability. Therefore, it is imperative to comprehend the water utilization in crop cultivation to devise effective solutions for the sustainable use of this natural resource. A study was undertaken to measure the water footprint (WFP) of major crops in Punjab state, focusing on total irrigation water inputs (IWI) and crop evapotranspiration (ETc). Five districts were chosen based on the highest acreage under major crops such as rice, wheat, cotton, sugarcane, and maize and total of 500 farmers were selected. The groundwater extraction rate was assessed based on various tubewell parameters and resulted that Sangrur district exhibited the highest average bore depth (355 ft) and motor depth at 159.66 ft, with an average electric motor capacity of 19.22 hp. District-wise estimation of water footprints revealed that Sangrur had the highest water footprints in paddy (non-Basmati) and Basmati based on IWI. Meanwhile, Fazilka district had the highest water footprints based on ETc. The crop wise calculation of WFP in different districts based on IWI were estimated as 2033 l/kg for paddy (Non-Basmati), 2567 l/kg for basmati, 1761 l/kg for cotton, 829 l/kg for maize, 669 l/kg for wheat and 121 l/kg for sugarcane. Further, WFP calculated based on ETc using CROPWAT 8.0 model and estimated water footprints of 926 l/kg, 1313 l/kg, 2280 l/kg, 744 l/kg, 547 l/kg, and 150 l/kg for paddy, basmati, cotton, maize, wheat, and sugarcane, respectively.

Keywords: Water footprints, Groundwater, Sustainable agriculture, Irrigation water inputs

Theme 3: 95
Income Generation Through Preparation of Incense Stick using Flower Waste in Varanasi District

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Varanasi is a holy place of Lord Shiva, where number of temples are there in these temples flowers in different ways are used for worshiping, but after satisfying its purpose these flowers are of no use and thrown away in river or some other places, which in results create pollution in a way. Each day waste material weighting 3.5-4 tonnes is left behind in the city of temples which also includes floral waste. A technology from ICAR-CIMAP (Lucknow) comes in focus to take care of these floral wastes, not only to reduce pollution, also to generate income specially in farming community. Wasting flowers is considered as wasting agricultural product. Considering all these points, KVK Varanasi has started providing training to female farmers for preparing incense stick using floral waste in Varanasi district. Two Vocational trainings of 5 days with 30 female farmers has been conducted in year 2023-24. These female farmers were members of different SHG groups. The training includes powder making of floral waste and then making of incense stick out the powder till packaging of products. After taking trainings these groups has started preparing incense sticks by using floral waste (rose and marigold mainly) at their own.

keywords: Income generation, Female farmers, Flower waste, Agriculture waste, Holy place Varanasi

Theme 3: 96
Conservation Agriculture Based Integrated Nutrient Management for Sustaining Crop Productivity and Profitability

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Conservation agriculture has come up as a new paradigm to achieve the goal of sustainable agriculture production. It typically improves soil quality and water conservation; however, its effect on crop productivity is highly variable and dependent on local conditions/management. Crop residue retention plays a crucial role in CA and can help to improve overall soil health and ultimately crop productivity and sustainability. Therefore, compared to the conventional intensive tillage, CA has a greater potential for soil C sequestration, favours higher soil biodiversity, lowers greenhouse gas emission, and can assist in mitigating climate change. The world vision of no hunger target, food security, and zero poverty followed by raising standards of living of rural people through agricultural transformation is the greatest challenges faced by the agricultural planners worldwide. The concept of using different sources of plant nutrients combined to check nutrient depletion, maintain soil health, and crop productivity, called INM. Recently several researchers introduced that integrated use of inorganic fertilizers, organic fertilizers, green manure, and bio-fertilizers is becoming an effective practice not only for increasing crop production and productivity but also for the better crop and soil health. In addition, INM helps to increase the activity of soil microorganisms and improves the soil physical, chemical and biological properties. So, INM create an economic eco-friendly environment by reducing the dependence on inorganic chemical fertilizers and improving the soil fertility, optimizing crop yield, maximizing profitability and ultimately making the agriculture sustainable.

Keywords: Conservation agriculture, Integrated Nutrient Management, Soil fertility

Theme 3: 97
Effect of Nano Fertilizers on Quality, Nutrient Content and Uptake by Maize in Southern Rajasthan

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Considering the food and nutritional security and post green revolution second generation problems *i.e.* increasing input use with declining efficiency trends, deteriorating soil health, depleting water resources, pollution and narrowing profits at the end of farmers, a Field experiment was carried out during *Kharif* 2022 at Dryland Farming Research Station, Arjia, Bhilwara, MPUAT, Udaipur (Rajasthan) to overcome these problems. The experiment was laid out in Randomized Block Design (RBD) with replicated four times. Results of the study revealed that maize grown with application of treatment 75% RDN + RD-PK + nano nitrogen @ 4 ml/l and 0.3 g/l at 30 and 60 DAS recorded significantly increased quality, nutrient content and uptake by maize. This was statistically at par with 50% RDN + RD-PK + nano nitrogen @ 4 ml/l and 0.3 g/l at 30 and 60 DAS. Nano technology based fertilizers offers solutions to most of the problems with chemical fertilizers. Foliar application of nano fertilizers at critical growth stages of a plant effectively fulfils its nutrients requirement and leads to higher crop productivity due to enhanced nutrient use efficiency in comparison to chemical fertilizers.

Keywords: Maize, Nano fertilizers, Nutrient content, Quality, Uptake

Theme 3: 98
Food Waste Management in Developing Countries

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Food production and processing in developing countries generate high levels of waste and byproducts, causing a negative environmental impact and significant expenses. However, these biomaterials have ample potential for generating food additives which in turn will minimize malnutrition and hunger in the developing countries where it is produced. Many of these biomaterials are a source of valuable compounds such as proteins, lipids, starch, micronutrients, bioactive compounds, and dietary fibers. Proper use of food waste and byproducts as raw materials or food additives, could generate economic gains for the industry, contribute to reducing nutritional problems, would produce beneficial health effects, and would reduce the environmental implications that generate mismanagement of waste. Due to the nutritional, nutraceutical, and functional properties of the food waste, it can be argued that this is a raw material with significant potential and numerous applications in food formulations, mainly in developing countries. Biomolecules like proteins, lipids, starch, vitamins, minerals, fibers, and antioxidants, present in the food wastes and byproducts can be separated individually from the biological matrix, using extraction techniques or used directly as food to make the most of the nutritional and functional components contained in them. However, microbiological risks should always be avoided, so the unitary drying operation is a fundamental step to guarantee the microbiological and physicochemical stability of biomaterials. The development of sustainable solutions for the management of byproducts and food waste is one of the main challenges of our society. These solutions must be able to take full advantage of the biological potential of biomaterials and achieve economic, social, and environmental benefits.

Keywords: Food additives, Malnutrition, Hunger, Micronutrients, Antioxidants

Theme 3: 99
Do Farmers Really Possess the Right Kind of Knowledge Pertaining to Conservation Agriculture Practices- An in-depth analysis from the North Western Indo-Gangetic Plains

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In the context of increasing per capita income, globalization, urbanization, and climate change, Conservation Agriculture (CA) has emerged as a promising environmentally sustainable farming practice, garnering widespread recognition both nationally and worldwide. Despite its manifold advantages, the pace of its adopting has been impeded. The present research study aims at assessing the knowledge level of farmers regarding conservation agricultural practices. Knowledge test containing 20 items and knowledge index was developed for scoring the knowledge. The study was conducted in the states of Punjab and Haryana and 10 CA adopters and 10 CA non-adopter were selected from each of 12 villages covered under the study making the total sample size of 240. Majority of CA adopters had medium to high level of knowledge as compared with non-adopters. Although adopter farmers knowledge regarding CA, its principles, machineries needed was high, but they lacked clarity

on the aspects of specific agronomic practices related to CA, nutrient management and relevant Government Schemes. This was one of the reasons why farmers reverted to conventional tillage practices even after adopting CA for one or two years. On the part of CA non-adopters, several misconceptions regarding package and practices of CA was the major barrier. Contact with field level extension agents, education, experience in practicing CA, ecological consciousness and higher opinion leadership quality were the prominent drivers in shaping the knowledge of the adopter farmers. Informal discussions with the farmers revealed that timely field visits and trainings conducted by CIMMYT, BISA officials, CSSRI scientists were crucial for motivating farmers for continuing with CA practices. Identifying the knowledge gaps will form a basis for the planners and scientific forum to chalk out need based locale specific extension advisory services and relevant policies on CA, which in turn will be a stepping stone towards a sustainable agriculture.

Keywords: Conservation agriculture, Knowledge test, Knowledge index, Driving factors, Sustainable agriculture

Theme 3: 100
Conservation Agriculture - Integrated Nutrient Management (INM)

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Conservation Agriculture is gaining popularity as it encourages the least amount of soil disturbance and the preservation of a permanent soil cover. It is a method of sustainable agriculture production made up of a variety of farming techniques tailored to the needs of particular crops and local circumstances in every area. It consists of agricultural practices and soil management strategies which maximize yields while preventing soil erosion and degradation, enhance soil quality and biodiversity, and support the protection of water and air resources. Conservation agriculture serves as a foundation for sustainable agricultural output intensification when combined with other well-known best practices, such as the use of high-quality seeds and integrated pest, fertilizer, weed, and water management. The most important thing to remember about Conservation Agriculture systems is that farmers should fertilize their soils instead of their crops. Therefore, in order to effectively manage nutrients in Conservation Agriculture systems, it would be necessary to focus on enhancing and safeguarding the biological processes of the soil to ensure that all soil microorganisms and biota are given preference, soil organic matter and soil porosity are built up and maintained, on producing enough biomass and engaging in biological nitrogen fixation to maintain soil energy and nutrient stocks sufficient to support higher levels of biological activity, on ensuring that plant roots have adequate access to all nutrients in the soil. The objective of Integrated Nutrient Management (INM) also includes the maximization of the physical, chemical, biological, and hydrological characteristics of the soil so that the farm productivity increases and land degradation reduces. For promoting soil fertility, health, and productivity, use of legumes in cropping systems, biofertilizers, crop leftovers, recyclable trash, and other locally accessible nutrient resources is used under INM. Higher crop yields are produced when plant nutrients from chemical fertilizers and organic manures are supplied together as opposed to when they are used separately. This increase in crop productivity is a result of their mutually beneficial relationship, which advances the chemical, physical, and biological components of soil, boosting soil organic matter and nutrient levels and providing a vast amount of well-balanced nutrient supply. Thus practicing integrated Nutrient Management under Conservation Agriculture can help increasing the productivity along with maintaining soil and environmental health which positively impacts the rural livelihood and aims at developing sustainably.

Keywords: Conservation agriculture, Integrated nutrient management, Sustainable development

Theme 3: 101
Utilizing Agricultural Residue Fibres: Pioneering a Sustainable Future in Textile Manufacturing

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The textile industry faces increasing pressure to transition towards more sustainable practices due to environmental concerns and resource constraints. In response, this paper explores the innovative utilization of agricultural residue fibres as a promising solution to address these challenges and propel the textile industry towards a more sustainable future. Agricultural residues like banana stems, orange peels, pineapple leaves, cactus leaf, corn husks and lotus stems are increasingly being used in the textile industry. By using these residues for fibre production can mitigate waste disposal issues associated with agriculture along with it helps to reduce environmental impacts arises due to synthetic fibres. These eco- friendly fibres exhibit desirable textile properties such as strength, breathability, and biodegradability, making them suitable for various textile applications. Moreover, the paper discusses the potential applications of agricultural residue fibres in textile manufacturing, including apparel, home textiles, and technical textiles. These applications demonstrate the versatility and performance capabilities of agricultural residue fibres, offering sustainable alternatives to traditional textile materials. In conclusion, the utilization of agricultural residue fibres presents an innovative and sustainable approach to revolutionize the textile industry. By embracing these renewable resources and integrating them into textile manufacturing processes can drive positive environmental & economic outcomes, paving the way for a more sustainable future in textiles.

Keywords: Agricultural residues, Eco-friendly Fibres, Textile manufacturing, Sustainability, Renewable resources

Theme 3: 102
Role of Agricultural Engineering in Jammu Region for Sustainable Agricultural Development

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Agricultural engineering plays a crucial role in ensuring sustainable agricultural development in the Jammu region. The majority of the population in Jammu and Kashmir depends on agriculture and its allied sectors for their livelihoods. The state's economy is heavily reliant on these sectors, which contribute nearly 50% to the Gross State Domestic Product (GSDP). However, agriculture in the region faces several challenges, including poor productivity, poor production management, labour shortages, poor post-harvest management, poor market networks, and lack of entrepreneurship. Agricultural engineering can help address these challenges by promoting judicious use of natural resources like land, water, and agro-climatically and agri-ecologically appropriate cropping systems. It can also help enhance production and productivity of crops and agro-based produce sustainably, ensure efficient use of resources by farmers, and ensure access of farmers to improved technology and inputs through effective transfer of technology programs. By leveraging agricultural engineering, farmers can cultivate low-volume high-value cash crops, such as flowers, vegetables, quality seeds, aromatic & medicinal plants, mushrooms, etc. round the year. This can help increase agricultural productivity and incomes, while also mitigating the impact of climate change on agriculture.

Keywords: Agricultural engineering, Sustainable agriculture, Climate change

Theme 3: 103
Organic Agriculture for a Sustainable Future: Enhancing soil biodiversity and embracing climate change

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In the face of global challenges posed by climate change and environmental degradation, the call for sustainable practices has never been more urgent. At the heart of this movement is organic farming, a method that not only sustains agriculture but also actively contributes to the preservation of our planet. Organic farming stands at the forefront of sustainable agriculture, offering a holistic approach to farming that not only produces nutritious food but also nurtures the environment. Central to organic agriculture are promotion of soil fertility, conservation of biodiversity, production methods that are adapted to the locality and avoidance of chemical inputs. Use of such methods and cultivation of a diverse range of crops stabilize the delicate ecosystems and reduce drought sensitivity and pest infestations. Biodiversity is increasingly regarded as a resource for rural development and organic agriculture as a production and marketing method that ensures a more productive future for our species and life-support system. Despite its potential benefits, several factors hinder the widespread acceptance and implementation of organic practices. These challenges include the lack of awareness and education, limited infrastructure and technology, market challenges, certification and regulatory issues, etc. By enhancing biodiversity and embracing climate change resilience, organic farming presents a viable path towards a more sustainable and resilient future for our planet. As consumers, policymakers, and farmers alike recognize the importance of these principles, the organic farming movement continues to grow, sowing the seeds for a healthier and more sustainable tomorrow as we navigate an era of increasing environmental consciousness, organic farming stands as a beacon, offering a pathway towards a balanced and sustainable coexistence between agriculture and the natural world.

Keywords: Agriculture, Biodiversity, Challenges, Cultivation, Farming, Organic

Theme 3: 104
Microbial Degradation of Waste: An Eco-friendly Solution to Agricultural Waste Management

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India is an agro-based nation, with almost 70% of rural households still making their livelihoods from agriculture. Abundant amounts of agricultural wastes (AWs) are produced daily throughout India to meet the growing needs of the rapidly expanding population. It is now urgently necessary to develop strategies to ensure their timely exploitation and valorization in order to support agricultural sustainability as well as the security of human food and health due to the inadequate or incorrect management of the same. Agricultural wastes can be used to produce paper, compost, electricity, biogas, fertilizer, biofuel and other products. The greatest alternative to lessen the problems with the global ecology caused by rubbish dumping is the sustainable use of resources. Lignocellulosic (LC) biomass made up of cellulose, hemicelluloses and lignin mainly refered as the agricultural wastes. Several methods including chemical, physical, physico-chemical and biological are used to deconstruct

LC biomass and increase enzyme accessibility for cellulose and hemicellulose degradation. Biological processing requires less energy and is more economical and environmentally benign, thus it is the favored method. However the intricate structure and extremely harsh microbial fermentation process for biomass is very crucial. Numerous microorganisms, including actinomycetes, bacteria, and white rot fungus, can break down lignocellulosic biomass in natural habitats, and these microbial consortiums contribute to the global carbon cycle. An extremely efficient enzymatic system of bacteria and fungi allows them to break down raw materials containing lignocellulose. They possess a distinct nonenzymatic oxidative system in addition to the hydrolytic enzymes, which include hemicellulases and cellulases and are in charge of breaking down polysaccharides. Thus this review will cover four main topics: (1) the isolation and identification of microorganisms that break down lignocellulose; (2) the mechanism by which microorganisms and the cellulase system break down lignin and cellulose; (3) the mechanism by which different types of microorganisms work in concert; and (4) the use of biofertilizer and bioenergy.

Keywords: Lignocellulose, Microorganisms, Eco-friendly, Fermentation

Theme 3: 105

Utilization Pattern of Non-timber Forest Products by Tribal Farmers in Meghalaya

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Non-Timber Forest Products (NTFPs) encompassing a diverse array of resources, play a significant role in the socio-economic fabric of the tribal community. The study entitled "Utilization pattern of non-timber forest products by tribal farmers in Meghalaya," conducted during 2022-23, aimed to comprehend the utilization pattern of NTFPs for various purposes and assess the extent of their utilization among tribal farmers. This research was carried out in two districts of Meghalaya namely East Khasi Hills and Ri Bhoi Districts. Two blocks were selected from each district and within each block, two villages were purposively chosen based on the prevalence and availability of NTFPs. Subsequently, 20 tribal farmers were randomly selected from each village using a simple random sampling technique, totalling 160 tribal farmers. The study adopted an ex-post facto research design and primary data were collected through a pre-tested interview schedule. The results regarding the utilization pattern of NTFPs for specific purposes indicated that all tribal farmers from both districts utilized Broom grass for household cleaning and Firewood for fuel and energy, with a mean score of 2.00 each. Bamboo was also used for construction and building materials, with a mean score of 1.84 in East Khasi Hills and 1.93 in Ri Bhoi. Additionally, various NTFPs including Bay leaf, Wild pepper, Mulberry, Chhal Mogra, Khasi yellow wood, Red Sorrel, Sohphlang, Bayberry, Perennial Buckwheat, Shiitake Mushroom, Garlic chives, and Chameleon Plants were utilized for food and nutrition, with a mean score of 1.66 in East Khasi Hills and 1.80 in Ri Bhoi. Regarding the extent of NTFP utilization, the results revealed that the majority (80.00%) of tribal farmers in both districts fell into the low and medium utilization categories. Hence, there exists an opportunity to enhance the utilization of NTFPs among tribal farmers through educational initiatives.

Keywords: Socio-economic, Building materials, Food and nutrition

Theme 3: 106
The Role of Ergonomic Intervention in Handicraft sector of India

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The handicraft sector in India has long been a cornerstone of both cultural expression and economic activity, with artisans crafting unique pieces that reflect the nation's rich heritage and traditions. Despite its significance, the sector grapples with challenges in productivity and worker well-being due to entrenched traditional methods. In today's globalized economy, characterized by a relentless pursuit of efficiency and innovation, businesses are constantly seeking avenues to enhance their operations. Recognizing this, one key area for improvement within the handicraft sector lies in the implementation of ergonomic interventions. Ergonomics, focused on tailoring workspaces to suit the needs of workers, holds immense potential in enhancing productivity, safety, and overall well-being. By integrating ergonomic principles into workspace and tool design, organizations can create environments conducive to efficient and comfortable work. For instance, ergonomic workstations can mitigate physical strain, reduce the risk of repetitive motion injuries, and improve posture, thereby enhancing both productivity and craftsmanship quality. Moreover, these interventions extend beyond physical benefits, positively influencing workers' mental and emotional well-being. A supportive and comfortable work environment can alleviate stress and fatigue, fostering greater job satisfaction and morale, ultimately leading to higher levels of engagement and motivation among artisans. In conclusion, the implementation of ergonomic interventions in the handicraft sector has the potential to significantly improve workplace efficiency and employee well-being, nurturing an environment that fosters creativity, productivity, and overall success in the industry.

Keywords: Ergonomic, Handicraft, Working environment

Theme 3: 107
Nutrient Management in Conservation Agriculture

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Nutrient management plays a pivotal role in conservation agriculture (CA), a sustainable farming approach aimed at preserving soil health, enhancing crop productivity, and mitigating environmental degradation. CA emphasizes three key principles: minimal soil disturbance, permanent soil cover, and diverse crop rotations. These principles create an environment conducive to nutrient retention and utilization, promoting long-term soil fertility and productivity. The nutrient management aspect of CA has received less attention. Although efficient nutrient management could increase the adaptation of CA. Optimizing it requires a multifaceted approach that considers various factors such as soil type, climate, cropping system, type of nutrient used, and nutrient cycling processes. In a CA-based system, crop nutrient requirements are satisfied through integrated management, which recognizes the contributions of fertilizer placement, legume introduction, and crop residual mulching. The 4R stewardship principles: right fertilizers, right technique, right dose, and right timing are to be followed to raise the nutrient use efficiency while using management techniques based on CA. Tools like leaf colour chart, SPAD meter, green seeker, and decision support systems (nutrient expert) help in soil and plant-based nutrient management, increasing their nutrient use efficiency and decreasing the losses via denitrification, volatilization, and leaching.

Keywords: Agriculture, Conservation, Management, Nutrient

Theme 3: 108
Management of Gummosis by Using Copper Sulphate, Boron and Copper Oxychloride in Mango Orchard

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Gummosis is one of the major disease of mango plants. Gummosis disease of mango caused by *Lasiodiploidia theobromae* is one of the economical important disease. The disease is also associated with nutrient deficiency. The disease is more prevalent after rainy season before the onset of winters which are planted in sandy/ light soil but also noticed in other mango growing soil. The symptoms is appears in the form of profuse oozing of gum on the surface of the affected wood, bark of the trunk and also larger branches but more common in cracked branches. In severe cases, droplet of gum trickle down on stem and bark which turn dark brown with cracks and later the tree dries up to cracking, rotting and girdling effects. In the district farrukhabad kaimganj tehsil and kamalganj block are main mango growing belt which shown that up to 25-40 years old mango trees are affected by the gummosis. Therefore an experiment was conducted by KVK, Farrukhabad (U.P.) during -2021-22 to find the effect of copper sulphate, boron and copper oxychloride for management of gummosis in mango orchard. The treatments combinations involved were T_1-Farmers practice (No use of any substances), T_2- (Copper sulphate-400-500 g/ plant during January, June and October), T_3- (Copper sulphate-400-500 + Boron -100 g/ plant + Spray Copper oxychloride 0.3% during January, June and October). The 25-35 year old 10-10 plant were selected for the experiment in three locations. The treatment T_3 was found the best among all the treatment in term of disease intensity, reduced population of gummosis, reduced new development of lesion, cracks on branches and trunk. The Copper sulphate-400-500 + Boron -100g/ plant and Spray Copper oxychloride 0.3% on whole plant during the month of January before start spring, June and October was found most effective and economically among the farmers.

Keywords: Management, Gummosis, Mango orchard

Theme 3: 109
Nitrogen Management in Organic Wheat Production

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A field experiment was conducted during *rabi* seasons of 2022 and 2023 at Organic Farming Unit (Agronomy), Rajasthan College of Agriculture, MPUAT, Udaipur to study the effect of nutrient management practices on the development and production of organic wheat (*Triticum aestivum* L.). The experiment consists 8 nutrient management practices, viz.100% RDN through FYM as basal; RDN through FYM as basal + 50% RDN with 1st irrigation; 75% RDN through FYM as basal + 25% RDN with 1st irrigation; 50% RDN through FYM as basal + 25% RDN with 1st irrigation + 25% RDN with 2nd irrigation; 100% RDN through FYM as basal+ Jeevamrut @ 500 L ha^{-1} at sowing and 1st irrigation + Panchagavya @ 5% at booting stage; 50% RDN through FYM as basal + 50% RDN with 1st irrigation+ Jeevamrut @ 500 L ha^{-1} at sowing and 1st irrigation + Panchagavya @ 5% at booting stage; 75% RDN through FYM as basal + 25% RDN with 1st irrigation+ Jeevamrut @ 500

L ha^{-1} at sowing and 1st irrigation + Panchagavya @ 5% at booting stage; 50% RDN through FYM as basal + 25% RDN with 1st irrigation + 25% RDN with 2nd irrigation+ Jeevamrut @ 500 L ha^{-1} at sowing and 1st irrigation + Panchagavya @ 5% at booting stage. The experimental results revealed that among the nutrient management practices the highest plant height (43.43 and 44.51 cm), gain yield (44.52 and 44.84 q ha^{-1}) and biological yield (110.35 and 110.58 q ha [1]) were recorded with 75% RDN through FYM as basal + 25% RDN with 1st irrigation+ Jeevamrut @ 500 L ha^{-1} at sowing and 1st irrigation + Panchagavya @ 5% at booting stage.

Keywords: Nutrient management, Grain yield, Biological yield, Crop growth rate, Organic wheat

Theme 3: 110

Conservation Agriculture – Integrated Nutrient Management

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Conservation agriculture has come up as a new paradigm to achieve the goal of sustainable agriculture production. It typically improves soil quality and water conservation; however, its effect on crop productivity is highly variable and dependent on local conditions/management. Crop residue retention plays a crucial role in CA and can help to improve overall soil health and ultimately crop productivity and sustainability. Therefore, compared to the conventional intensive tillage, CA has a greater potential for soil C sequestration, favours higher soil biodiversity, lowers greenhouse gas emission, and can assist in mitigating climate change. The world vision of no hunger target, food security, and zero poverty followed by raising standards of living of rural people through agricultural transformation is the greatest challenges faced by the agricultural planners worldwide. The concept of using different sources of plant nutrients combined to check nutrient depletion, maintain soil health, and crop productivity, called INM, has a bright solution in this area. Recently several researchers introduced that integrated use of inorganic fertilizers, organic fertilizers, green manure, and bio-fertilizers is becoming an effective practice not only for increasing crop production and productivity but also for the better crop and soil health. In addition, INM helps to increase the activity of soil microorganisms and improves the soil physical, chemical and biological properties. So, INM create an economic eco-friendly environment by reducing the dependence on inorganic chemical fertilizers and improving the soil fertility, optimizing crop yield, maximizing profitability and ultimately making the agriculture sustainable. The interest of agriculture specialists and farmers must be turned toward a simple technique of integrated nutrient management, which is an acceptable option, a cost-effective practice, can be easily followed by farmers, and an eco-friendly approach, reducing the claim of fertilizers and could produce greater yield production with better quality traits and maintain satisfactory profit.

Keywords: Conservation agriculture, Integrated nutrient management, Soil fertility

Theme 4: 111
Decoding Engagement: Unravelling Factors of Involvement in Knowledge Value Chains among Marine Fisherfolks with a Minimum Legal-Size Focus

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In the intricate web of marine ecosystems, the sustainable management of fisheries requires a profound understanding of the factors influencing the engagement of fisherfolks in knowledge value chains. The delicate balance between ecological preservation and economic sustenance has prompted a closer examination of the determinants that shape the involvement of marine communities in these knowledge networks. The Minimum Legal Size serves as a pivotal regulatory tool, dictating the permissible size of harvested marine species introduces unique dynamics that necessitate careful exploration. By honing in on the Minimum Legal Size perspective, this research aims to shed light on the complex interplay between regulatory frameworks and the knowledge-sharing practices within marine fishing communities. As we probe into this investigation, we recognize that the engagement of fisherfolks in knowledge value chains is not only influenced by regulatory policies but is also connected to multiple factors at various levels. By adopting a holistic approach, this study seeks to offer a comprehensive understanding of the multifaceted forces such as social capital, socio-economic factors, cultural elements, etc., that shape the decision-making processes and participation levels of marine fisherfolks in knowledge value chains. The outcomes of this research not only contribute to the scholarly discourse surrounding fisheries management but also offer practical insights for policymakers, resource managers, and community leaders. By decoding the elements that drive engagement in knowledge value chains within the context of Minimum Legal Size, we strive to foster a more sustainable and collaborative approach to fisheries management, one that respects both the ecological integrity of marine environments & the livelihoods of the communities reliant on them.

Theme 4: 112
A Tool to Measure Farmers' Knowledge about Fish Farming

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The growing demand for protein-based food products underscores the need to evaluate the knowledge levels of farmers, particularly those involved in fish farming. The test aims to evaluate their understanding of fish farming principles, best practices, disease management and other relevant aspects. This test was developed in Haryana state during 2023. A total number of 43 items were subjected to experts for relevancy testing and finally 39 items (overall mean score > 2.40) were selected for item analysis. The 39 items were presented to 60 respondents from other than the study area. Based on item analysis score, difficulty index and discrimination index were calculated. The items with difficulty index ranging from 30 to 80 and discrimination index above 0.3 were selected. For reliability (Cronbach alpha, Spearman brown coefficient and Guttman split half) and validity (point biserial correlation) were estimated for standardization of the test and found to be highly significant. Ultimately 35 items were selected for the final knowledge test. Thus, reliability and validity of the current test indicate the consistency and precision of the results. The developed test will help in assessing the knowledge level of fish farmers about scientific fish farming.

Keywords: Fish farmers, Item analysis, Knowledge test, Reliability and validity

Theme 4: 113
Effect of Liver Enhancer on Growth, Survival and Production of Major Carps at Farmer's Field

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The present study was intended to determine the effects of liver enhancer during field application when add in farm-made-aqua-feed under a semi-intensive culture system on the growth, survival and production parameters of three Indian major carps (IMCs), *Catla catla* (Catla), *Labeo rohita* (Rahu), *Cirrhinus mrigala* (Mrigal) and three exotic carps *Cyprinus carpio* (Common carp), *Ctenopharyngodon idella* (Grass carp), *Hypophthalmichthys molitrix* (Silver carp) cultured in a ratio of 1.5:2.0:1.5:1.5:2:1.5 (Catla/Rahu/Mrigal/Common carp/Grass carp/Silver carp) at five farmer's pond for a period of one year (August to June). Each farmer's pond was having an area of 0.1ha and stocked with 4000 nos. of fish fingerlings of 25-40 mm size. Results were compared with control (C: fed only with farm-made-aqua-feed) and treatment (fed with liver enhancer @ 2g/day plus farm-made-aqua-feed) @) at the rate 3% body weight in both ponds. A significant increasing trend was observed in the growth parameters including total length-final (TLF), standard length-final (SLF), mean weight-final (MWF), % gain of mean total length (MTL), % gain of mean standard length (MSL), % weight gain (WG), specific growth rate (SGR) % per day, survivability % and increase in yield. Fishes depicted good health and shining skin colour. Results indicated favourable growth and yield, which may benefit fish farmers during their culture practices, and the addition of liver enhancer resulted into good output of fish species with good quality food-fish for human consumption.

Keywords: Liver enhancer, Growth, Survival, Production, Carps

Theme 4: 114
Impact of Climate Change on Fisheries of J&K

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Climate change poses a significant threat to aquatic biodiversity, particularly affecting the diverse fish fauna of Jammu and Kashmir, India. Rising temperatures, altered precipitation patterns, and habitat degradation have led to substantial declines in native fish populations and facilitated invasions of non-native species. These changes jeopardize regional biodiversity, upsetting delicate ecosystems. The region experiences varying impacts of climate change and variability, resulting in reduced water levels in rivers and streams, endangering the habitats of freshwater fish such as trout. Additional stressors, including excessive water pollution, deforestation, and the introduction of invasive species, contribute to the decline in local fish populations. This decline not only endangers the environment but also poses risks to the food industry and the livelihoods of those dependent on fishing. The impact on the fisheries sector is part of the broader implications of climate change on various sectors in the region, encompassing glaciers, rivers, forests, soils, ecosystems, society, and the economy. Urgent attention and sustainable management strategies are needed to address the declining fish populations caused by climate change and other factors, safeguarding fisheries and the livelihoods they support.

Keywords: Climate, Jammu & Kashmir, Biodiversity, Freshwater fish

Theme 4: 115
Harmony and Discord: Unveiling the Dual Roles of Bacteria in Fish Health

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In aquatic ecosystems, the symbiotic relationship between fish and bacteria is complex, encompassing both beneficial and detrimental aspects. Beneficial bacteria, such as Lactobacillus and Bacillus strains, play vital roles in fish health by aiding in digestion, facilitating nutrient absorption, and bolstering immune function. These microorganisms contribute to the overall well-being of fish, particularly in aquaculture settings, where optimal growth and disease resistance are paramount. Conversely, pathogenic bacteria like Aeromonas and Vibrio species pose significant threats to fish health, causing diseases such as fin rot and bacterial septicaemia. These pathogens can disrupt the delicate balance of the fish microbiome, leading to dysbiosis and increased susceptibility to disease, especially in environments with poor water quality or temperature fluctuations. Furthermore, the indiscriminate use of antibiotics in aquaculture presents a pressing concern due to the emergence of antibiotic-resistant bacteria. This not only jeopardizes fish health but also raises broader public health concerns regarding the consumption of contaminated seafood. Therefore, responsible antibiotic use and the development of alternative disease management strategies are essential for mitigating this risk and ensuring the sustainability of aquaculture practices. Understanding the intricate dynamics between fish and bacteria is crucial for maintaining healthy aquatic ecosystems and sustainable fisheries. Researchers continue to explore the nuances of the fish microbiome, seeking ways to harness the benefits of beneficial bacteria while minimizing the impact of harmful pathogens. Probiotics, which consist of beneficial bacteria, offer promising avenues for enhancing fish health and reducing reliance on antibiotics in aquaculture.

Keywords: Fish bacteria, Probiotics

Theme 4: 116
Effect of Temperature on Reproduction and Survival of Adult Guppy

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Guppy fish *(Poecilia reticulate)*, commonly known as "millions fish" or "rainbow fish," is one of the most popular and widely imported ornamental freshwater fish species globally, accounting for one-fourth of trade volume and 15% of global trade value, along with neon tetra. The purpose of this study was to determine how temperature variations-a crucial aspect of Jammu and Kashmir-affect the ability of adult guppy (*Poecilia reticulata*) to survive and reproduce over the course of a four-month period (4th September to 4th January). Four treatments-T1 (24°C), T2 (26°C), T3 (28°C), and T4 (outdoor temperature)-were used in triplicate for the experiment in 45x30x30 cm aquariums. Each tank included six pairs of mature guppy fish, with an average length of 4.19±0.028 cm and a weight of 0.09±0.002g. In December at 14°C, the T4 treatment showed 0% survivorship, while the T1, T2, and T3 treatments showed the highest survivability (100%) overall. T3 had the highest fecundity and fry output, with a substantial difference as compared to T1 and T2. The current study's results clearly show that, in comparison to other temperatures, T3 therapy improved the survivability and reproductive efficiency of female guppy.

Keyword: Guppy survivability, Reproduction, Temperature effect

Theme 4: 117
Sustainable Fishing Practices: Balancing Conservation and Economic Viability

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As global concerns about overfishing and environmental degradation intensify, the need for sustainable fishing practices becomes paramount. This article aims to explore the intricate balance between conservation efforts and economic viability in the fishing industry, highlighting key strategies, challenges, and advancements that contribute to a more sustainable future. One pivotal aspect of sustainable fishing involves the implementation of selective fishing gear. This technology aims to reduce bycatch, minimizing the unintentional capture of non-target species. By adopting gear designed for specific species and sizes, fisheries can mitigate ecological impact while maintaining economically viable catch levels. Embracing ecosystem-based management approaches is crucial for maintaining the health and resilience of marine ecosystems. This strategy considers the interconnectedness of species and habitats, emphasizing the importance of preserving the overall ecosystem rather than focusing solely on individual species. Aquaculture plays a vital role in meeting the increasing demand for seafood while reducing pressure on wild fish stocks. Innovations in sustainable aquaculture practices, such as recirculating systems, responsible feed formulations, and disease management techniques, contribute to the industry's economic viability while lessening its environmental footprint. The integration of technology, including satellite monitoring, artificial intelligence, and blockchain, enhances the monitoring and enforcement of fishing regulations. This not only combats illegal, unreported, and unregulated (IUU) fishing but also promotes transparency and accountability throughout the supply chain. A comprehensive approach to sustainable fishing acknowledges the socio-economic dimensions of the industry. Community-based fisheries management, fair labour practices, and initiatives promoting gender equality are integral to creating a sustainable and socially responsible fishing sector.

Keywords: Sustainable, Aquaculture, Illegal

Theme 4: 118
Export of Fish and Fisheries Products from India: Current Status and Prospects

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Exports of fish and fisheries products are important to the Indian economy in terms of employment, income generation and increasing foreign exchange earnings. During the financial year 2021-22, India exported 13,69, 264 MT of Seafood worth US$ 7.76 Billion (Rs. 57,586 Crores). The USA and China are the major importers of Indian seafood. Frozen Shrimp continued to be the major export item. In 2021- 2022, India exported fish and fisheries products to 123 nations. India's export basket includes shrimp, finfish, cuttlefish, squid, dried fish, chilled items and live items. Shrimp export accounted to 53.18% of total export in terms of quantity and 74.16% of total exports in terms of value, with the Pacific white legged shrimp Litopenaeus vannamei being the most important contributor of seafood export basket. Target of increasing fish production to 22 MT and doubling export from the present value has been set by the Government under PMMSY. Further, the Government of India has launched a number of initiatives to fully realize the potential of the fisheries sector in a sustainable and responsible manner. The Govt. has taken several initiatives to boost export of fish by enhancing export

target of fisheries products to Rs. One lakh crore during 2020-25, diversifying the export basket by adding new and value added products, exploring newer markets and expanding existing markets, boosting production of high value products and value - added products, promoting diversification in aquaculture species for exports, providing institutional mechanism for easing markets access, minimizing trade barriers and solving other issues related to sanitation and phytosanitation and enabling fishers and farmers to get benefits of export opportunities.

Keywords: Fisheries, Employment, Export, Income generation, Indian economy, PMMSY

Theme 4: 119
Role of Fisheries in Indian Economy

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Fisheries and aquaculture are an important source of food production, nutritional security, employment, and income in India. The fisheries sector is a direct source of livelihoods for more than 20 million fishers and fish farmers; contributes INR 1.75 trillion annually to the gross value added to India's economy; and is a major export earner. With a coastline of over 8,000 km, an Exclusive Economic Zone of over two million square km, and with extensive freshwater resources, fisheries play a vital role. India has the distinction of second largest fish producing country of the world after China with exports worth more than Rs. 47,000 crore. The total fish production during 2017-18 was registered at 12.61 million metric tonnes (MMT) with a contribution of 8.92 MMT from inland sector and 3.69 MMT from marine sector. The marine fishery potential in the Indian waters have been estimated at 5.31 MMT constituting about 43.3% demersal, 49.5% pelagic and 4.3% oceanic groups. Fisheries are the country's single largest farm export, recording a growth rate of 6 to 10 per cent during the past five years, against the growth rate of 2,5 per cent observed in the farm sector. It has a marine fisher population of 3.5 million; 10.5 million people are engaged in inland fishery and fish farming. There is enormous potential of fishing industry in India to flourish. The investment of Rs 3,000 crore in the Blue Revolution is being supplemented through the Rs 7,523-crore Fisheries and Aquaculture Infrastructure Development Fund for meeting the capital investment requirement of this sector. The productivity of freshwater fish farms has gone up to more than 3 metric tonnes per hectare from the 2.5 tonnes per hectare. Productivity of brackish water coastal aquaculture has touched 10 to 12 metric tonnes per hectare. Thirty thousand hectares have been added to the area under fish farming. The government has invested in hatcheries to meet the ever-increasing demand for good quality fish seed. The expansion of aquaculture would increase this demand exponentially. Nearly 8,000 cages have been installed and even though a cage gives a modest yield of three tonnes of fish, this translates into a more than 1,000 per cent increase in productivity. This new practice gives freedom to fishermen from the risk of traversing dangerous rivers and restricted reservoirs.

Keywords: Fisheries, Indian economy

Theme 4: 120
Changing Role of Women in the Development of Fisheries Sector in India

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Women play a crucial role in marine fisheries and aquaculture, specifically in the small-scale and artisanal fisheries sector. There are about 5.4 million people fully engaged in fisheries activities, including 1.50 million fisherwomen. Several activities like seaweed and shellfish collection, fishing, weaving and repairing nets, processing, sales, local and intra-regional trade are being performed by women. Clams, crabs, fish fry, seaweed, chank etc. are fished by women in states like Kerala, Tamil Nadu, West Bengal, Andhra Pradesh, Odhisa, Gujarat and the North East. Freshwater pearl culture is a diversified activity in aqua-farming systems. There are three identified pearls mussel species namely *Lamellidens margnialis, L. corrianlis* and *Parreysia corrugate*. These different varieties of pearls are cultured using three different pearls are cultured using three different surgical procedures. Women are being encouraged and trained in pearl culture for alternative source of income. A practice of backyard ornamental fish culture is being adopted as a lucrative and stable business by women in remote villages and they are being encouraged to adopt innovative and economically advantageous technologies. Women are being employed and trained in raising short term crops of fish fry, fingerlings costs in the neglected large number of small and backyard ponds. Seed collection and grading is also being done by them as an alternative source of income as they have developed skills for grading juvenile sea bass fattening of crabs, mussel, pearl and oyster. Market related information is being provided to women through technology dissemination, imparting training on time efficient technologies. Fisherwomen are already playing an important role in sorting and grading different varieties of fish for sale in the local markets.

Keywords: Changing role, Development, Fisheries, Women

Theme 5: 121

Transformative Impact of Mobile App on Dairy Farmers' Knowledge About Management of Parasitic Infestation and Antiparasitic Resistance

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Mobile is today's most popular device for information dissemination owing to the 275 million smartphone subscribers present in India and providing hope for improvement of the extension services through the recent advancement in this field of mobile applications and their use. The mobile app is crucial to dairy farmers in improving their decision-making ability to cope up with the changes and meet future challenges of increased milk demand. The effectiveness of the developed IVRI-Parasite Management Guide app was tested among a total of 160 Small Dairy Farmers (SDF) and Large Dairy Farmers (LDF) of Rajasthan and Uttar Pradesh, the two high-productivity states of India. A semi-structured interview schedule was used for data collection. The overall knowledge of management of parasitic infestation in dairy animals, the Mean Rank Score (MRS) increased from 16.70 to 17.62 and 18.77 to 19.17 for SDF and LDF, respectively. Consequently, the knowledge gap reduces from 44.33% to 41.25% and 37.41% to 36.08% in case of SDF and LDF, respectively. Further, under the dimension of prevention and control of parasiticide resistance emergence, the MRS increased from 3.38 to 3.53 and 4.21 to 4.37 for SDF and LDF, respectively. The knowledge gap reduced from 63.30% to 60.98% for SDF and from 533.30% to 51.33% for LDF. This suggests that the app has successfully narrowed the knowledge gap among its users.

Keywords: Dairy, Farmer, Knowledge, Mobile app

Theme 5: 122

Income Generation of Tribal Youth Through Agro-enterprises in Southern Rajasthan

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The present research work was undertaken with the objective to find out the income generation through agro-enterprises by the tribal youth under ARYA project. Agriculture needs to be made more profitable to create interest and confidence among rural youth and retain them in agriculture. Rural youth are migrating to urban areas in search of jobs and on the other hand, small holdings are on the rise which poses challenge to food security for increasing population. Income generation is the most crucial parameter in enterprise by which any venture can be termed as success or unsuccessful. If the outputs are not yielding the desired returns, the effort is wasted, and the person switches to another activity. Therefore, The study was conducted under the ARYA project in KVK Banswara and Udaipur of Rajasthan, with a total sample size of 200 tribal youth. There were three agro-enterprises selected for the study namely goat farming, poultry farming and nursery management. The research findings revealed that the respondents earned annual net profit of Rs. 1,06742/- from goat farming, Rs. 77,980/- from nursery management and Rs. 57,140.98/- from poultry farming. All the three agro-enterprises were found profitable as the benefit cost ratio was 21.34, 6.3 and 14.18 for goat farming, poultry farming and nursery management, respectively.

Keywords: Agro-enterprises, ARYA project, Tribal youth, Rajasthan

Theme 5: 123
Sustainable Agriculture as a Catalyst for Livelihood Security and Women Empowerment in Rural India

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The agricultural sector is one of the main drivers of India's growth and development which is essential to the nation's advancement. A critical concern in Indian agriculture is raising agricultural output while protecting and increasing natural resources. Sustainability of agriculture is the answer to this issue in the evolving landscape. As the agricultural landscape faces unprecedented challenges such as climate change, resource depletion, and socio-economic disparities, adopting sustainable practices becomes imperative. Sustainable agriculture, characterized by environment friendly and socially responsible farming methods, not only addresses the pressing challenges of food security and climate change but also holds the key to transforming the lives of rural communities, particularly women. Sustainable agriculture encourages diversification of crops and livestock, reducing the risk associated with mono-cropping. This diversification not only ensures food security but also opens up new income streams for rural households. Despite the positive impact of sustainable agriculture, challenges such as limited access to resources, awareness, and market linkages persist. Being responsive to women and men according to their respective needs is also critical for sustainable agriculture. Addressing these challenges requires collaborative efforts from government bodies, NGOs, and local communities. Investments in education, research, and infrastructure are crucial to ensure the long-term success of sustainable agriculture initiatives and to create an environment conducive to women's empowerment in rural areas. By promoting eco-friendly farming practices, empowering women, and ensuring livelihood security, sustainable agriculture not only addresses immediate challenges but also paves the way for a resilient and sustainable future. Recognizing the vital role of women in this transformation is essential for creating inclusive and equitable rural societies, where the benefits of sustainable agriculture reach every corner of the country.

Keywords: Agriculture, Empowerment, Livelihood, Rural, Sustainable, Women

Theme 5: 124
Value Chain Analysis of Goat Farming Practices in Bihar

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Goat is largely reared for chevon production and contributes largely to the livelihood of resource-poor households specifically in climatically disadvantageous regions, where crop production is always at risk. Goat farming is less capital intensive and thus suitable for a large number of rural populations. Goat has multi-facet utility for meat, milk, skin, wool, hair and manure, etc. Bihar is the 5th largest goat population state in India, and it is about 7.68% of country's total goat population. In Bihar, 42.6% people are in below poverty line and hence there is an immense opportunity for goat husbandry to meet up the large gap between demand and supply of meat. Goat farming in Bihar is very popular commercial livestock business as there is a huge demand for goat meat all over the state. Every year, 6,00,000 goats are slaughtered in slaughterhouses, which is about 32% of total goat meat production of Bihar. Goats are collected from the farm gate to livestock markets by primary traders who sell

them to butchers/secondary traders. The secondary traders collect goats from local mandies (markets) and send to end-markets. Goats are also collected directly by the butchers from farm gate in Bihar. Most of the markets are managed by market committees/municipalities/private agencies with out any veterinary health facilities, fodder and fresh water for animals and shelter for stay. In Bihar, goat farming is not well accepted business by all classes of people. In olden days, goat farming is confined only to backward and landless people in rural areas of Bihar. However, the scenario is completely changed and goat farming is recognized as an industry and more unemployed and people who want to earn more with livestock are setting up goat farm businesses throughout Bihar. Bihar also supplies goats to other neighbouring states. There are many individuals getting profits in small scale goat farming business. Bihar has an excellent grazing area for goats for extensive farming method. Goat farming in Bihar is proven and successful business. Investment for goat farming in Bihar depends on the flock size and ones target. Anyone can start with 2 goats and can expand the shed as one can gain more experience and profits. It is more useful to know about the goat basics, various goat development schemes/subsidies and goat value chain etc, from goat farming training centres, State Veterinary University and Animal Husbandry Department before starting a goat farming enterprise.

Keywords: Goat farming practices, Goat value chain, Goat farming enterprise

Theme 5: 125
Study of Dairy Value Chain and Implications of Advisory Services of Uttar Pradesh

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Uttar Pradesh state was selected based on average milk production and the districts (Azamgarh and Kanpur Nagar) were selected based on the purposively from both districts who were involved in dairy value chain. for the present study. From each of the two districts 40 milk producers, 4 input suppliers, 4 cooperative, 8 processing unit, 4 wholesaler, 4 retailer, 4 sweet shop and 10 consumers so as to constituted sample size 78. Random sampling method was used for the selection of actors which were involved in dairy value chain. Primary data was collected using interview method. The secondary data collected by reviewing literature and internet sources pertaining the relevant study. The major actors in value chain were milk producers, input supplier, processing unit cooperative society, sweetshops, wholesalers, retailer, and consumers. The study analyzed the basic components of value chain as activity, information flow and channel before it reaches the end user. Farmers indicated that milk yield is highest during the first four months of lactation and decline thereafter. However it depends on the month of calving, feed availability, milking experiences etc. The mean milk yield per day was an average of 20 liters for exotic breeds, 10 liters for cross breeds and 6 liters for locale breeds. During investigation find out milk producers largest portion of milk were sold to milk market (local milk mandi) 27.5 percentage followed by 22.5 percent sold of sweet shop, 20 percentage of milk sold through home delivery, 15 percentage of milk sold in locale area and 10 percent of milk was sold directly to the consumers from farm. From the result it is clear that milk producers still not connected to organized sector. So there need is need to more attraction of milk producer so that they can sell milk direct by to organized sector to get more benefits.

Keywords: Dairy farming, Socio economic status, Value addition

Theme 5: 126
Leveraging Innovations in Dairy Sector for Sustainable Development

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The dairy and livestock sectors contribute significantly to the sustainability of the environment, livelihood and global food security. In order to achieve sustainable development, it is imperative that the livestock sector use innovations in light of the global issues of population expansion, climate change, and resource constraints. The main areas that innovation may influence positively and help create a more sustainable future are examined in this study. Farmers may enhance the health, feeding and general management of their animals by using cutting-edge technology like sensors, data analytics and artificial intelligence. Selective breeding can improve animal resilience and lessen the need for overuse of antibiotics by selecting for features including heat tolerance, illness resistance and feed efficiency. This solves issues with environmental pollution and antibiotic resistance in addition to improving animal welfare. Waste created from animal husbandry such as manure, may be reused as valuable resources through creative technologies like biogas generation and nutrient recycling. By adopting these methods, the sector's overall ecological footprint is reduced, soil health is enhanced, and greenhouse gas emissions are decreased. Furthermore, adopting substitute protein sources like plant-based feed and insect farming offers a workable route towards sustainability. This reduces the environmental effect of traditional animal feed manufacturing while also diversifying the protein supply chain. In summary, using advancements in the cattle industry is essential to accomplishing sustainable development objectives. Precision agriculture, genetic innovations, circular economy ideas, and substitute protein sources all help to improve resilience to global issues, environmental stewardship and production.

Keywords: Livestock, Sensors, Data analytics, Sustainable development, Artificial intelligence

Theme 5: 127
Maggot Debridement Therapy for Reducing Oxidative Stress Enhance Early Diabetic Wound Healing

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Molecular oxygen plays a central role in pathogenesis and therapy of chronic wounds. Overproduction of reactive oxygen species (ROS) results in oxidative stress causing cytotoxicity and delayed wound healing. Beneficial effect of *Lucilia sericata* maggot in healing chronic wound is widely reported. Present study was aimed to evaluate the effectiveness of maggot therapy in reducing oxidative stress in chronic wound healing. A total of 48 numbers of rats were taken where chronic wound was created by inoculating mixed colonies of bacteria. Animals were randomly divided into 4 groups with 12 each being presented as control, antibiotic, maggot and maggot and antibiotic in combination treated. Treatments were applied once for 24 hours. Different oxidative stress parameters were evaluated in all groups at weekly interval and recorded. Significant increase of Glutathione-S-transferase with a decreased level of Lipid peroxidation (LPO) in comparison with other groups ($P<0.05$) on 21th day of treatment, which were correlated with significant reduction of wound measurement in maggot treated wound in different days of treatment with complete healing on 14st day of treatments. Decrease wound area, increase GST and decrease LPO level in maggot treated animal might be due to free radical scavenging activity of ES of blowfly maggot.

Keywords: Chronic diabetic wound, Maggot debridement therapy, Oxidative stress

Theme 5: 128
Knowledge level of Farmers about Pratapdhan Breed under Backyard Poultry in Udaipur District of Rajasthan

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Indian poultry industry, as it exists today is a mixture of traditional backyard system of poultry keeping and modern space age technology. Poultry has a crucial place in India as the eggs and chicken meat are rich source of protein, vitamin and minerals. AICRP on Poultry Breeding running at MPUAT, Udaipur has developed a dual-purpose chicken breed to cater the needs of rural poultry keepers coined as Pratapdhan which bear a resemblance to local birds of Rajasthan. The study regarding knowledge level of farmers about Pratapdhan breed under backyard poultry was conducted in Udaipur district of Rajasthan. The four villages from two tehsils, Girwa and Gogunda of Udaipur district were selected. It was observed that out of the 120 respondents, 69.17 per cent of the beneficiary farmers had medium level of knowledge regarding Pratapdhan breed under backyard poultry, while 16.67 and 14.17 per cent of the beneficiary farmers had low and high level of knowledge, respectively. The findings were also supported by calculated 'Z' test value 3.233 was found to be greater than the tabulated value which is statically significant at 1 per cent level of significance which shown the significant difference between the knowledge level of Girwa and Gogunda tehsils respondents about Pratapdhan breed under backyard poultry. Therefore, it is recommended that knowledge of poultry farmers should be increased through exposure and trainings.

Keyword: Pratapdhan breed, Backyard poultry, MPUAT area, Dual-purpose, Chicken breed

Theme 5: 129
The Economic Losses to Livestock Owners due to Plant Toxicity in Dairy Animals

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The toxic plants are affecting the health of dairy animals and hence, income of dairy farmers. Many of the plants which adversely affect the animal health are found in vicinity of the farmers. Sometimes, the farmers lack information regarding those toxic plants and it comes to feed of the animal whereas sometime due to accidental ingestion the animals are affected. The study was conducted in Rohilkhand region i.e. Bareilly, Badaun, Pilibhit and Shajahanpur of Uttar Pradesh. From each district, three villages were selected randomly and from each village 20 farmers were interacted. More than 30 toxic plants were collected from farmers' field based on farmers' perception but only those toxic plants were documented for which favourable review of literature were available. Critical Incident technique was employed to study the detrimental effect of *cuscuta reflexa* on dairy animals. The reduction in milk yield (68.67%) shares the maximum percentage of economic loss due to feeding contaminated *berseem* followed by replacement cost (25.38%) and then treatment cost (5.95%). It was observed that the maximum economic losses due to plant poisoning was found because of milk yield loss in dairy animals (26.51%) followed by treatment cost (22.42%) and then opportunity cost due to death of an animal (17.59%). However, economic losses due to plant poisoning in dairy animal for *Khamaria* village of Pilibhit was found minimum as the awareness and knowledge level of farmers was high for this village.

Keywords: Toxic plants, Dairy farmers, Rohilkhand region, Critical Incident technique, *cuscuta reflexa*

Theme 5: 130
Role of Artificial Insemination in Bovine Upgradation for Developing Rural Economy

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Artificial insemination (AI) in bovines plays a crucial role in the rural economy by upgrading genetic traits, leading to increased productivity and income for small-scale farmers. This cost-effective approach allows access to superior genetics without the need for expensive breeding bulls. Artificial insemination is the most imperative technique to bring genetic improvement in the animals yet its potential is not entirely adopted by many farmers. A contemporary study was conducted in three districts of Jharkhand to know the role of bovine breeding and management practices which ultimately can contribute to the economic development of rural livestock farmers. The data was collected from 204 respondents (180 farmers and 24 service professionals) with the help of pre structured interview schedule. The study revealed that 67.22 per cent of the respondents served their animals using AI. Still, 12.22 per cent of the respondents were practicing natural breeding in their animals. Pooled value showed that most of the respondents (46.67%) were having small herd size (Standard Animal Unit < 2.03) followed by medium (Standard Animal Unit 2.03-3.54) (32.77%) and large (Standard Animal Unit > 3.54) (20.56%) herd size. About 68 per cent of the respondents used AI in non-descript cattle whereas 88.89 per cent used it in crossbred cattle. Overall, 92.41 per cent of the respondents agreed that they adopted AI because it helped in breed improvement followed by 91.77 per cent of the respondents who said that it was time saving and convenient as compared to natural breeding. Other reasons for adoption were low possibilities of infection (74.68%) and it was economical as compared to natural service (41.77%).

Keywords: Artificial insemination, Standard animal unit, Adoption, Rural economies

Theme 5: 131
Traditional Knowledge in Goat Farming for Sustainable Development

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Animal husbandry and livestock sector contributes to approximately 10% of the state GDP. Animal Husbandry is not only a subsidiary occupation to agriculture but it is a major economic activity. Goats are a very important species of livestock in India, mainly on account of their short generation intervals, higher rates of prolificacy and the ease with which the goats and their products can be marketed. The goats are especially useful in the semi-arid and arid zones, where they can sustain themselves on sparse vegetation and extreme climatic conditions where other species of animals may perish. Goats are one of the main meat animals in India contributing more than 10 percent of the total meat production in the arid and semi-arid regions of the Rajasthan. Goats possess wide range of adaptability and higher disease resistance. The rural farming community has evolved their own practices over years through the indigenous knowledge of goat farming. In this backdrop of importance mentioned above this article examines the traditional wisdom in goats farming that has been practiced by generations and its contribution to sustainable development of our eco system.

Keywords: Goat farming, Traditional wisdom, Farming community, Sustainable development

Theme 5: 132
Dissemination and Adoption of Scientific Livestock Production Technologies in Jodhpur district

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Rajasthan ranks second with 10.6% of the livestock population of the country. However, the productivity of livestock in the region is low and lot of scope exists to enhance the production potential. In this context, action research was undertaken to disseminate the scientific livestock production technologies based on the gaps identified among the livestock readers and measure the adoption. The study was undertaken from 2019 to 2022 in Jodhpur district of western Rajasthan. Primary data was collected from 200 farm families using a semi-structured interview schedule. The major livestock species in the study area were cattle (47% households), buffalo (17%), goat (27%) and sheep (9%). Improved livestock rearing technologies developed by Central Arid Zone Research Institute (CAZRI) and National Agricultural Research and Education System (NARES) were disseminated through various extension methodologies viz. field demonstrations of fodder crops, skill trainings on preparation of animal feeds, capacity building programmes on scientific livestock technologies and practices and entrepreneurial motivation training exercises. The change in adoption behavior was measured after a period of two years. Maximum change was recorded in adoption of the right milking practice (54.5% farm households), feeding colostrum within the prescribed time limit (49.5%), deworming for gastro-intestinal parasites (49%), weaning (46%) and providing feed supplements (34.5%). The adoption was high for technologies which were simple, less time consuming and provided visible results. Adoption of artificial insemination in cows and buffaloes was low (14%) because of low success rate. Certain technologies and practices such as keeping of pedigreed animal bull and construction of pucca animal sheds needed investment and require institutional support.

Keywords: Adoption, Arid region, Improved livestock technology

Theme 5: 133
Socio-personal, Communication Characteristics of Youth of ARYA Project on Goat Farming in Tribal Area of Banswara District in Rajasthan

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The livestock sector in India's economy is a significant sub-sector of agriculture. In the form of vital inputs, it is a significant source of income for most of the farmers. It benefits the household's health and nutrition while also augmenting income and providing job opportunities. The livestock among tribal communities in India is complex, dynamic and multidisciplinary phenomenon, the perception of which varies with geographic location, age, education, gender, community, job and services, fluctuation in resources, social, cultural, political and ecological determinants. In this study, it was observed that the majority of youth belonged to secondary level of education (43.33%), Schedule caste/ Schedule tribe (SC/ST) category (98.33%) with medium family size (70%) and medium herd size between 9-29 goats (56.16%). It was also found that most of the youth had a medium level of social participation (70.83%), training experiences (60%), mass media utilization behaviour (71.67%), innovativeness (63.33%), extension contact (64.17%), achievement motivation (63.33%) and scientific orientation.

Keywords: ARYA, Socio-personal, Communication characteristics of youth

Theme 5: 134
Role of Livestock Sector in Rural Economy

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Livestock is an important component of farming system in India. It is more popular among the marginal and small farmers as more than 62 per cent of marginal household directly associated with livestock sector. Livestock contributed 16% to the income of small farm households as against an average of 14% for all rural households. Livestock provides livelihood to two-third of rural community. It also provides employment to about 8.8% of the population in India. Livestock sector contributes 4.11% GDP and 25.6% of total Agriculture GDP. The livestock sector grew at a CAGR of 7.9% during 2014-15 to 2022-23 (at constant prices), and its contribution to total agriculture GVA (at constant prices) has increased from 24.3% in 2014-15 to 30.1% in 2022-23. India is world's highest livestock owner at about 535.78 million. First in the total buffalo population in the world (109.85 million), second in the goat population (148.88 million), second largest poultry and fish market in the world, third in the population of sheep (74.26 million) etc. Besides their monetary benefit and providing employment to the rural family, act as insurance during crop failures and the number of livestock owned by a farmer determines the social status among the community. It has the potentiality to overcome poverty, household which are associated with livestock has less chance to fall into poverty. Rearing cattle and poultry also help to improve nutrition among children of the household as the output has great nutritive value and mainly use for consumption purpose. The livestock products such as milk, meat and eggs are an important source of protein. The per capita availability of milk is 459 grams, eggs is 101 eggs and 7.1 kg meat per annum during 2022-23. The livestock sector serves the farmers in different ways such as income, employment, food, social security, draft, dung, sports, weed control etc.

Keywords: Agriculture, Employment, GDP, Income, Livestock

Theme 5: 135
Exploring Aspiration of Rajbanshi Youths from Dairy Farm Families

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Aspiration is a strong desire to have or do something. It helps a person to choose a suitable and desired occupation. An index was developed to study the aspirations of rural Rajbanshi youth. For preparing the level of aspiration index (LAI), 10 dimensions of aspiration were selected considering the wide range of scope of the term aspiration. The dimensions were educational aspiration, training and skill-related aspiration, income expectation, preferred job, agricultural aspirations, aspiration in dairying, goal orientation, work-life balance, work environment and independence of work. The study focused on assessing the aspirations of rural Rajbanshi youth in the Coochbehar district of West Bengal during the year 2022, with a particular emphasis on the dairy farming sector. To understand the aspirations of rural Rajbanshi youth, the index was administered to a sample of 200 respondents from the age group of 15-29 who had at least 50.00 per cent family income from dairy husbandry was selected randomly. The majority of respondents exhibited a medium level of aspiration (44.50%). The respondents express a high level of aspiration for a good work environment (0.82) and a harmonious

work-life balance (0.81), highlighting the importance of both professional and personal aspects in their lives. Notably, training and skill-related aspirations (0.73) ranked high. On the contrary, Goal orientation (0.29), income expectations (0.33) and preferences for a specific job (0.30) exhibit relatively lower scores, signifying a lower expectation of financial goals and specific job roles. The scores in agricultural aspirations (0.35) and aspirations in dairying (0.43) signal a moderate level of interest in these sectors. Targeted initiatives such as offering skill development programs are essential to attract and engage youth in agriculture and dairying.

Keywords: Aspirations, Rajbanshi Youths, Dairy

Theme 5: 136
Livestock Farming: A Reliable Source of Income Generation

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Livestock provides regular, supplementary income to producers engaged in secondary and tertiary forms related to livestock business. Dairy sector has been instrumental in bringing socio-economic transformation. Our country ranks number one in milk production, this success can be crowned to huge number of animals kept, rather than the full utilization of the calibre of animals. In recent years we have seen tremendous improvement in the dairy sector of India, owing the success to the educated youth who are taking interest in the dairy farming. Mr. Raj Chowdhary is an example. He was basically was a media person, he always wanted to start his own business. So, he purchased a cattle, with 10 liter milk production, for trying his luck in dairy business. He kept the cow at his own land and observed that all the milk produced got sold very quickly, this further increased his interest and he brought some more cows. But as he further entered in this business he also started to face some problems as he had no proper guidance or experience in this field. He came in contact with the DBT team. They helped him directly and indirectly by providing free visits and treatment to the animals. Further he received various trainings under the said project which helped him in understanding the management and nutrition of animals. Today he owns 22 healthy animals. The demand of milk is increasing day by day. He has started his own brand of glass bottled milk with the brand name of 'Moo Milk'. All the milk sells very quickly and now he has taken this business as full time and he is very happy with the outcome. His total income per month is Rs. 277500/- and net profit per month is 137500/-. So livestock rearing has great potential in transforming the economic status and welfare of society as a whole.

Keywords: Milk, Dairy business, Income, Livestock

Theme 5: 137
Adoption Level of Beneficiary and Non-beneficiary Dairy Farmers about Milk Production Techniques

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India is the highest milk producer and ranks first position in the world contributing 24.64% of global milk production in the year 2021-22. In the current year 2021-22, the milk production has registered an annual growth rate of 5.29%. Top five major milk producing States are Rajasthan (15.05%). Hence, Rajasthan is the highest milk producing state in India. The present study was conducted in Udaipur district of Southern Rajasthan.

There are 22 Panchayat Samiti, out of which two Panchayat Samiti namely Bhinder, and Sakumber were selected on the basis of maximum milk collection centers. From each selected Panchayat Samiti, Three milk collection centers were selected on the basis of maximum milk collection and 20 respondents (10 beneficiary and 10 non-beneficiary) from each milk collection center were randomly selected with the help of MCC incharge. Thus, total 120 respondents were selected for the study. Data were collected from the respondents by using interview schedule. The collected data was categorized, analyzed by using appropriate statistical measures in computer and tabulated for the convenience. The study indicated that 53.33 per cent of beneficiary respondents and 26.67 per cent of non-beneficiary respondents belong to high level of adoption category and 31.67 per cent of beneficiary respondents and 35.00 per cent of non-beneficiary respondents belong to medium level of adoption category of improved milk production practices. On the other hand, 15.00 per cent of beneficiary respondents and 38.33 per cent of non-beneficiary respondents belong to low level of adoption category of improved milk production practices. It was observed that majority of non-beneficiary farmers had low level of adoption about improved milk production practices so capacity building training program should be organized to enhance the adoption level of non-beneficiary farmers.

Keywords: MCC, Adoption, Breeding, Saras dairy, Feeding, Management practices

Theme 5: 138
Millet: Tiny Seed, Mighty Impact on Diabetes Management

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A diverse group of ancient grains – millet – aren't any longer confined to dusty folklore. They are now emerging as powerful allies in the fight against diabetes, offering a unique nutritional profile that holds immense promise for blood sugar management. Let's delve into the science behind this tiny seed's mighty impact. Fiber's Fortified Firewall: Unlike their refined counterparts, millets boast a treasure trove of dietary fiber. This "wonder nutrient" acts as a digestive bodyguard, slowing down carbohydrate breakdown and preventing the feared blood sugar spikes that torment diabetics. Their slow-release energy keeps you feeling fuller for longer, curbs cravings and aids in weight management, another vital aspect of diabetes control. Glycemic Advantage: When compared to white rice, millets outshine it with a significantly lower glycemic index – the reigning grain in many cultures. This translates into a gentler, more measured rise in blood sugar levels, offering a sigh of relief for those who continually monitor their glucose readings. Beyond Blood Sugar: Research paints an optimistic picture. Studies have shown that incorporating millets into a diabetic diet can lead to tangible improvements. Blood sugar levels drop, hemoglobin A1c (a long-term blood sugar control marker) decreases, and even cholesterol levels change positively. Bonus Benefits: For individuals with celiac disease, which often accompanies diabetes, the naturally gluten-free nature of some millets offers a sigh of relief. In addition to this, their antioxidant and anti-inflammatory properties suggest further health benefits, designating them as a true nutritional powerhouse. The Final Verdict: While more research is necessary, the evidence is clear: millets are not just a fad. They are a potentially game-changing addition to the diabetic dietary arsenal. Incorporating these versatile grains as part of a balanced plan could empower individuals to manage their blood sugar effectively and lay the groundwork towards a healthier future. Remember, embarking on this journey is best with the guidance of healthcare professionals to ensure a personalized approach to diabetes management. So, embrace the ancient wisdom of millets and watch your health flourish.

Keywords: Millets, Tiny seeds, Diabetes, Blood sugar, Nutrients

Theme 5: 139
Analysis of Adoption of Scientific Swine Management Practices and their Influence on Farm Production Parameters

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Regional disparities in pig farming practices are apparent across the country, as the North-eastern and Eastern states predominantly utilize traditional low-input methods while commercial pig farming with exotic breeds is on the rise in regions like Punjab, Haryana, Uttar Pradesh, and Karnataka. Improving production performance involves multiple factors such as refining breeding techniques, adjusting feeding practices, and adopting advanced management technology, all aimed at enhancing efficiency and sustainability in pork production. The present study investigated the adoption of scientific swine management practices and farm characteristics among 150 Farrow-to-Finish pig farms in Punjab and Haryana. These farms were categorized based on their sow count into small (up to 15 sows), medium (16–30 sows), and large farms (> 30 sows). A comprehensive analysis covered 67 practices spanning breeding, feeding, housing, biosecurity, health, general management, and farm management, with an adoption index calculated for each category. Farm profiles were constructed using metrics like Feed Conversion Ratio (FCR), litter size and weight across different growth stages, farrowing interval, Body Condition Score (BCS), mortality rate, number of farrowing per year, and weaning age. Results indicated that larger farms exhibited the highest adoption rates, particularly in feeding, biosecurity, and general management practices. Furthermore, a significant correlation emerged between practice adoption and various production parameters within the farming operations. Implementing recommended breeding, feeding, care, and management practices correlated with decreased Feed Conversion Ratio (FCR), weaning age, time required to achieve marketable weight, and reduced mortality rates. This underscores the importance of implementing scientifically sound methods across various facets of swine management to enhance efficiency and overall performance within the pig farming sector.

Keywords: Adoption, Scientific swine management, Production parameters, Pig farming

Theme 5: 140
Role of Livestock Sector in Indian Economy

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Animal Husbandry and dairying activities are not only contributing to the food basket and draught animal power, it also helps in maintaining ecological balance. Livestock sector is a supplementary and complementary enterprise of Indian agriculture as it provides livelihood security for most of the farmers, supports agriculture by providing critical inputs, contributes health and nutrition to the household and supplements incomes. There were about 303.76 million bovines (cattle, buffalo, mithun and yak), 74.26 million sheep, 148.88 million goats, 9.06 million pigs and about 851.81 million poultry as per 20th Livestock Census in the country. For 2020-21, the Gross Value Added (GVA) of livestock sector was about Rs. 11,14,249 crore at current prices during FY 2020-21 which was about 30.87% of Agricultural and Allied Sector GVA and 6.17% of total GVA. At constant prices (2011-12), the GVA of livestock sector was about Rs. 6,17,117 crore during FY 2020-21 with a positive growth of 6.13% during 2019-20. India has distinction of being the largest producer of milk in the world. Milk

production during 2020-21 and 2021-22 was 209.96 million tonnes and 221.06 million tonnes, respectively showing an annual growth of 5.29%. The per capita availability of milk was around 444 grams/day in 2021-22. Nearly 45% of the milk production was contributed by Indigenous Non-Descript Buffaloes followed by 30% by crossbred cows. The Indigenous/Non-descript cows contributed 20% of the total milk production in the country. Goat milk shares a contribution of 3% in the total milk production across the country. The contribution of exotic cows in total milk production is 2%. Currently, the total poultry population in our country is 851.81 million (as per 20th Livestock Census) and egg production was around 129.60 billion during 2021-22. The per capita availability during 2021-22 was around 95 eggs per annum. The egg production had shown positive growth as 6.19% during 2021-22. Wool production which was 46.05 million kg during 2012-13 and increased to 48.14 million kg in 2014-15 but declined to 33.04 million kg in 2021- 22. Meat production which was 6.69 million tonnes during 2014-15 has increased to 9.29 million tonnes in 2021-22. The meat production has shown positive growth as 5.62% during 2021-23.

Keywords: Livestock sector, Indian economy, Livelihood security, Milk production, Meat production, Egg production, Wool Production

Theme 5: 141
Advances in Treatment and Disposal of Dairy Wastewater: A Review

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The surge in demand for milk and milk products has led to the establishment of numerous dairies of varying capacities across different regions. These dairies typically procure milk from producers and undertake various operations, including bottling for direct marketing or processing into different dairy products based on their production capabilities. However, these operations generate significant quantities of wastewater as a byproduct. The wastewater originating from dairy operations contains organic substances derived either directly from milk or in a degraded form due to processing activities. Despite being biodegradable, dairy waste is characterized by its potent nature, posing challenges for treatment and disposal. Dairy plants engage in processing a diverse array of products, including milk, cheese, butter, ice cream, yogurt, non-fat dry milk, whey, and lactose. The volume and composition of wastewater generated in each plant are contingent upon factors such as the range of products manufactured, implementation of waste minimization practices, types of cleaning agents employed, and the efficacy of water management practices within the facility. Given that most dairy plants handle multiple milk products, the composition of wastewater streams can exhibit significant variations from day to day. This variability underscores the importance of implementing robust wastewater management strategies tailored to the specific operational dynamics of each dairy plant. Effective management of dairy wastewater necessitates the implementation of comprehensive treatment methodologies to mitigate environmental impacts and ensure regulatory compliance. Strategies for wastewater management in dairy plants encompass various approaches, including the adoption of advanced treatment technologies, optimization of cleaning practices, implementation of water recycling and reuse systems, and adherence to stringent regulatory guidelines. Furthermore, proactive measures aimed at minimizing wastewater generation, such as process optimization and the utilization of eco-friendly cleaning agents, play a crucial role in reducing the environmental footprint of dairy operations. By prioritizing sustainable wastewater management practices, dairy plants can mitigate environmental risks, enhance operational efficiency, and contribute to the overall sustainability of the dairy industry.

Keywords: Advances, Dairy, Disposal, Treatment, Wastewater

Theme 6: 142
An Innovative Approach to Empower Women through Transformative Sustainable Development

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With the growing civilization, India has lately emphasized the use of resources that vastly offers inclusive quality of life for "The Rural Women". Furnishing the livelihoods with green power requires a grass root support that can enlighten the lives of women as a whole. The multifaceted renewable resources offer diverse opportunities that makes rural women the entrepreneurs, lighting up the nation with revolutionary use of volatile green and clean energy. One such revolution is "Solar Power Revolution". Solar has always been known for its traditional spectrum offering a range of potential that can be harnessed, yet has the force to fence the livelihood of rural women with moment of chance to run her own possibilities collectively. Renewable energy has immense possibilities and potential for women that can reduce drudgery and improve their livelihood opportunities. Working with energy resources improves the efficiency of business and help increase women's self-employment, giving access to afford extra time to utilize in skill trainings to get started with their own business. Access to energy can benefit both at macro and micro level strengthening livelihoods and boosting local economies, catering to "Time Poverty". Solar powered agriculture, solar powered micro business, green textile and crafts offers a wide range of opportunities and employment to rural women that are sustainable and brings growth and expansion for upward mobility. To accelerate women in renewable, investors and donors, policy makers, financial institutions, rural technology and business incubators, entrepreneurship development programs and clean energy enterprises can join hands together conditioning enhanced energy security, renewable energy solutions led by and targeted at women that sooner or later can bring down the carbon emissions enhancing security and sustainability leading to "Net Zero" the ultimate goal of the nation.

Keywords: Green livelihood, Renewable energy, Solar energy, Women empowerment, Entrepreneurship

Theme 6: 143
Digital Literacy Among Women – Indian Scenario

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India is a developing country and it has numerous areas that require immediate attention. Digital literacy is one of the few sectors in which India is working rapidly. Digital literacy refers to individual's ability to search, analyse and communicate through digital media platforms like internet platforms, social media and mobile devices. Though Indian government launched the digital India program and multiple schemes, the reality is that Indian women are still far away to meet global standards. So, digital literacy is crucial for the modern Indian women, as it empowers them to participate in the digital society, access information, communicate and adapt to rapidly evolving technologies effectively. Thus, this study is planned to explore the current scenario of digital literacy among women in India. It will also put light on the opportunities and challenges faced by women. Additionally, it will also highlight about successful initiatives and strategies implemented to empower women regarding digital literacy. The study will provide valuable insight to policymakers, educators and organizations to promote digital inclusion in India.

Keywords: Digital inclusion, Digital India, Digital literacy, Digital media, Social media

Theme 6: 144
Entrepreneurial Behaviour of Fruit Crop Growers

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The research, conducted in Vijayapura district of Karnataka during 2019-20, delves into the entrepreneurial behavior of fruit crop growers, focusing on grape, lime, and pomegranate cultivators. Employing a simple random sampling technique, 40 growers were selected for each crop, resulting in a total sample size of 120 participants. The key findings showcase that 42.50% of grape growers, 40.00% of lime growers, and 37.50% of pomegranate growers exhibited a medium level of entrepreneurial behavior. In terms of overall entrepreneurial behavior, 37.50% of respondents demonstrated a medium level, with 33.33% displaying high levels and 29.17% falling into the low category. The analysis extended to dimension-wise entrepreneurial behavior, revealing that a significant percentage of growers belonged to the medium category in various aspects. These included innovativeness (38.33%), decision-making ability (41.67%), achievement motivation (38.33%), knowledge on farming enterprise (41.67%), risk orientation (40.83%), information-seeking behavior (34.17%), ability to coordinate farm activities (44.17%), economic motivation (38.33%), leadership ability (38.33%), scientific orientation (36.67%), and management orientation (45.00%). A noteworthy outcome emerged as the study identified a significant difference in mean entrepreneurial behavior among grape, lime, and pomegranate growers.

Keywords: Entrepreneurial behavior, Fruit crop growers, Dimension-wise analysis, Crop-specific Differences, Karnataka, Agriculture

Theme 6: 145
Constraints in using ICT tools by School Teachers of Punjab

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This research delves into the challenges faced by school teachers in Punjab regarding the utilization of Information and Communication Technology (ICT) tools in education, exploring both personal and infrastructural complexities. As the educational landscape undergoes a transformative shift with evolving technology, it becomes imperative to reassess teaching methodologies to align with contemporary pedagogical frameworks. The study focused on understanding how the integration of ICT tools transforms the learning environment. In this comprehensive investigation, 200 respondents from five non-adjoining districts in Punjab-Ludhiana, Hoshiarpur, Faridkot, Patiala, and Amritsar-were involved. The selection of these districts aimed to capture a diverse representation of the region. The study prioritized an in-depth exploration of the challenges faced by school teachers in implementing ICT tools. The findings illuminated major infrastructural constraints, including the slow speed of internet connectivity, poor maintenance of ICT tools, unreliable power supply, and a shortage of adequately trained teachers. As technology increasingly becomes integral to modern education, this research sheds light on specific obstacles hindering the seamless adoption of ICT tools by educators in Punjab. The paper not only identifies and analyzes these barriers but also proposes viable solutions. The insights gleaned from this study contribute significantly to the ongoing discourse on educational technology. Furthermore, the actionable recommendations can inform policymakers, educational institutions, and teachers, facilitating a more effective integration of ICT tools in the teaching and learning process.

Keywords: Educational technology, ICT Tools, Infrastructural Constraints, Teaching methodologies

Theme 6: 146
Assessment of Perceived Loneliness and Family Structure Among Rural Families

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This study aimed to assess the impact of gender and family background on perceived loneliness in rural families, focusing on variables that play a crucial role in shaping social and emotional well-being. Adopting a survey method, a random sampling approach was employed to collect data from 150 rural families in Fazilka District. The Perceived Loneliness Scale, utilizing a five-point rating scale, served as the primary tool for data collection. The analysis involved calculating t-ratios between the mean values of different categories of rural families. The results revealed a significant effect of both gender and family background on perceived loneliness. Notably, the study underscored the influential role of the family structure, highlighting that the nuclear family system predicted higher levels of loneliness in rural families compared to joint family setups. Additionally, the findings indicated a higher likelihood of loneliness in females compared to males within the context of rural families. The implications of these research findings are substantial, particularly in addressing and improving the conditions of rural families residing in nuclear family structures. By identifying the factors contributing to perceived loneliness, this study provides valuable insights that can guide interventions and policies aimed at enhancing the well-being of rural communities. Understanding the nuanced impact of gender and family background allows for tailored strategies to address the specific needs of individuals and families in rural settings.

Keywords: Perceived loneliness, Nuclear and Joint families, Gender, Family background

Theme 6: 147
Content Analysis of PAU Kisan App for Major Crops

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Effective communication hinges on the quality of content, particularly in online media where information dissemination is prevalent. In the realm of agriculture, mobile apps, such as the PAU Kisan App, serve as crucial tools for farmers. Recognizing the pivotal role of content, this study, titled "Content Analysis of PAU Kisan App for Major Crops," aimed to meticulously evaluate the app's content related to major crops. Eight significant crops, including Wheat, Autumn Sugarcane, Spring Sugarcane, Desi Cotton, Cotton, Paddy, Maize, and Basmati Rice, underwent scrutiny. The emphasis of the study was on assessing readability ease, content sufficiency, heading suitability, uniform categorization, font size and style, use of technical terms, and the availability and clarity of photographs. Results unveiled that the readability of content for major crops fell within standard and fairly difficult categories, scoring between 53.14 and 66.04. While photographs were comprehensive, clarity was lacking in several instances. Content sufficiency exceeded that of traditional package-of-practices guidelines. The headings were deemed entirely suitable, and categorization followed a consistent pattern for each major crop. The percentage of technical terms ranged from 7.50% to 14.05%, and font size and style adhered to default smartphone settings. This comprehensive analysis sheds light on the intricacies of the PAU Kisan App's content, offering valuable insights into its effectiveness and potential enhancements. The study's findings can guide improvements to ensure optimal communication and usability for farmers relying on this essential agricultural.

Keywords: Agriculture, Content analysis, PAU Kisan App, Readability, Crop information

Theme 6: 148
Use of Social and Behaviour Change Communication Programme for Combating Domestic Violence Against Women: A Study from Punjab

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Social and behavior change communication (SBCC) is a strategy that employs both top-down and bottom-up communication approaches to engage individuals and communities, leveraging local wisdom, expanding horizontal communication, and fostering collective dialogue and action. Through this process, changes in both individual outcomes, such as increased knowledge and healthier behavior, and social outcomes, such as strengthened community leadership, broader participation, and social cohesion, are anticipated. In line with this perspective, a SBCC program addressing domestic violence against women was developed and validated by subject matter experts. The program included a PowerPoint presentation, an activity sheet, and a leaflet (take-away flyer). Subject matter experts found the design and content of the SBCC program to be adequate, relevant, and visually appealing. The developed and validated SBCC program was then implemented among males and females aged 18-55 in rural and urban areas of two districts in Punjab, namely Amritsar and Ludhiana. The program informed respondents about the nuances of domestic violence, its various types, the causes/situations leading to each type of violence, and the perpetrators of violence. Additionally, participants were familiarized with the existing laws and litigation aimed at protecting victims of domestic violence. The program also outlined actions that community members could take to address this social issue, with leaflets distributed among the masses as a takeaway for reinforcement. Before the implementation of the SBCC program, respondents had limited knowledge about different aspects of domestic violence, which significantly increased after exposure to the SBCC program. The study found that the SBCC program effectively enhanced the knowledge of males and females regarding domestic violence against women.

Keywords: Domestic violence, Development, Validation, Outcomes, Knowledge levels

Theme 6: 149
Adoption of Okra Cultivation Practices followed by the Farmers in Jammu District

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The present study was conducted in the sub-tropical areas of Jammu district of the Jammu and Kashmir State. Simple random sampling technique was employed to draw a sample of 120 okra growing farmers. Semi-structured interview schedule was used for collection of the primary data. The results reveal that majority 82% of the respondents belonged to medium level of adoption. Majority 82% of the respondents had adopted hybrids of okra and only 18% of the respondents were adopting open pollinated varieties. Overall 91 per cent of the respondents applied irrigation at flowering stage, out of which 90% were from R.S. Pura sub-division and 92% were from Marhsub-division. 100 per cent of the respondents were applying urea in okra cultivation. Overall 76% of the respondents had adopted interval of irrigation of 5-6 days, Majority of the respondents 73% were applying insecticides. 80% of respondents were doing 13-14 picking in hybrids, whereas 77% of the respondents were doing 6-7 pickings in open-pollinated okra varieties.

Keywords: Technique, Farmers, Okra

Theme 6: 150
Women Entrepreneurship to Empowerment: Balancing Gender discrimination

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Social entrepreneurial activities embedded for social purposes remain beneficial for the entire community. Such activities are particularly characterized by a focus on gender, with a specific emphasis on women. To comprehend the role of women in social entrepreneurial activities, this study was initiated in Punjab. In a theoretical sense, the present study adopts a qualitative and narrative approach. It is based on the life stories of women who serve as social change agents. The case studies include farming women who initiated processing units in their fields, creating employment opportunities for village women. Another case study involves a woman who established a pickle-making unit, providing employment opportunities for village women to sustain their livelihoods. The study reveals that women transitioned from the private to the public sphere, boosting their confidence and increasing their participation in decision-making processes. This transition also enhanced women's mobility and economic well-being, solidifying their presence in society. Women became more active and expressive in patriarchal household setups. However, they still encounter various challenges that hinder their visibility at both societal and family levels, necessitating attention. This study serves as a valuable resource for policymakers and non-governmental organizations (NGOs) aiming to address gender discrimination and poverty-related issues through engagement in entrepreneurial activities.

Keywords: Social entrepreneur, Women, Agent of change, Decision-making, Gender, Patriarchy

Theme 6: 151
Utilization Pattern of Information Communication Tools by SHG Members in Jodhpur District of Rajasthan

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A study was conducted to find out the use of information communication tools (ICT) by self help group (SHG) members of Jodhpur district of Rajasthan. A total of 100 women were selected as respondent for the study during the year 2022-23. The study aimed to identify the utilization behaviour of ICT by the SHG members of Jodhpur District and to extent to which they got benefited from these tools. The constraints faced by the members in adoption of ICT were also studied. The data were collected from respondents through interview schedule and personal discussion. The results showed that 78 percent members owned mobile phones and television. The 6 percent members had computer along with mobile and TV, whereas 16 percent members has no information communication tool. The most frequently used ICT tool was mobile phone. Mobile phones were widely used for social communication, getting information through various Mobile apps, WhatsApp groups, YouTube videos etc. The mobile was being used for marketing and financial support, input arrangement, expert consultation and making online payment. The members also reported that mobile phones proved to be very useful during health emergencies. The television was used for getting weather related forecast, Mandi Bhav, success stories and events like Melas, exhibitions etc. The computer was utilized for record management and printing services. Major problems in the use of ICTs were erratic power supply, low network connectivity and lack of awareness of the benefits of ICTs.

Keywords: ICT, SHG, Constraints

Theme 6: 152
Impact of ARYA Project on Poultry Beneficiaries in terms of Socio-economic Improvement in Banswara District of Rajasthan

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Krishi Vigyan Kendra, Banswara was locale of the study because initially Attracting and Retaining Youth in Agriculture (ARYA) project was implemented through KVKs in 25 states of the country. In Rajasthan, Banswara is the only district in which this project was initiated. Under, ARYA project, Poultry farming is one of the major aspects chosen for the study. With this context, the study has been carried out to know the impact of ARYA project on poultry beneficiaries in terms of socio-economic improvement. Results shows that ARYA project had positive and significantly huge impact on all the quantitative such as egg production, flock size, body weight, income, and meat production as there is significant increase in the egg and meat production. Application of ARYA project interventions, among other things, had a considerable impact on qualitative variables like employment practices, standard of living, educational attainment, nutritional security, and food security. A rise in income from the production of eggs and meat provides family members with energy and protein supplements, which improves their daily nutritional intake and further ensures food security while also enhancing their health. The level of life increased as well as possibilities for education and employment became more easily accessible. These were the elements that ultimately ensured social security for every individual at every level of livelihood security. Out of total 120 participants (beneficiaries and non-beneficiaries) of the study, impact evaluation was done for 60 beneficiaries who have attended all sessions and guidance under training programmes conducted by Krishi Vigyan Kendra, Banswara.

Keywords: ARYA, Poultry beneficiaries, Socio-economic, Improvement

Theme 6: 153
Cyber Extension and Farm Advisory Services

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Cyber extension includes effective use of Information and Communication Technology (ICT). Cyber extension means using the power of online networks, computer communications and digital interactive multimedia to facilitate dissemination of agriculture technology. Cyber Extension thus can be defined as the extension over cyber space. Cyber space is the imaginary or virtual space of computers connected with each other on Networks, across the Globe. These computers can access information of Text, Graphics, Audio, Video and Animation files. Software tools on networks provide facilities to interactively access the information from connected servers. It is required for Member States to set up a Farm Advisory System (FAS) which aims at helping farmers to better understand and meet the EU rules for environment, public and animal health, animal welfare and the good agricultural and environmental condition (GAEC). The rural development policy supports farmers to make use of advisory services and supports Member States in setting up new farm advisory services where needed. The participants of these activities are able to apply the latest scientific know-how in their farming activities, resulting in improved yields. Most of the farmers, members of the Kisan clubs are getting quarterly news letter published by the KVK in Hindi, through which they are getting farm advisory services.

Keywords: Cyber extension, Cyber space, Farm advisory system, ICT

Theme 6: 154
Challenges faced by Agri-Tech Startups in Rajasthan

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Agri-tech startups in India offer innovative solutions such as digital marketing platforms, advisory services, and transparent pricing to transform the agricultural sector. These startups leverage modern technologies to enhance productivity, profitability and efficiency in agriculture. With increasing investments and government support, the agri-tech sector is poised for growth, redefining Indian agriculture and attracting more investments. The purpose of this study was to analyze the challenges for agri-tech startups in Rajasthan. The co-founder of agri-tech startups operating in Rajasthan were involved in the present study for in-depth investigation. The startups identified were divided in categories like upstream supply chain, downstream supply chain, agri-fintech, precision agriculture and farm mechanization. Out of these, a total of 10 agri-tech startups were selected from the upstream and downstream supply chain categories as they had the highest number of startups operating in the study area. The Rajasthan Startup Policy 2022 supports the entire startup ecosystem, including agri-tech, providing incentives, training, and enabling conditions. However, awareness of certain initiatives within the policy was limited among startups. Slow digital technology adoption by farmers, small land-holding size, low awareness of agri-tech solutions and problems in last mile delivery as well as procurement are the biggest problems faced by the agri-tech startups in Rajasthan. This paper discussed on the different challenges being faced by these startups and the way forward to help them overcome these challenges.

Keywords: Agri-Tech Startups, Rajasthan, Challenges

Theme 6: 155
Constraints towards Women Enterprises Growth in Uttar Pradesh

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Women entrepreneurs can play a powerful role in confidence building and creating awareness in other women to promote self-reliance. On the other hand, women entrepreneurs have to face more problems than men entrepreneurs. Their risk taking ability is less. They have to devote more time to the family and maintain a balance between their family responsibility and business. Other obstacles faced by women entrepreneurs include being accepted as a woman in business, lack of role models, lack of professional interaction, difficulties in gaining the confidence of their clients and suppliers, lack of adequate training and lack of related experience. The primary objective of this study was to examine the problems faced by women entrepreneurs. The present study was carried out in district Hardoi. District Hardoi was divided into 18 blocks. One block Bawan was selected in this study. From this selected block, three villages namely Tatyora, Rukmanapur and Mujahidpur were selected and 50 respondents were selected purposively from each village. Thus, a total of 150 respondents were selected for the study. It was found that the rank order of economic constraints viz; lack of family income restrict the women not for doing any extra/other enterprises was ranked I with mean score value of 2.78 and the rank order of social constraints viz., negative social attitude about women role outside the home was ranked-I with mean score value of 2.64.

Keywords: Entrepreneurship, women entrepreneur, constraints, micro enterprises

Theme 6: 156

Constraints Faced by the Extension Personnel with the Existing Transfer of Technology System of State Department of Agriculture

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In India, there are four major extension systems i.e. first line extension system comprising mainly the Indian Council of Agricultural Research (ICAR) institutes and State Agricultural Universities (SAUs), extension system of the Ministry of Agriculture and the State Department of Agriculture, extension system of the Ministry of Rural Development and the State Development Departments and extension system of Non-Government Organizations (NGOs) and business houses. The public sector extension represented mainly by the State Department of Agriculture (SDoA) is the leading agency and continues to be the most important source of information and technology transfer for majority of the farmers. The department has the major responsibility of implementing the programmes of state and the central government. In spite of these remarkable achievements, Indian agriculture extension service is facing great challenges in further increasing the production to match the population demand. The present paper highlights the constraints faced by the extension personnel with the existing transfer of technology system of State Department of Agriculture. The present study was conducted in Udaipur district of Rajasthan state. The sample of extension personnel consisted of 207 respondents i.e. 11 Officials (Deputy Director, Assistant Director, and Agriculture Officers) and 196 functionaries (Assistant Agriculture Officers and Agriculture Supervisors). Questionnaire technique was used for data collection. Findings revealed that the extension personnel were facing so many constraints that have severely hindered the effective functioning of the department. The administrative constraints were the most severe with MPS 51.73 followed by operational (50.11 MPS), general (49.94 MPS), infrastructural (44.23 MPS), technical (43.79 MPS) and financial constraints (39.89 MPS).

Keywords: Agriculture, Constraints, Extension personnel, Transfer of technology

Theme 6: 157

Empowerment of Farm Women through Self Help Group Activities in Udaipur District of Rajasthan

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Empowerment is an important process through which women are enabled to realize their full identity and powers in all spheres of life. Empowering women with economically productive and viable work will enhance their contribution to rural development. A Self-help group (SHG) is a financial intermediary committee. It is usually composed of 10-20 local women members. The research work was performed in Udaipur district of Rajasthan state. For this research among the 17 tehsils of Udaipur district Rishabhdev and Kherwara tehsil were selected as they have the highest number of SHG. We have selected 20 SHGs from 2 selected tehsil and 6 farm women from each SHG. Thus, a total 120 farm women were selected for the proposed study. For data collection, the face-to-face interview technique was opted. The gathered data was refined, tabulated, and analyzed and interference was made following the objective. This study has been designed mainly to focus on the level of empowerment of farm women in SHGs. This helps in identifying educational methods to alter these factors enhancing the level of empowerment of farm women.

Keywords: Women, Face-to-face interview, Educational methods

Theme 6: 158
Constraints Perceived by Teachers of Agricultural Universities in Utilization of ICT tools

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ICT has the ability to prepare learners for a rapidly changing world scenario. They may use ICT as a tool to identify, analyze, exchange and present information as per their need. The study was conducted in three purposively selected agricultural universities in Rajasthan. Three constituent colleges from each agriculture university were selected purposely on the basis of having maximum number of teachers and 60 per cent of teachers were selected from every college by using simple random sampling technique. General constraint "computer virus which can damage the data" was perceived as most severe in all the selected agriculture universities, infrastructural constraint "lack of facilities for repair and maintenance of computers" was perceived as most severe in SKNAU. Jobner and SKRAU, Bikaner whereas in MPUAT, Udaipur teachers perceived most severe infrastructural constraint as "internet connection is poor, Training constraint "lack of ICT-oriented training" and health constraint "adverse effects on eye sight" were perceived as most severe in all the selected agriculture universities.

Keywords: Agriculture universities, ICT tools, Teachers, Constraints, Utilization

Theme 6: 159
Characteristics Influence for Entrepreneurship Behaviour Ability

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Entrepreneurship has become a popular term currently, but not all the entrepreneurs can succeed in entrepreneurial business. This research paper discuss about entrepreneur and entrepreneurship from three aspects, characteristics of entrepreneurs like perseverance, dedication, self-confidence, desire of achievement, and so on, help them obtain necessary capabilities to operate business in the venture world. Before starting an entrepreneurial business, entrepreneurs should exploit an appropriate opportunity. Opportunity identification is critical in the process of entrepreneurial world. And capturing necessary resources such as financial resources, human resources are also important. The last step is to balance opportunity, resources, and team so that the entrepreneurial business can be operated successfully. Entrepreneurial behaviour refers to the way entrepreneurs act and think. It involves taking initiative, calculated risk-taking and innovating to create value. Entrepreneurial behaviour entails the identification of opportunities and the proactive implementation of innovative ideas. It involves individuals or groups engaging in activities requiring creativity, perseverance, and personal drive. It is characterized by a unique set of traits, skills, and behaviour that contribute to identifying and pursuing business opportunities. It is characterized by unique traits, skills, and behaviours that drive individuals to pursue entrepreneurial ventures. To understand the complexities of entrepreneurial behaviour and the underlying psychological theories, valuable insights into the entrepreneurial mindset and the factors contributing to entrepreneurial success were analysed. Entrepreneurial motivation depends on intrinsic factors, like the need for self-fulfilment, and extrinsic factors, like financial gains. Both types of motivation drive entrepreneurial success.

Keywords: Entrepreneurship, Business, Behaviour opportunity

Theme 6: 160
Consumer Buying Behaviour for Millet Products in Bikaner District

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Indian millets are high in protein, vitamins, minerals and they are nutritionally superior than wheat and rice. Therefore, to ensure nutritious food consumption and address the different health issues this generation is facing, it is essential to understand how consumers feel about millet-based products and to identify the factors influencing their purchasing decisions. The current study was conducted to determine the factors influencing sampled consumers' purchasing decisions for millet products as well as to gauge consumer acceptance of millet products provided by various manufacturers in the study area. To meet these objectives, 120 consumers across Bikaner district of Rajasthan were surveyed. Quality was the crucial factor among the respondents influencing the purchase of millet based products. Among all the channels of information of millet products regarding health benefits, friends and family had more influence. Primary factor influencing respondents' consumption of millet-based products in the study area was health benefit, supporting the idea that millets are one of the world's healthiest foods. Regarding awareness on 'major millets', it was very good whereas for 'minor millets', the awareness was not good. Quality was ranked as a crucial factor for consumer acceptance of the millet-based product by the majority of respondents. Therefore, the quality aspect of millet based products should be enhanced to increase consumer acceptance by addition of natural and not artificial preservatives. There were many millet product brands that were available in the market, among which ITC was the most preferred brand among the respondents.

Keywords: Millet, buying behaviour, Nutrition, Brand

Theme 6: 161
Role of Rural Women in Agriculture in Indian Society: A Critique Study

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India is one of the largest developing country in the Asia. About 70 per cent of people involved in Indian agriculture. Among these, rural women cover a wide area. The primary focus of this study is on the various roles that women play in the agricultural industry, as well as the menial tasks that women perform. About 70 per cent of farm work is performed by women. Although it was estimated that women made up 45.3% of the agricultural labor force, many of them continued to be invisible laborers. Eighty-four percent of women in rural India get their living from agriculture. Approximately thirty percent of cultivators and forty-three percent of agricultural laborers are women. To understand the condition of rural women in agriculture, literature was reviewed. Data is collected from secondary sources such as review articles, research papers, government sites and newspapers etc. to study the growth rate of the female agricultural workers in last few years. The ability of female farmers to increase production is greatly restricted by their unequal access to productive resources. The current study demonstrates the tremendously important role that women play in agriculture. It also highlights the challenges they have, such as limited access to resources that may be beneficial and lack of recognition for her contributions as an active and productive member. This review article deeply examines the academic literature on women in agriculture in Indian society, rural women empowerment in agriculture, recognizing gaps and scope for further research.

Keywords: Women, Agriculture, Empowerment, Gender and development

Theme 6: 162
Effect of Chickpea Variety "GNG–1958" on Productivity and Profitability in Unnao District

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Raising productivity and quality are likely the most important factors, if income of farmers groups are to be increased/doubled. To overcome the problem, there isa need to focus on high yielding variety, irrigation, seeds/ planting materials, reduction in input cost and new technological based interventions coupled with shift into high-value, short duration and cost effective commodities such as pulses during *rabi* season and replace the wheat with chickpea to get extra crop during summer season, also increase the profit with low investment in crop production. Despite the scope and importance for cultivation of chickpea, farmers in mass are not adopting the latest production technologies. To overcome this anomaly Krishi Vigyan Kendra, Unnao conducted Cluster Frontline Demonstrations (CFLDs) on farmers' fields at different locations in the district with high yielding variety "GNG – 1958" and applying recommended agronomic package and practices in cultivation of chickpea including line sowing/planting. The chickpea productivity and economic returns under improved technologies were calculated and compared with the prevailing farmers' practice. Results revealed that "GNG – 1958" variety under improved practices recorded higher yield of 29.19%, 31.53% and 34.17% during 2020-2021, 2021-2022 and 2022-2023 respectively. Recommended practices gave higher net returns of Rs. 58,280, Rs. 62,756 and Rs. 66,310 per ha and B:C ratio of 3.42:1, 3.75:1 and 3.92:1 respectively as compared to farmers practice (2.12, 2.33:1 and 2.64).

Keywords: GNG-1958, Extension gap, Frontline demonstration, Line sowing, Net returns

Theme 6: 163
Role of Women in Agriculture in Rural Punjab

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Agriculture is seen as a male-dominated endeavor, but women farmers also have extensive expertise with agricultural patterns, irrigation, pest control, and soil management techniques. They can contribute significantly to the advancement of sustainable agriculture if given the chance. Nonetheless, they encounter a variety of difficulties and limitations despite their intense commitment. The contribution of women to agriculture has traditionally been underrepresented. Owing to ignorance, women have continued to be unseen contributors, and their involvement has always been disregarded. Women's position is still worthless despite their significant participation in agriculture and allied activities. So, it's critical to comprehend their standing and significant contribution. The well-being of society as a whole, and standard of living for these women peasants may greatly be increased if we could overcome the obstacles they faced through programme development and policy initiatives. This study sheds light on the unsung role that women play in agriculture, identifies the barriers that need to be overcome, and calls attention to the opportunities that are out there. The study makes the case that when more women enter the agricultural industry, problems like hunger and inequality can be resolved through the increased opportunities and improved resources.

Keywords: Women, Policy Initiative, Hunger

Theme 6: 164
Benefits Gained by Women Beneficiaries of National Rural Livelihoods Mission

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Realizing the significance of rural development, India has adopted various innovative strategies and approaches for ensuring the basic rights of the rural population. In this regard, the Government has implemented National Rural Livelihoods Mission (NRLM) to support rural people living below poverty line. It aims to make a multidimensional impact on the lives of India's rural poor by mobilizing them, particularly the women, into robust grassroots institutions of their own where, with the strength of the group behind them, they will be able to exert voice and accountability over providers of educational, health, nutritional and financial services. The core belief of National Rural Livelihoods Mission is that the poor have innate capabilities and a strong desire to come out of poverty. The challenge is to unleash their capabilities to generate meaningful livelihoods and enable them to come out of poverty. The objective of present study was to find out the benefits gained by women beneficiaries of NRLM. The study was conducted in four villages of Panchayat Samiti Sarada of Udaipur district, Rajasthan. The sample consisted of randomly selected 100 women beneficiaries of NRLM from selected villages. The major findings of the study reveal that majority of the respondents (61%) belonged to the category of low socio-economic status. With regard to benefits gained, majority of the respondents received loan (65%) and 77 per cent respondents started income generating activities such as i.e. dairy production, vegetable cultivation, soap making, papad & badi making and stitching.

Keywords: NRLM, Women, Beneficiaries

Theme 6: 165
Adoption of Recommended Litchi Cultivation Practices by the Growers in Jammu Region

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The maximum production in litchi is from district Jammu (847 MT) followed by Kathua (583 MT), and Samba (138MT) (Department of Agriculture and cooperation). Fewer than two selected districts of Jammu & Kathua with the basic objective to examine the adoption status of the recommended package of practices of litchi cultivation. The selected districts were selected purposively for the study. A total of 99 responded were selected purposively non random sampling for the study. It was evident from the study that 14.00 per cent of the responded had recommended ploughing practices, Majority of litchi farmers adopted Dehradun variety and followed recommended plant in their litchi fields. Majority of the farmers 93.00 per cent had adopted Dehradun variety followed by Calcuttia variety 34.00 per cent time of planting of plant. 26.00 per cent of litchi farmers adopted recommended dosage of urea. 28.00 per cent of litchi farmers had applied recommended dosage of DAP whereas 36.00 per cent farmers had applied recommended dosage of MOP in their fields. Majority 84.00 per cent of litchi growers had adopted recommended interval of irrigation in their litchi fields. Overall 43.00 per cent litchi growers had applied mulching material in their litchi fields. Only 18.00 per cent of the litchi growers had applied insecticides and fungicides in their fields respectively. Overall 100 per cent of the litchi growers had adopted recommended stage of harvesting 75% redness of fruit of litchi fruits in their fields.

Keywords: Adoption, Litchi, Practices, Jammu, package and practices

Theme 6: 166
Role of Women Empowerment in Agricultural Development

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The enduring principle that "woman is a key for success for any human being" underscores the profound influence women have on individual's achievements both directly and indirectly. Despite shouldering the majority of responsibilities in meeting family needs, women have historically occupied dependent positions, lacking access to resources and freedom essential for fulfilling their roles. This disparity has persisted throughout history, emphasizing the need for a paradigm shift towards women empowerment. Women empowerment a global concern gaining momentum in recent decades, encompasses various dimensions and has garnered attention from researchers, governments and stakeholders. This transformative process aims to uplift women at individual, household, community and broader levels, enhancing their well-being in terms of health, nutrition, income and life span. The empowerment of rural women is particularly crucial, given their inherent knowledge, skills, potential and resources to establish and manage enterprises. Key to fostering women's entrepreneurship is the recognition of women entrepreneur networks as invaluable sources of knowledge and tools for development. These networks play a pivotal role in promoting women's participation in various sectors, providing a platform for shared experiences and expertise. Agriculture, a significant domain for women's involvement, necessitates a focus on developing gender-friendly tools, equipment and workspaces. Acknowledging women's distinct agronomical characteristics is imperative in designing farm tools and equipment that cater to their specific needs. Emphasizing women's active participation in agriculture is essential for sustainable development, requiring a concerted effort to address existing challenges and bridge gender gaps.

Keywords: Women empowerment, Entrepreneurship, Agriculture, Gender gap

Theme 6: 167
Knowledge of Farm Women about Recommended Technologies Related to Cauliflower Cultivation

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Vegetables play an important role in the maintenance of human health. This makes diet nutritive and balanced. Cauliflower is one of the most important as well as popular rabi season vegetable crops, which is grown throughout the country. Curd, the edible part of cauliflower, is composed of a stalk system with small internodes, branches, apices, and bracts. It contains high-quality proteins, vitamins, and variety of minerals, including potassium, sodium, iron, phosphorus, calcium, and magnesium. The present study was conducted in four *Panchayat samitiees* of the Udaipur district of Rajasthan purposively selected based on the highest area and production. A sample of 89 cauliflower growers was selected from sixteen villages by using a Proportionate Random Sampling technique. Data were collected using structured interview schedule. It was found that 91.50 per cent respondents were categorized with average knowledge while 5 per cent of respondents had poor knowledge and 3.5 per cent of respondents had good knowledge about recommended technologies related to cauliflower cultivation.

Keywords: Vegetables, Cauliflower, Human health, Knowledge, Recommended technologies

Theme 6: 168
Assessing Farmers' Attitude and Utilization of ICT-based Extension and Advisory Services in West Bengal

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The Information and Communication Technology (ICT) revolution has significantly transformed agricultural extension, evolving it from a conventional technology transfer process to a facilitator of diverse information and advisory services. The present study examined farmers' attitude towards ICT-based extension services in Purba Burdwan, an agriculturally prosperous district, and Birbhum, a backward district in West Bengal, with the help of a modified scale developed by Kumar and Ratnakar (2011). The analysis, based on a total sample of 160 respondents, revealed a significant difference in attitude, with majority of Purba Burdwan farmers expressing highly favourable attitude and most of the Birbhum farmers exhibiting least favourable attitude toward ICT-based advisory services. Positive and significant relationships were observed between farmers' attitude and various independent variables such as annual income, land-holding, possession of ICT tools, training, social participation, innovativeness, information-seeking behaviour, e-readiness, economic, risk, and scientific orientation. Additionally, the research delved into the utilization of ICT-based advisory services among crop and dairy farmers, revealing distinct usage patterns in both the districts. Purba Burdwan farmers predominantly employed ICTs for weather forecasting for crop production and management of dairy animals, contrasting to Birbhum farmers' focus on crop marketing and animal breeding. Television and smartphone were the preferred ICT tools as explored through correspondence analysis. The study delineated strategic pathways to promote the adoption of ICT, especially in the backward districts, thereby offering a comprehensive roadmap to propel the socio-economic development of farmers in West Bengal.

Keywords: Attitude, Digital agriculture, Extension and advisory services, ICT

Theme 6: 169
Sentiment Analysis as an Effective Technique for Impact Assessment of Trainees

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Sentiment analysis is the process of categorising a text passage as neutral, negative, or positive. The purpose which Sentiment analysis tries to gain is to be analysed people's thoughts in a way that can help knowledge expansion. It focuses on emotions (happy, sad, furious, etc.) in addition to polarity (positive, negative, and neutral). It employs a range of Natural Language Processing techniques, including Automatic, Rule-based, and Hybrid. The goal of this study is to determine how trainees' perspectives have changed as a result of participating in development efforts. The feedback that students provide can be a useful tool for teachers and other educational instructors to improve training activities and approaches. Ex post facto research with a significant reliance on verbal data will be conducted. Studies of trainings that are cross-sectional or longitudinal can benefit from this research. You can also record the responses using a Likert scale. The outcomes of the study can be used for improving the quality of the training sessions, and to learn and focus on the requirements of the trainees. Educators can design effective learning strategies to pique students' interest and support constructive monitoring of learning progress throughout the course or to enhance subsequent courses by analysing students' activities and extracting data relevant to their learning behaviour.

Keywords: Sentiment analysis, Natural Language Processing, Ex post facto research, likert scale

Theme 6: 170
Exploring Entrepreneurial Climate for Agrienterprise Diversification to Enhance Agripreneurial Income

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Indian agriculture is facing major problems like reduced producer share in consumer price, huge post-harvest losses, insignificant proportion of agroprocessing and value addition in agricultural commodities. There is need to focus on beyond farm production and productivity. Secondary agriculture can be one of the answers for such issues. Various support system in suitable entrepreneurial climate can help agripreneurs to overcome the problem. The suitable entrepreneurial climate play major role in agrienterprises to develop the support system from various agencies is being recognized as critical to agricultural development process. Entrepreneurial climate as a tool for stimulating agripreneurial culture and agripreneurship to enhance the income of agripreneurs has widely been accepted. There is an increased need to understand what factors influence stress. Some factors that may shape/influence/create an entrepreneurial climate include institutional factors, psychological factors, cognitive factors, managerial factors, sociological factors, and, economical factors. Conceptually, when agripreneurs in a particular work unit agree on their perceptions of the impact of their work environment, their shared perceptions can be aggregated to describe their entrepreneurial climate. The entrepreneurial climate is defined as factors that are critical in developing entrepreneurship in certain regions. Hence, the factor influencing/creating/shaping the entrepreneurial climate were delineated and assessed.

Keyword: Entrepreneurial climate, Agrienterprise diversification, Secondary agriculture, Agro-processing, Value addition

Theme 6: 171
Knowledge and Benefits of Selected Government Schemes among Rural Women of Uttarakhand

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The agricultural sector plays a vital role in India's economy, employing a significant portion of the population and contributing substantially to the nation's Gross Domestic Product (GDP). To promote sustainable growth, improve farm productivity and uplift the livelihoods of farmers, the Indian government has implemented various agriculture schemes over the years. This study aims to analyze selected government schemes of agriculture sector viz., Pradhan Mantri Deen Dayal Upadhyay Gram Jyoti Yojana, Pradhan Mantri Krishi Sinchaayi Yojana, Pradhan Mantri Soil Health Card, focusing on the knowledge gained and the benefits received by the rural women. The sample comprised of 100 randomly selected rural women from *Kalsi* block of Dehradun district. Interview method was used to conduct data. Frequency, percentage and mean per cent scores were used for analysis. Findings reveal that majority of the respondents (66%) belonged to poor knowledge category with the overall MPS of 18.23. Regarding the overall benefits gained by the respondent's findings revealed that 78 per cent of the respondents did not gained any benefit from the selected scheme with the overall MPS of 9.33.

Keywords: Knowledge, Benefits Received, Rural Women, MPS

Theme 6: 172
Women Empowerment by Fostering *in situ* Skill Enhancement Ecosystem: A Case Study of Aipan Art in Kumaon Region of Uttarakhand

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Women are indispensable for furthering the agenda of an inclusive economic and sustainable development in India. Aipan art, which dons a Geographical Indicator tag, is primarily practiced by women in the Kumaon region of the state. Deeply entrenched in socio-cultural rituals and norms of the people of this region, the artform has vast potential that remains untapped for promoting entrepreneurship. However, in order to realise this potential, there is a need to understand the perspectives, aspirations and expectations of the women on ground who practice this art. This paper attempts to 'hear these voices from the ground' and inform policy and practice strategies around promotion of Aipan art that are based on a bottom-up assessment 'of the women, for the women and by the women'. Using a case study methodology of households in Kumaon region of the state, the study intends to combine traditional learning methods with modern creative applications, and bridge the gap between cultural heritage and contemporary skills development. Additionally, the study also seeks to obtain insights and provide recommendations for supplementing the income of agricultural households that are involved in Aipan art through standardisation of Aipan art making techniques, value-addition of agro-based products, surface enrichment of various products, and promotion of product-based local eco-tourism and facilitation of market linkages for the same. The study investigates how skill enhancement ecosystem can be developed which incorporates Aipan for not only for artistic utilization in different avenues but also in development of entrepreneurial and leadership skills. In line with Government of India's vision on Atmanirbhar Bharat and efforts towards initiatives like 'vocal for local' and skill development, the study enriches our understanding of the transformative potential of traditional in democratising women empowerment while furthering the harmonious integration of cultural preservation and contemporary empowerment endeavours.

Keywords: Aipan, Entrepreneurship, Gender and Development, Cultural preservation, Artistic expertise

Theme 6: 173
Role of Traditional Media in Dissemination of Information

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Traditional media can indeed be employed as efficient instruments in the task of inspiring farmers and modifying their behavior. The media is utilized by, for, and in conjunction with the populace. Farmers have a very favorable opinion of traditional media as a source of news and information. Traditional media's communication capabilities have been proven throughout the history of development in numerous cultures. The government tries to boost the use of traditional communication through the Ministry of Information and Culture by holding frequent seminars and workshops to train individuals in the use of Indigenous media. Additionally, the family should encourage indigenous interaction by bringing awareness among their family members at home. To reach the most farmers in the current technological world, traditional media must be integrated with ICT tools. We must combine the two media so that extension workers may use them effectively and they should learn from each other, complement each other's advantages, and develop together.

Keywords: Traditional, Media, Extension, ICT, Dissemination, Information

Theme 6: 174
Role of Information and Communication Technologies in Sustainable Agriculture Development

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India possesses one of the largest agricultural sectors due to its wide-ranging and diverse agricultural land. With over 60% of its people working in agriculture, India's economy and food security heavily depend on agriculture. In recent years, Information and Communication Technology (ICT) has emerged as a potent tool for empowering farmers, boosting production, promoting sustainable practices and bringing game-changing transformations in Indian agriculture. India ranks 2nd among Asian countries in the advanced user category. On the one hand, profit motivation, corporate expansion, community services and rural welfare have been the goals of ICT-based agricultural models in India. Here are some key aspects of ICT's role in agriculture: Access to Information (Farmers can easily access weather forecasts, market prices, pest and disease management strategies and best agricultural practices through mobile apps, websites, and SMS services), Precision Agriculture (this involves collecting data from satellites, drones and sensors to optimize the use of resources), Financial inclusion (mobile banking and electronic payment systems, farmers can access safe and practical financial services), Data Analytics (with the help of ICT, farmer can gather and analyze a lot of agricultural data), Climate Resilience (ICT tools help farmers adapt to changing climate conditions in agriculture by providing early warning systems for extreme weather events), Supply Chain Management (ICT systems can track the movement of agricultural products along the whole supply chain), Capacity Building (Online resources and training help farmers learn new skills and stay updated on agricultural innovations) and Policy and Governance (Governments use ICT to implement agricultural policies, distribute subsidies, and monitor the sector's performance). This information empowers them to make decisions regarding crop selection, planting times and selling strategies, ultimately improving crop yields and income.

Keywords: ICT, Agriculture, Sustainable agriculture, Empowerment

Theme 6: 175
Adoption of Solar Home Lighting System Among Rural Women

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Since 43.2% of the rural population in India still lacks access to power, access to electricity has become a big issue. A large majority of rural households in India still lack access to dependable electricity, with 45 per cent of them being without it. Even people who are electrified frequently experience low-quality grid supplies, including frequent blackouts and brownouts. There is total twenty panchayat samities in Udaipur district of Rajasthan, out of which sixteen are tribal and four are rural. Out of four rural panchayat samiti Badgaon was selected purposively as All India Coordinated Research Project on Women in Agriculture has work in the five villages of this panchayat samiti. The total sample of study consisted of 100 farm women (20 beneficiaries from each village) who were beneficiaries of solar home lighting system. Interview technique was used to collect information from the respondents according to the training provided to the farm women. Results revealed that majority of them (77%) were in the category of low level of adoption whereas, 23% respondents belonged to medium adoption category and none of the respondents was found in high adoption category.

Keywords: Adoption, AICRP, Farm women, Solar home lighting system

Theme 6: 176
Modernization of Tribal Farmers in Meghalaya: A Comprehensive Analysis

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Modernization serves as a driving engine that takes one community from existing life to a better world. The study entitled "Modernization of Tribal Farmers in Meghalaya: A Comprehensive Analysis," conducted during 2022-23, aimed to assess the level of modernization among tribal farmers and investigate the relationship between various profile characteristics and their modernization status. The study mainly focused on the regions of East Khasi Hills and Ri Bhoi districts, primarily inhabited by the Khasi tribes, this research was designed to delve into the factors influencing modernization. Two blocks were purposively chosen from each district and two villages within each block were selected for the research. Subsequently, by employing a simple random sampling technique, 20 tribal farmers were randomly chosen from each village, totalling 160 participants. The research design adopted was an ex-post facto approach and primary data were gathered through structured interviews using a pre-tested questionnaire. The findings revealed that three-quarters (75.00%) of the tribal farmers fell into the medium to high modernization categories. Correlation analysis indicated that educational status, type of house, material possession, social participation, annual income, marketing pattern, indebtedness and loan repayment behaviour, mass media use, extension participation, awareness of development programmes and market orientation were significantly related to modernization. Additionally, multiple linear regression analysis showed that a collective set of twenty-four variables accounted for 64.30 per cent of the variation in the modernization of tribal farmers. Further, stepwise regression identified material possession, marketing patterns, mass media use, extension participation, annual income, market orientation and type of house as key predictors, explaining 60.50 per cent of the modernization variance. Hence, it is imperative for policymakers to prioritize the crucial aspect of modernization to foster the comprehensive development of the community.

Keywords: Modernization, Khasi tribes, policymakers

Theme 6: 177
Utilization Pattern of ICT Tools by Dairy Farmers in Andhra Pradesh

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Information and Communication Technologies (ICTs) are becoming more and more common across a variety of sectors. Despite having plentiful opportunities for ICT in the dairy sector, there is still a lot of uncertainty about its usage over traditional ways. The study titled "Utilization Pattern of ICT tools by Dairy Farmers in Andhra Pradesh", conducted during 2021-2022, aimed to assess the extent of ICT tools usage and understand the utilization pattern among dairy farmers. The research was carried out in Chittoor district of Andhra Pradesh. Three mandals were purposively selected within the district, and two villages from each mandal were randomly selected. Subsequently, 20 dairy farmers were randomly selected from each village, totalling 120 dairy farmers. The study adopted an ex-post facto research design and primary data was collected through a pre-tested interview schedule. The results from the study revealed that the majority (47.50%) of the respondents belonged to medium level of ICT tools usage followed by (31.70%) under low and (20.80%) under high categories. Among various ICT tools, the majority (85.84%) of the dairy farmers used television frequently i.e.; once a

week, followed by mobile phone (75.84%) and 25.00 percent of them rarely used radio for getting dairy information. Among mobile applications, the majority (54.16%) of them used SMS apps and WhatsApp (40.80%) frequently for getting and sharing dairy information. Regarding utilization patterns, ICT tools were majorly used for getting market information about prices and maintaining sales records, with a mean score of 2.15, followed by disease management (1.39), feed management (1.23), etc. All the line departments of the state should make good use of the potential of ICT technologies to provide dairy farmers with accurate information and relevant skills, thereby increasing its usage among dairy farmers.

Keywords: Television, Mobile phone, Radio, WhatsApp, Market information

Theme 6: 178

Empowering Rural Women Though Development of Instructional Material on Improved Cattle Rearing Practices

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The present study was conducted to design multimedia instructional material (multimedia CD and flip book) on improved cattle rearing practices for rural women, to assess the comprehension of designed instructional material by the rural women and to study its effectiveness in terms of gain in knowledge among rural women. The study was conducted in three phases. In first phase, multimedia instructional material was designed and evaluated by twenty experts. The audio-visual assessment of multimedia CD was done in terms of 21 criteria, i.e., purpose accomplished, content, organization and layout, colour, visual clarity, attention catching, self-explanatory, continuity in messages, tuning of visuals with commentary, overall presentation, language, commentary, content clarity, voice, continuity of messages, pace and speed of narration, length and time of narration, overall length of programme, music and interest orientation, overall presentation. The flip book was evaluated on six criteria i.e. clarity of visuals, subject matter, organization and continuity, appropriateness of size and overall presentation. In second phase, multimedia instructional material was field tested for its comprehension by 60 rural women (30 for each aid). One group post-test only design was used for collecting data through interview technique. Instructional material was finalized without any modification. In third phase, effectiveness of instructional material was studied in terms of gain in knowledge by rural women. Pre- and post-test experimental design was used for collecting data using personal interview technique. Data were analysed using frequency, percentage, mean score, mean percent score and paired t test. Findings reveal that overall comprehension of multimedia CD and flipbook was found to be very good with mean percent score 95.61 and 92.46. After exposure to CD a good increase in knowledge of the respondents was observed as 100 per cent respondents fell in good knowledge category. A significant difference was observed in the pre and post-test scores of overall knowledge of the respondents with calculated t value 4.9. The pre test scores increased from 24.24 to 83.61 per cent with the gain of 56.20 per cent. In case of flip book all the respondents (100%) exhibited poor knowledge (76.67%) at initial stage in all the components of improved cattle rearing practices but after exposure cent per cent respondents were found in good knowledge category. Overall knowledge of the respondent after their exposure to flipbook increased from 24.51 to 86.69 per cent with the gain of 62.84 per cent. Overall, it could be concluded that both the aids i.e. multimedia CD and flipbook were found to be effective in increasing knowledge of the respondent.

Keywords: Cattle rearing practices, Comprehension assessment, Knowledge gain, Multimedia instructional material, Rural women

Theme 6: 179
Mass Media Utility Perception Behaviour of the Farmers in Nimar agro-climatic Region of Madhya Pradesh

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The present investigation was conducted in the Nimar agro-climatic region of Madhya Pradesh State. The main objective of the study was to know the utility perception behaviour of the farmers towards mass media. The study was carried out on a sample of 240 mass media user farmers. The data were collected through personal interviews of respondents with the help of a structured interview schedule. Data were analyzed with the help of suitable statistical tools. The results of the study showed that the majority (73.33 per cent) of the radio-listening farmers had utility perception as fully clear by radio, followed by 70.41 per cent of the radio-listening farmers having utility perception as fully feasible and 70 per cent of the radio-listening farmers perceived radio covered subject matter fully. The majority (87.08 per cent) of the T.V. viewing farmers reported that T.V. was fully illustrative, followed by 77.50 per cent of the T.V. viewing farmers perceived T.V. as inspiriting, 75.83 per cent of the T.V. viewing farmers opinioned that T.V. fully comprehends the contents. The majority (78.75%) of the newspapers-reading farmers reported that newspapers were fully illustrative, followed by 68.75 per cent of the newspapers-reading farmers who said that newspapers were fully innovative, 65 per cent of the newspapers-reading farmers expressed those contents covered subject matter fully. It was also found that many of the radio-listening farmers had having high level of mass media utility perception behaviour. The majority of the T.V. viewing farmers had a high level of mass media utility perception.

Keywords: Utility perception, Mass media,Ffarmers

Theme 6: 180
Association Between Socioeconomic Characteristics of Farm Women and their Decision-making Pattern Regarding *Bt.* cotton Cultivation

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Women are the most powerful and invisible players in the agricultural sector. Most importantly, they play a major role in the decision-making process at the farm household level. Farm women have a huge contribution to Bt. Cotton cultivation. The present investigation was conducted in Rajsamand District of Rajasthan during 2019-2020. A total 120 respondents were randomly selected for data collection. The data were collected personally through a structured interview schedule. The present study revealed that the majority of farm women shared similar socio-economic characteristics; such as age, education, landholding, social participation, and innovativeness, with a medium level of these factors being the most prevalent. Moreover, the study highlighted that farm women actively participated in decision-making processes related to various aspects of Bt. cotton cultivation. Further the chi-square value clearly showed that age, education, extension participation, and risk orientation had a significant association at a 1 percent probability level with their decision-making pattern while the variables like land holding, social participation, and innovativeness had a significant association at 5 percent probability level with their decision-making pattern regarding Bt. Cotton cultivation.

Keywords: Decision making, Farm women, Association, *Bt.* cotton, Socio-economic characteristics

Theme 6: 181

Advancing Gender and Development Through Skilling, Innovations, Entrepreneurship, Agri-startups, Livelihood, and Capacity Building: A Holistic Approach to Women Empowerment

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Gender and development initiatives play a pivotal role in fostering inclusive and sustainable societies. This abstract explores the interconnected realms of skilling, innovations, entrepreneurship, agri-startups, livelihood, and capacity building as integral components of a holistic strategy for advancing gender equality and empowering women. Skilling programs are identified as crucial mechanisms for bridging gender gaps in various sectors, equipping women with the necessary knowledge and expertise to participate actively in the workforce. Innovations and entrepreneurship further enhance economic opportunities, enabling women to break through traditional barriers and contribute to societal progress. The focus on agri-startups not only addresses food security challenges but also opens avenues for women to lead in agricultural innovation and sustainable practices. Livelihood initiatives form a key aspect of gender and development, recognizing the importance of economic independence in women's empowerment. By supporting agri-startups and diverse livelihood opportunities, societies can ensure the equitable distribution of resources and promote self-sufficiency among women. A central theme in this abstract is the intertwining of these elements to form a comprehensive strategy for women's empowerment. Capacity building emerges as a fundamental pillar, empowering women with the skills, knowledge, and confidence needed to excel in diverse fields. Recognizing and dismantling societal norms that hinder women's progress is an essential aspect of capacity building, fostering an environment conducive to gender equality. The abstract emphasizes the need for collaborative efforts from governments, non-governmental organizations, and private sectors to implement and scale these initiatives effectively. By integrating skilling, innovations, entrepreneurship, agri-startups, livelihood, and capacity building, societies can create a robust framework for gender and development, ultimately contributing to a more inclusive and equitable world.

Keywords: Agri-startups, Women's empowerment, Capacity building, Holistic strategy

Theme 6: 182

A Comparative Analysis Unveiling the Journey of Women Entrepreneurs in Punjab

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Successful women entrepreneurs have been making significant strides in diverse industries, breaking barriers, and reshaping the business landscape. Women's entrepreneurship has been considered an important instrument in achieving equity in the form of a better quality of life for women in the developing world. Empowerment associated with female entrepreneurship changes a woman's position in the family unit, her community, and society, not only through financial independence but also through her acquisition of a position in the national workforce traditionally left to men in developing and underdeveloped regions. This article delves into a comparative

analysis of two remarkable women entrepreneurs, exploring the motivational factors that contribute to their success. The main purpose of the present paper is to identify the factors essential for the sustainable development of a holistic conceptual framework of traits and competencies and thereby motivate other women in Punjab. For this, an in-depth interview of two women entrepreneurs who indulged in the food processing venture was conducted in the Ludhiana and Sangrur districts of Punjab. During the case study analysis, it has been observed that personal, social, and environment-driven motivational factors have affected the development of entrepreneurial learning and competencies that are crucial for the success of women entrepreneurs. Both entrepreneurs discussed in the study had several common factors. The two succeeded in their entrepreneurship due to their sheer grit, determination, and a sense of higher purpose. After the cross-case analysis and comparison, the study revealed that both cases include 'opportunity' and 'necessity' entrepreneurs. It also studied the push and pull effects in entrepreneurship, which are analogous to opportunity-based and necessity-based entrepreneurship. The pull entrepreneur was highly educated and belonged to the urban area, while the push entrepreneur was less educated and had a rural background.

Keywords: Women entrepreneurs, Entrepreneurial motivation, Push and Pull Factors, Case study

Theme 6: 183
Impact of MGNREGS on Women Empowerment in Ludhiana District, Punjab

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The contemporary investigation focuses on women's empowerment in the 21st century via the implementation of the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). It represents the Rural Development Act, delineating provisions aimed at elevating both the rural economy and social development. This study aims to analyze the impacts of MGNREGS and examine various constraints related to the socio-economic empowerment of women within the MGNREGA framework and also compare it with the Non-MGNREGS. This study is based on primary data of a random sample which was collected from 80 female respondents. The Assi–Kalan and Sidda village of Ludhiana district were purposively selected for the research work. Among these, 40 were MGNREGS workers and 40 were non-MGNREGS workers. There is a reduction in percentage of major issues like financial resources, gender inequality, mental ill-health, indebtedness, and dependence on money lenders among MGNREGS beneficiaries further, suggesting that the program has had a positive impact in improving these challenges as compared to Non-MGNREGS. Availability of work has been increased after MGNREGS. This act has also had a great impact on labor migration. Non-MGNREGS respondents were having exhaustive manual work as compared to MGNREGS beneficiaries. The major constraints faced by women in MGNREGS are delays in wage payments, delays in getting job cards, etc. This scholarly analysis underscores the transformative potential of MGNREGS, offering a compelling argument for its continued support and expansion. It ensures gender parity by giving equal participation rights to both men and women in this legislative framework, thereby facilitating sustainable livelihoods. The research has also proposed recommendations for enhancing the existing MGNREG scheme, drawing upon the constraints identified by the workers affiliated with the program.

Keywords: Women empowerment, Constraints, MGNREGS, Rural

Theme 6: 184
Entrepreneurial Behaviour of Dairy Farm Women in Nainital District

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In India, dairy farming has been practised to generate employment and steady income. Dairy farming is considered as an entrepreneurial venture predominantly for women because most of the women are involved in dairy activities starting from caring of animals to marketing milk products. Thus, entrepreneurial development in the field of the dairy sector might be the best possible way to make women competent and self-reliant. Thus, the need to explore the entrepreneurial behaviour of dairy farm women was realized. The study was carried out in Nainital district of Uttarakhand state. Haldwani block was selected purposively and a total of 120 respondents were selected from five villages based on maximum number of dairy entrepreneurs. The findings of the study revealed that the majority of the respondents (72.5%) belonged to middle age category, had education up to high school (30.83%), had medium family size (69.17%), with medium dairy experience (59.16%) and all of them were married. Results further revealed that the majority of the respondents (52.50%) had medium herd size and milk production, 72.50 per cent had a medium level of monthly income from dairy farming, 37.5 per cent had small landholding i.e. one to two hectares, three fourth of the total respondents had medium economic motivation and 77.5% had medium scientific orientation. Regarding the entrepreneurial behaviour of dairy farm women, majority of the respondents (62.5%) had medium level of entrepreneurial behaviour with medium innovativeness (46.67%), achievement motivation (57.5%), decision-making ability (70%), risk orientation (50%), coordinating ability (67.5%), planning ability (59.17%). Further, it was found that respondents had medium information seeking behaviour (73.33%), cosmopoliteness (82.5%) and self-confidence (56.67%). The results showed that majority of the respondents had medium to high level of entrepreneurial behaviour.

Keywords: Entrepreneurial behaviour, Dairy, Farm women

Theme 6: 185
Adoption of Post-harvest Technologies and Value-added Products by Rural Women

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Agriculture is essential to human survival and societal development & has long been recognized as the basis of India's national economy. The declining trend of per capita land availability will shrinking operational holding size poses a serious challenge to the sustainability and profitability of existing system. In order to ensure availability of food throughout the year, these should be processed and preserved to be kept for a longer period. Training is the most important input for bringing desirable changes in human behavior in terms of knowledge & skill. Adoption of these technologies at household level as well as enterprise can enhance food security as well as livelihood security. Present study was conducted under RKVY project implemented at Fatehabad & Hisar districts of Haryana. A sample of 120 rural women's from 4 villages 2 each from these districts were selected randomly. Intervention was provided to each (30 each). Adoption status was measured on four parameters. Majority of them (86.67%) at household level and further disseminated the technology (100%). Major constraint encountered by them was lack of knowledge for marketing facilities available for them.

Keywords: Adoption, Post-harvest technologies, Food security, Intervention

Theme 6: 186
Utilization of Mass Media by the Farmers of Manipur

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The present study was conducted in the first quarter of the year 2023 in Imphal East district of Manipur. Out of 16 districts of the Manipur state, Imphal East district was selected purposively because this district has a KVK at Andro under the control of Central Agricultural University and the researcher was having well acquaintance with the Subject Matter Specialists and Head of the KVK. In the district of Imphal East, two blocks and from each of these two blocks, two villages were selected randomly. Finally, 30 framers from each of four villages were chosen randomly. Thus, a total of 120 respondents were pooled for the study. For analysing the data, percentage, Mean and Standard Deviation were applied. In case of television, 65.83 per cent of the respondents used it daily; in case of radio, 64.17 per cent of the respondents used daily; in case of newspapers, the majority of the respondents (34.17%) never used them; in case of farm magazine, majority of the respondents (94.17%) never used it; whereas, in case of mobile phones, all the respondents (100%) used them daily. Further, it was found that the majority of the respondents (65.83%) had a medium level of extent of mass media utilization, 17.50 per cent had low whereas, 16.67 per cent of respondents had high level of mass media utilization. When preferences of the farmers for utilizing mass media was assessed, it was seen that mobile phone was given as first preference followed by television, radio, newspaper and farm magazine.

Keywords: Manipur, Mass media, Mobile, Television

Theme 6: 187
Assessment of Farm Mechanization in Wheat Production System in Kumaon Region of Uttarakhand

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The present study regarding the assessment of present status of farm mechanization in Udham Singh Nagar and Nainital districts located in Kumaon region of Uttarakhand was assessed for wheat crop production system. The well-structured schedule for the same was prepared and the survey was conducted in the Kumaon region. The data was gathered from the farmers through personal interview during field visit. It was reported that average farm power availability (FPA) (kW/ha) was 2.72 and 2.13 for Udham Singh Nagar and Nainital districts respectively. The farm power availability (kW/ha) in Udham Singh Nagar and Nainital was 3.34, 4.15, 2.70, 2.10 and 1.65 and 2.57, 2.34, 2.30, 1.87 and 1.46 for large, medium, semi-medium, small and marginal farmers. The mechanization index (MI) was highest for tillage (98%, 97%, 97%, 96% and 95%) and lowest for irrigation operation (73%, 63%, 56%, 55%, 51%) for large, medium, semi-medium, small and marginal farmers in Udham Singh Nagar. The large and medium farmers exhibit more adequacy of implement availability than small and marginal farmers in both the districts. It was deduced from the findings that small and fragmented land holdings, extortionate custom hiring and less availability of farm machines during high demand also hinders small and marginal farmers to follow mechanized ways of conducting agricultural operations in the Kumaon region.

Keywords: Farm Power Availability, Mechanization index, Farm machinery demand-supply gap, Custom hiring

Theme 6: 188
Nutritional Extension Strategies for Empowering Rural Women

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Women, the reservoir of productive human resources constitute almost half of the country's total population. Women perform a multiplicity of roles to contribute critically to family, health and sustainable development in our country. In India, the health profile of women is very low due to lack of nutritional education and lack of availability of food. Poor nutrition that continues into pregnancy leads to low birth weight baby, infant death and maternal mortality. To improve the health of women, this requires massive education for women through proper and need-based media in use of sophisticated inputs and recommended packages of practices provided by government and extension workers. There are different forms of media available in the field of mass communication as electronic, print, traditional and modern media. These ICTs are effective in providing information, education among rural women. The present study was carried out in the Nainital district of Uttarakhand state. Purposive sampling was followed for selection of district and villages. Whereas, block and respondents were selected through chit method of Simple Random Sampling. The analytical research design was used to meet out the objectives set forth for the study. The data were collected with the help of interview schedule and knowledge test. The findings reveal that the majority of the respondents were in middle age group, were literate, homemakers and belonged to Other Backward Caste category, fell in the medium level of income had no formal membership, preferred to attend informal meetings as festivals, religious ceremonies and *melas* and possessed high media ownership, used all types of media including modern, print and electronic occasionally, had high trustworthiness attached to the media. Education was positively and significantly correlated with gain in knowledge. Caste and family type were positively and non-significantly correlated with gain in knowledge. ICTs were significantly effective for imparting knowledge to rural women. Based on the findings of the present study, the Nutritional extension strategy for empowerment of rural women was designed.

Keywords: Extension strategy, Nutrition, ICTs

Theme 6: 189
Women Entrepreneurship in India

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In India, entrepreneurship holds immense potential for empowering women, both individually and nationally. It fuels self-reliance, elevates living standards, and fosters economic growth. However, numerous social and economic barriers still hinder women's full participation in the workforce, including challenges in starting and running businesses. Recognizing this, the government has implemented various initiatives to encourage women to embrace entrepreneurship as a path to economic independence. In this context, the paper reviewed relevant literature and data from various sources, including government reports and research studies. This paper focuses on current status of women entrepreneurs in India, impact of various government schemes on women entrepreneurship development and challenges faced by women entrepreneurs in entrepreneurial world. By outlining potential solutions to overcome these hurdles, this paper aims to contribute to a more inclusive and empowered entrepreneurial ecosystem for Indian women, where they can thrive and contribute significantly to the nation's economic and social development.

Keywords: Women entrepreneurship, Status, Impact, Challenges, Suggestions

Theme 6: 190
Role of Agricultural Cooperatives in Nurturing Women Empowerment

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In developing countries, particularly among the impoverished, rural women often find themselves in the most precarious and vulnerable positions. Within this demographic, agricultural cooperatives emerge as promising catalysts for the comprehensive empowerment of women. This abstract delves into the integral role played by agricultural cooperatives in nurturing women's empowerment within the specific context of India. As agriculture remains a foundation of India's economy, women have traditionally held significant roles in farming activities, yet frequently encountered systemic challenges in accessing resources and participating in decision-making processes. Agricultural cooperatives in India serve as dynamic platforms for the advancement of women's empowerment within rural communities. These cooperative structures offer women farmers invaluable opportunities for economic participation, leadership development, and social inclusion. Through cooperative initiatives, women gain access to essential resources, receive specialized training, and gain entry to markets, thereby enhancing their agricultural skills and knowledge. Beyond these tangible benefits, cooperatives function as communal spaces for collective decision-making and skill-sharing, creating environments where women can confidently voice their opinions and actively contribute to the development of their communities. Participation in agricultural cooperatives propels a transformative shift in the roles of women, not only within the realm of agricultural practices but also within societal structures. This engagement provides women with financial independence, a pathway to education, and heightened social recognition. As a consequence, the empowerment of women through agricultural cooperatives contributes not only to individual growth but also to the broader socio-economic development of rural communities. In the Indian context, where the empowerment of women remains a critical agenda, agricultural cooperatives emerge as powerful agents of change, addressing the multifaceted challenges faced by rural women and fostering a more inclusive and equitable society.

Keywords: Agricultural Cooperative, Women, Empowerment

Theme 6: 191
Conserving Agricultural Heritage: Farmer-led Conservation Practices for Landraces in Odisha

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The shift from landraces to modern high-yielding varieties in the "Green Revolution" has resulted in a substantial loss of genetic diversity in agriculture, with over 90% of crop varieties disappearing. Only nine plant species now contribute to 66% of global crop production. Landraces, dynamic populations of cultivated plants lacking formal improvement, are vital for genetic diversity, constituting the livelihoods of millions of global farmers. Informal farmer knowledge of conservation practices is key for on-farm conservation, especially as landraces face threats from climate-induced genetic drift and economic pressures. Odisha is one of the agro-biodiversity hotspots in India with the Jeypore block of Koraput district, serving as the centre of origin for *Aus-type* rice.

Two districts, Koraput and Bargarh, from western and eastern Odisha respectively, were selected for this study. The sampling plan involved selecting five villages from each region, with 15 custodian farmers (conserving landraces) chosen as respondents. This resulted in 75 farmers surveyed in both western and eastern Odisha; a total of 150 custodian farmers as the sample of the study. A Four-Square Analysis was conducted to document conserved landraces, resulting in the identification of 30 paddy landraces in western Odisha and 16 paddy landraces in eastern Odisha. The analysis led to the identification of practices crucial for landrace conservation, categorized into agronomic practices and management practices. Principal Component Analysis was performed to elicit the relationship between best practices required for the conservation of landraces. In western Odisha, 10 agronomic and management practices were identified for paddy landraces, while in eastern Odisha, 10 agronomic and 6 management practices were elicited for paddy conservation. Western Odisha emphasized sustainable farming, avoiding fertilizers, utilizing local bacterial culture *Jeevaamrit*, and adjusting fertilizer based on soil colour. They emphasized the importance of seed banks and diversity blocks for the conservation of paddy landraces. Eastern Odisha focused on organic farming, the use of bacterial culture *Jeevaamrit*, and kitchen gardening for paddy conservation, employing seed banks and mass selection.

Keywords: Conservation, Custodian farmers, Genetic diversity, Odisha, Paddy

Theme 6: 192

Application of ICT in Agriculture: Opportunities and Challenges in Developing Countries

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Information and Communication Technology (ICT) plays a substantial role in developing agricultural growth through the use of various devices to attain economic sustainability and self-reliance. Information and communication technology (ICT) aids provide up-to-date information on the market prices of commodities, inputs and consumer trends which ultimately can improve a farmer's negotiating position and their livelihood. Major aspect of ICT is that accurate information should reach the farmers at the right time to make more sustainable use of on-farm resources. Now the question arises that how this information can be disseminated to such a diverse group of the farming community. ICT is going to play a greater role in agricultural extension as well as private sector agribusiness, market information and market intelligence. Here this paper reviews the role of ICT not only in providing greater awareness and knowledge in agriculture technology and information but also in terms of farmers' attitudes towards trying to adopt new technologies. Findings indicate that the enhancement of market activities, efficient exchange of pertinent information, increased profitability, global networking within the agricultural sector, as well as the facilitation of research and strategic planning for economic self-reliance, stand out as potential benefits of ICT in the agricultural sector. Conversely, the review highlights obstacles such as inadequate ICT facilities, a shortage of skilled personnel, insufficient infrastructure, the need for knowledge and language standardization, unreliable power supply, and the perceptions of farmers, impeding the successful implementation of ICT in agricultural growth. The study concludes by underscoring the imperative for additional research to generate pertinent ideas and suggestions that can optimize the effective implementation of ICT, thereby advancing agricultural development.

Keywords: ICT, Growth, Challenges, Benefits, Agricultural and Development

Theme 6: 193
Utilization Pattern of Social Media by the PG Students of SKRAU and RAJUVAS, Bikaner

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Social media has gained high popularity among the students. Millions of students have accounts on one or more social media platforms. The study was being undertaken in the constituent campus colleges of SKRAU and RAJUVAS, Bikaner. To have an appropriate proportion of representation from both universities, the technique of proportionate random sampling was applied. A total number of 160 respondents (109 Master level students and 51 Ph.D. level students) were selected. Thereafter, data were collected by using the interview method. The statistical analysis of appropriate and required parameters revealed that among the majority of the master level and Ph.D. level students "WhatsApp" got the overall first rank. The majority of the students belonged to the medium category (11.40 to 24.16) of utilization of social media and used social media for "Gaining information". The majority of master level students spent their time of 2-4 hours per day and Ph.D. level students spent their time of 1-2 hours per day on social media. Majority of the master level students accessed social media through both (data packs and Wi-Fi) and Ph.D. students accessed social media through data packs. The majority of respondents reported "both" (Day - Night time) as the most preferred time of using social media as the first rank. Among of the master level students, the most preferred package of internet use was "24/28 Days and 56 Days" and among Ph.D. level students, the most preferred package of internet use was "24/28 Days.

Keywords: Social media, Utilization, Students

Theme 6: 194
Impact of KVK Training on Improving Socio-economic Status of Paddy Growers in Southern India

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Paddy plays a critical role in global nutrition, with over half of the world's population relying on it as a staple food. The focus on India, the second-largest global producer of paddy, and specifically the Cuddalore district, sheds light on the transformative impact of Krishi Vigyan Kendra (KVK) initiatives on the socio-economic status of paddy growers. To know the impact of the KVK Training programme among KVK Vridhachalam trained paddy growers, the study was conducted in the Cuddalore District of Tamil Nadu. 150 Paddy growers were selected as respondents from 15 Paddy growing villages by employing simple random sampling techniques. Results reveal significant positive changes, including a 19.17% increase in income, enhanced mechanization, formation of Farmer Producer Organizations, seed production, and the initiation of direct marketing and value addition. These findings underline the multifaceted benefits of KVK training in promoting sustainable agricultural practices and improving the livelihoods of paddy growers. The study contributes valuable insights for future agricultural development strategies, emphasizing the need for continued support for initiatives like KVK.

Keywords: KVK training, Paddy, Impact, Socio-economic status

Theme 6: 195
Impact of Extension Strategies on the Adoption of Practices Pertaining Drinking Water Quality

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The health of a person is directly impacted by the potability of the water they consume. Thus, it is imperative to ensure the quality of water used for drinking purpose. In this regard, the present research was carried out with the aim to assess the existing adoption of practices related to drinking water quality, and to assess and compare the effectiveness of different extension strategies in changing the adoption of these practices. The concept of drinking water quality was studied in terms of the use of appropriate water quality tests, water purification methods and safe water storage practices. The action-cum-experimental research was focused on 200 rural women of Ludhiana district, Punjab. One-fifty (150) respondents were treated as the experimental group and 50 respondents were kept as the control group. Intervention was given in the form of three extension strategies i.e. use of interpersonal methods (Strategy I), WhatsApp video messages (Strategy II) and combination of interpersonal methods and WhatsApp video messages (Strategy III). The results revealed that before intervention, about one-fifth of respondents regularly tested the quality of their drinking water, only a few respondents had tested the water TDS and pH level, while use of chlorine was observed in two per cent control group respondents only. Not even a single respondents' use of RO purifiers was influenced by the TDS content of their household water and about one-fourth of the respondents were the non-users of plastic water storage containers. The findings indicated significant change in adoption of the selected practices through the use of all three extension strategies while the use of interpersonal methods under strategy I was the most impactful. Respondents' active engagement during the discussion and the ability to understand the process through live demonstrations were the leading factors contributing to the effectiveness of the strategy I for modifying the respondents' adoption. Thus, it is suggested to upsurge the use of interpersonal methods while promoting the adoption of recommended practices or technology by extension personnel.

Keywords: Adoption, Extension strategies, Water purification, Water quality testing, Water storage

Theme 6: 196
Attitude of Trainees Towards Long Term Skill Development Course Organized by Skill Development Centre, PAU Ludhiana

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The Skill Development Center concentrated on the improvement of employment opportunities in agriculture and related fields as well as the development of entrepreneurial skills to increase production and farm income. The National Skill Development Corporation plans, oversees, evaluates, certifies, and keeps track of all skill development programs. This course certificates is accepted across the nation. This course provides skills and hikes their business doing to make them self-reliant by initiating their own professions. Training is the compass that guides individuals towards excellence and organizations towards success. It is the pathway to acquiring new skills, refining existing ones, and fostering a culture of continuous improvement. The phenomenon of learning

and skill stagnation is increasingly emerging as a significant impediment to the progress of society. The study entitled on attitude of the trainees towards the training course. The study was conducted from Punjab. A list of total 280 trainees (8 batches of four years i.e., 2 batches in a year) for the course i.e., three months young farmer Integrated crop production training course during the period of 2016-2019 was obtained from Skill Development centre, PAU Ludhiana. Out of the procured list, a total sample of 200 respondents was selected from random sampling technique. Attitude of trainees towards long term skill development courses was measured by developing attitude scales (Likert 1932). Data was collected by personal interview method. Collected data were analyzed with the suitable statistical techniques. The study revealed that after training the majority of trainees had favourable attitude towards long term skill development course.

Keywords: Attitude, Trainees and Skill development centre

Theme 6: 197

Innovative Extension Strategies for Livelihood Diversification and Women Empowerment: A Comprehensive Review

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Livelihood diversification is pivotal in enhancing women's empowerment by providing them with increased economic opportunities and agency within their communities. Recent research underscores the importance of integrating innovative extension approaches to effectively support livelihood diversification initiatives and promote gender equality. These strategies encompass a range of interventions, including capacity-building programs, technology adoption, market linkages and community mobilization efforts tailored to the specific needs and aspirations of women. Women can be empowered to explore alternative income sources and assert greater control over their economic destinies by being given access to relevant training in diversified livelihood options like small-scale entrepreneurship, agro-processing, and handicraft production. Value chain development initiatives and extension services also help women to become more resilient to economic shocks and vulnerabilities, reducing the negative effects of market fluctuations, climate change and other externalities. Furthermore, the adoption of Information and Communication Technologies (ICTs) has emerged as a promising tool for enhancing the reach and effectiveness of extension services in promoting livelihood diversification and women's empowerment. Mobile applications, online platforms, and virtual training sessions facilitate access to critical information on market trends, financial services, and technical know-how, thereby enabling women to make informed decisions and leverage emerging opportunities. In addition, participatory extension approaches that emphasize community engagement and women's participation in decision-making processes are essential for fostering ownership and sustainability of livelihood diversification initiatives. By involving women as active agents in the design and implementation of extension programs, practitioners can ensure that interventions are contextually relevant, culturally sensitive, and responsive to women's diverse needs and priorities. By adopting a holistic approach that combines gender-responsive training, ICT interventions, and participatory methodologies, extension services can effectively support women in diversifying their livelihoods, enhancing their economic well-being, and contributing to sustainable development.

Keywords: Livelihood diversification, Economic opportunities, Information and communication technologies, Women's empowerment

Theme 6: 198
Livelihood Dependency and Living Standard of Farmers in Tribal Area of Madhya Pradesh

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The livelihood dependency of tribal farmers has been assessed in Madhya Pradesh. Barwani district was selected randomly for the present study under externally funded project. Two types of respondents as sample *i.e.* sole farming respondents and diversified farming with allied activities respondents (tribal farmers) were selected. Opinion regarding livelihood dependency of about 80 percent respondents of diversified farming with allied activities group and sole farming group are agreed that their livelihood were not depending on merely sole farming, whereas a big majority of both respondents group are agreed that livelihood depending on diversified farming with allied activities. A double majority/percentage of respondents of diversified farming and allied activities group than respondents of sole farming group are strongly agreed about living quality standard in case of 'surviving and health indicator' and 'social reputational indicators'. The constraints were reported by researcher are like more expenses on smoking or drinking, lack of proper scientific knowledge about farming, lack of farm infrastructure, lack of extension/ awareness programme 'lack of knowledge about govt. subsidies based programme' and 'believe on traditional life' etc. The suggestion of researcher given under sub-heads to be considered by respondents for overcome on the constraints *i.e.* regarding awareness creation, regarding transfer of technology, regarding infrastructure development, regarding general need.

Keywords: Livelihood, Living standard, Sole farming, Diversified farming, Allied activities, Scheduled area

Theme 6: 199
Grassroots Leadership Development for Gender Mainstreaming

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Relative to their share in the population, women are under-represented in all political positions. Women's voice in decision-making is critical for the development of all. When women have a say in private and public affairs, decisions reflect their needs, and often the needs of their families and communities. A number of studies find that increased female representation in politics is associated with significant changes in policymaking. Women's leadership is also intrinsically linked to achieving the Sustainable Development Goals like, "Achieve gender equality and empower all women and girls. For advancing gender justice and gender equality, it is critical to encourage women as leaders and decision-makers at all levels and to promote economic, social, and political progress for all. The present review paper discusses the status of women in different spheres of life like politics, business and community. The paper further highlights the role of leadership development for gender mainstreaming and the constraints associated with this. The paper suggests that providing skill training to women, supporting women's organizations, advocating gender-sensitive policies and promoting women's rights can help develop leadership among women. Efforts should be made to include them actively at all levels of decision-making as well as provide them with the information and knowledge that is required to make them better planners. Capacitated women can raise their voices for gender mainstreaming at all levels.

Keywords: Gender mainstreaming, Women, Leaders, Politics, Decision-making

Theme 6: 200
The Study on Gender Equality in Promoting Food Security and Nutrition in India

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Access to good nutrition is a basic human right and a fundamental component of human dignity. Yet malnutrition affects women and girls twice as much as it does men and boys, due to a combination of biological, social and cultural reasons. Empowering women and girls to claim their rights leads to improved health and nutrition for themselves and a better quality of life for their families and communities. But as long as malnutrition affects women and girls at a much higher rate than men and boys, we cannot achieve gender equality. All people, at all times, achieve food security at the individual, household, national, regional, and global levels when they have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for a healthy and active life. A strong link exists between food security, good nutrition, and gender. Applying a gender approach to food security can shift gender power relations and ensure that all people, regardless of gender, benefit from and are empowered by development policies and practices to improve food security and nutrition. No one can contest the centrality of gender equity for inclusive development. Inequalities based on gender manifest in myriad ways. These include unequal access to educational opportunities, gender-based discrimination, and social norms that restrict the participation of women and other groups that are unfairly marginalized from the development process. This brief provides an overview of why and how to consider gender aspects in both short-term humanitarian assistance and long-term development cooperation that address food security in India.

Keywords: Food security, Gender equity, Nutrition

Theme 6: 201
Innovative Approaches in Extension: Unraveling Creativity through Digital Embroidery Techniques

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In a rapidly evolving technological landscape, the fusion of traditional craftsmanship with cutting-edge digital tools has opened up exciting possibilities in the field of textile artistry. Digital embroidery serves as a transformative medium, providing artists and designers with a canvas to express creativity in unprecedented ways. This abstract delves into the exploration of novel techniques and methodologies within the context of extension services. By embracing digital embroidery, practitioners can transcend conventional boundaries, introducing intricate details and precision that redefines the traditional narrative of textile art. The narrative unfolds with a discussion on the integration of advanced software and computerized machines in the embroidery process, highlighting how these technological innovations contribute to the development of intricate and complex designs. Moreover, the abstract emphasizes the democratization of creativity facilitated by digital embroidery, as it enables a broader audience to engage in the artistic process, fostering a collaborative and inclusive approach to extension services.

Keyword: Innovative approaches, Digital embroidery, Textile artistry, Traditional craftsmanship, Technological integration

Theme 6: 202
Indigenous Technical Knowhow for Community Development

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Indigenous knowledge refers to knowledge that is unique to people living or evolving in a particular geographical area resulting from historical behaviors. It is the local knowledge which passes from one generation to another. It is basically people's way of dealing with situations and problems in various aspects of life. This indigenous technical knowhow is efficient for community development as it is eco-friendly, cost effective and best by product user. Linking indigenous knowledge and modern technology can engage communities in their overall development because indigenous technical knowhow is more socially acceptable, economically affordable involving minimum risk. With the growing advancement of technology and its negative impact on the society indigenous knowledge is the best alternative towards the achievement of food security at the community level and overall development of rural based communities. It can contribute to the generation and exploitation of technology to benefit rural community. It reduces the reliance on foreign inputs which promotes eco-friendly agriculture. For local community indigenous knowhow is an inseparable part of their culture but in course of time less attention was given towards the documentation and preservation. This treasure is getting buried for the sake of modernization. Therefore, there is urgent need of the hour for the collection and documentation of the indigenous know how so that the coming generation can take advantage and use it for its best results. This will create a base for future research and development in agriculture. This will serve as a best alternative means of managing resources. with the use of indigenous knowledge by using indigenous communication channels the problems of the community can be easily solved and promotes sustainable development.

Keywords: Indigenous knowledge, Community development, Sustainability

Theme 6: 203
Women Entrepreneurship

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Women entrepreneurs are women who start and run their own business enterprises. Basically, They play a vital role in driving innovation, economic growth, and social change around the world. Entrepreneurship is a state of mind, which many women have in her, but has not been capitalized in India in way it should be. Women in developing economies are much more likely to start their own businesses than those in high-income countries, with approximately 25% of women in low-income countries and 13% in lower-middle income countries compared to approximately 10% globally. The reason for this is the fact that these women valuate entrepreneurship as a way to find better incomes for their families. Due to change in environment, now people are more comfortable to accept leading role of women in our society. This entrepreneur development is being recognized as an important untapped source of economic growth since women entrepreneur create new jobs for themselves and others and by being different also provide society with different solutions to management, organizations and business problems. They see the world through a different lens and, in turn, do things differently. The role played by micro enterprises in India is immense, as they are effective tool for sustainable livelihood, employment generation and empowerment of women.

Keywords: Entrepreneurship, Empowerment, Development, Role, Women

Theme 6: 204
Awareness and Utilization of Telangana Government Schemes by Rural Women Beneficiaries

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Telangana is India's newest state, with a goal of providing residents with a holistic and comprehensive development. Towards the accomplishment of the 'Bangaru Telangana' vision. Telangana government has implemented a number of schemes aimed at improving the lives of women and the society. Four schemes were chosen for the research among all initiatives to learn more about rural women's awareness and utilization about government schemes. The selected government schemes were Kalyana Lakshmi/ Shaadi Mubharak, Aasara pension, KCR Kit and Aarogya Lakshmi. An Ex-post facto research design was followed in the present study and random sampling was done for selection of respondents. A total of 120 respondents were taken for the study, 40 from Karimnagar, 40 from Jangoan and 40 from Nalgonda districts, where all the selected schemes were being implemented. The data collected through personal interview method with the help of a structured interview schedule. Statistical procedures like frequency and percentage were employed to analyze and interpret the data. Results revealed that majority of the respondents belonged to young age group, with highest per cent of high school education, most of them were housewives, highest per cent of respondents had annual income between Rs. 60,001- Rs. 1,00,000, majority of them were married, highest per cent of them had one child and had medium mass media exposure and low extension contact. With regard to the level of awareness of selected schemes, Kalyana Lakshmi/ Shaadi Mubharak and KCR Kit had high level of awareness among the respondents. In case of Aasara pension and Aarogya Lakshmi they had medium level of awareness. Extent of utilization of Kalyana Lakshmi/ Shaadi Mubharak and Aasara pension was medium, in case of KCR Kit and Aarogya Lakshmi it was high extent of utilization.

Keywords: Rural women, Government schemes, Awareness, Extent of utilization

Theme 6: 205
Impact of Cluster Front Line Demonstration on Yield of Pulses in Sheopur District M.P.

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A study was carried out in 50 progressive farmers field in the Sheopur district of M.P to find out the impact of CFLD on yield and income of farmers, during the year of 2020-21 and 2021-22 under cluster demonstration have been carried out in Rabi seasons on pulses crop like chickpea. The area has been covered during the period each 20 ha. and demonstrations each 50. During the period the variety RVG 201. Average yield of demonstration in case of chickpea was 19.95 q/ha. while it was 16.53 q/ha was found in farmers practice 20.68% yield has been found increase over farmers practice during 2020-21 and during the year of 2021-22 variety average yield of demonstration was 19.35 q/ha while it was 16.62 q/ha was found in farmers practice 17.72% yield has been found increase over famers practice.

Keyword: Pulses, Yield, Technology gap, Extension gap, Technology index

Theme 6: 206
Assessing the Entrepreneurial Competencies and Performance of Startups in Telangana State

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Agri-Startups have the potential to significantly contribute to the expansion of the agriculture sector by transforming it from 'subsistence farming' into 'Agri-business' and ultimately increasing the farmer's income. Entrepreneurial competencies serve as the cornerstone of success for Startups, enabling them to innovate, disrupt, and achieve sustainable high performance in today's dynamic business environment. As Startups continue to play an increasingly significant role in driving economic growth and fostering innovation, the importance of nurturing and harnessing these competencies cannot be overlooked. The present study was conducted in Telangana State covering 53 Agri-Startups out of 526 Agri-Startups, selected randomly by using multistage stratified random sampling method in order to assess the entrepreneurial competencies and performance of Startups. The sector wise classification of selected 53 Agri-Startups include; 'Agri-Tech' (23), 'Animal Husbandry' (3), 'Dairy' (3), 'Fisheries' (2), 'Food Processing' (6), 'Horticulture' (3), 'Organic' (7), and 'Other' (6). The overall distribution of entrepreneurs based on entrepreneurial competencies as perceived by the entrepreneurs revealed that most of the respondents belonged to 'medium level of competencies' of 'opportunity seeking competence' (45.28%), 'conceptual competence' (47.17%), 'organizing competence' (64.15%) and 'strategic competence' (35.85%). Whereas, 'relationship competence' (37.73%) and 'commitment competence' (35.85%) belonged to 'high level of entrepreneurial competency'. The overall distribution of Agri-Startups based on performance as perceived by the entrepreneurs revealed that two-fifth (41.51%) of the Startups belonged to high level of performance. The Chi-square analysis reveals that among all the six dimensions of entrepreneurial competencies had a significant relationship with the performance of Agri-Startups. In conclusion, the pivotal role of entrepreneurial competencies in fostering the success and high performance of Startups cannot be overstated. Through a combination of skills, traits, and mindset, entrepreneurs navigate the complex landscape of Startup ventures with agility, resilience, and innovation.

Keywords: Agri-startups, Entrepreneurial competencies, Performance of Startups

Theme 6: 207
Importance of Silicon Regarding Yield Attributes and Yield in Maize Crop

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Silicon (Si) is an agronomically beneficial element as it improves growth, confers rigidity, strength and enhances plant tolerance to various abiotic stresses. Diatomaceous earth (DA) is an important source of silicon. The results revealed that application of diatomaceous earth had a significant effect on the yield attributes and yield of maize. In the case of main effects of 300 kg ha^{-1} diatomaceous earth recorded maximum number of seeds cob^{-1}, shelling percentage, test weight and yield. The present investigation therefore suggests the inclusion of 300 kg ha^{-1} diatomaceous earth in maize crop production practices.

Keywords: Diatomaceous earth, Maize crop, Yield

Theme 6: 208
Gender Dynamics in Agricultural Migration and Development in India

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The largest agricultural economy of world, India's agricultural sector serves as a crucial backdrop for understanding the nuanced roles and experiences of men and women in migration processes. According to the Migration of India, 2020 report rural males and rural word repeated twice females migrated in search of employment was 11.8% and 0.2%, respectively; urban males and females migrated in search of employment were 29.9% and 1.5%, respectively during 2020-21. 'Migrarian' (migration and agriculture) livelihoods now form a crucial part of India's economy and migration has become a significant livelihood option across rural India. With the aim to investigate how gender norms, and power relations shape migration patterns, access to resources, and decision-making processes within agricultural households the study have been undertaken. The multistage stratified sampling design was used to collect data from 480 migrants. The theory of planned behaviour was employed and analyzed using structural equation modeling with sample survey weights to determine migration behaviour and household decision-making. The study revealed positive association between exogenous latent variables (attitude, subjective norms and perceived behaviour control over migration) and endogenous latent variable (migration intention and behaviour). The consequent implication of migration on household decision-making and engagement of women in farm as well as household activities have established. Moreover, this research identifies policy interventions aimed at promoting gender equality and women's empowerment in agricultural migration processes.

Keywords: Decision-making, Gender dynamics, Gender equality, Migration, Structural equation modeling

Theme 6: 209
Analysis of Training Needs of Farmers *vis-a-vis* Agritourism in Mountanious Region of India

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Agritourism combines agriculture and tourism, incorporating tourism activities in the farming fields and providing vivid farming experience to the people from non-farming community. This innovation in agricultural practices assists farmers in mitigating inevitable losses resulting from various unpredictable factors. As agritourism remains relatively unpopular across India, except in the western region of Maharashtra, it is essential to assess the training requirements of farmers interested in adopting it. The research took place in Uttarakhand, one of India's mountainous states. An exploratory research design was utilized to investigate agricultural practices in Uttarakhand, where a sample of 200 farmers was selected randomly. Training needs were assessed across seven key areas crucial for the successful operation of an agritourism venture. These areas encompassed guest management, financial management, administration, marketing of agritourism offerings, procurement, networking, and related activities. Additionally, farmers' preferences concerning the duration and location of training were determined. The findings regarding training needs indicated that within the hospitality domain, farmers required training primarily in safety and risk management (weighted mean score (WMS=1.910), followed by transportation management (WMS=1.905) and housekeeping (WMS=1.90). Regarding financial management, the identified training needs focused on accounting (WMS=1.925), followed by forecasting (WMS=1.855), budgeting (WMS=1.845), and taxation (WMS=1.805).

Keywords: Agritourism, Training needs, Risk management, Forecasting, Budgeting, Taxation

Theme 6: 210
Effect of Front Line Demonstrations on Yield and Economics of Gobhi Sarson

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Technology assessment and demonstration for its application and capacity development is one of the major mandate of Krishi Vigyan Kendras (KVKs). Gobhi sarson is an important high yielding rabi oilseed crop, suitable for growing both under irrigated and rainfed conditions. Its leaves are thick, smooth, sweet in taste, and give quality sag. Its initial growth is slow and plants remain in vegetative phase till late January. As such crop escapes frost and plants do not lodge easily. It is resistant to white rust and has about 44.5% oil content. It takes about 160 days for maturity and yields about 15-20 q/ ha. Area under oilseed crops in HP is 10891 ha and in district Kangra is 3522 ha with production of 7829 and 1881 MT, respectively. Thus, frontline demonstrations on oilseed crop, improved variety of gobhi sarson (GSC-7) were laid out in an area of 14.16 ha in 103 farmers' fields comprising seven villages of district Kangra of Himachal Pradesh. The study was conducted with the objectives to evaluate the crop yield gap, economic returns, constraints faced by the farmers and extent of farmer's satisfaction. In the present study, 103 need based respondent farmers were selected and frontline demonstrations were laid out during the years 2021-22 and 2022-23.The average plot size was 0.14 ha for the technology demonstrated and local check. The FLD resulted in an increase in yield by 21.92 percent over the local check. The demonstrated technology outperformed local check as the study resulted in technology gap, extension gap and technology index of 25.53, 1.95 and 14.34, respectively. The FLD of improved variety of gobhi sarson resulted in an additional economic returns of Rs. 7250/ ha with an additional cost of cultivation of Rs. 2800/ ha. The B:C ratio of 1.80 was recorded for FLD and 1.65 for the local check. The farmer's satisfaction index revealed that majority of respondent farmers expressed high (63.60%) level of satisfaction about FLD on this variety. Timely non-availability of improved seed varieties of gobhi sarson was found to be the most confronting constraint as expressed by the farmers and ranked at number one, followed by lack of irrigation facility.

Keywords: Front line Demonstrations, Yield, Economics, Gobhi sarson

Theme 6: 211
Artificial Intelligence in Agriculture

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The United Nations FAO (Food and Agriculture Organization) states that the world population would increase by another 2 billion in 2050 while the additional land area under cultivation will only account to 4% at that time. In such circumstance more efficient farming practices can be attained using the recent technological advancements and solutions to current bottlenecks in farming. A direct application of AI (Artificial Intelligence) or machine intelligence across the farming sector could act to be an epitome of shift in how farming is practiced today. Farming solutions which are AI powered enables a farmer to do more with less, enhancing the quality, also ensuring a quick GTM (go-to-market strategy) strategy for crops. Artificial intelligence is based on the idea that

human intelligence can be described in such a way that a computer can simply duplicate it and carry out activities. Artificial intelligence in agriculture aids in pest management, data organisation, healthier crop production, soil analysis and monitoring, supply chain management, crop cycle expertise, farm produce aggregation, farmer advisory, crop harvesting, precision farming, work load reduction and many other tasks. The value of AI in the global agriculture market was estimated to be around 1.7 billion dollars in 2023 and is forecast to grow to about 4.7 billion dollars by 2028. At present in India, Microsoft Corporation is working in the state of Andhra Pradesh with 175 farmers rendering services and solutions for land preparation, sowing, addition of fertilizers and other nutrient supplements for crop and a result of on average 30% crop yield. Government launches many programmes and projects for boosting the AI sector such as Artificial Intelligence for Agriculture Innovation (AI4AI) initiative in August 2020, with the Government of Telangana and support from the Ministry of Agriculture, the National Instruction for Transforming India (NITI) Aayog and the Ministry of Electronics and IT.

Keywords: Artificial intelligence, Agriculture, Crop, Farming

Theme 6: 212
Empowering Women Agripreneurs: Challenges, Coping Mechanisms, and Policy Recommendations

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India has a high number of unemployed women of working age. Women-owned businesses in India have increased from 14% to 20% in the last decade. India ranks low in terms of female entrepreneurship compared to other countries. Women entrepreneurs in India primarily focus on culinary activities. The number of women entrepreneurs is slowly increasing due to government programmes and organizations. TREAD, Mahila Udhyam Nidhi Yojana, Stree Shakti package, Bhartiya Mahila Bank Business Loan, Dena Shakti Scheme, Udyogini scheme, Cent Kalyani scheme, Mudra Yojana Scheme, Shishu, Kishore, Tarun *etc.* are some of the financial efforts of the government to nurture women entrepreneurs. Women entrepreneurs are emerging and leading ventures successfully in India; today, we can see that there are more than 8.5 million women entrepreneurs in India. Even though their number is increasing, considering the actual scenario, they face several issues and challenges that need to be solved. Apart from these problems, the Covid pandemic has brought another aspect of business problems that partially stopped or permanently stopped the business operations. This report aims to identify the challenges and issues women agripreneurs face during different phases of their business and to know what measures they have followed in tackling those problems, along with these possible measures. The study also focuses on challenges faced by women agripreneurs during the pandemic. The mechanisms they have adopted related to various business aspects and actions to build resilience in the business are suggested. It is found that most of the women agripreneurs are facing challenges related to strategy planning, marketing and business skills, and during this pandemic; they have gained knowledge of online platforms as they started their website. Along with these aspects, different schemes supporting women agripreneurs and policy recommendations considering covid situations are suggested. This report aims to find out the issues and challenges faced by women agripreneurs before and after the covid pandemic, coping mechanisms adopted by women agripreneurs for those challenges, and possible measures to be taken to tackle such crucial situations. Schemes and opportunities supporting women agripreneurs and policy recommendations for women agripreneurs.

Keywords: Agripreneurs, Challenges, Empowering, Mechanisms, Policy, Women

Theme 6: 213
Satisfaction Level of the RAWE Students of SKNAU, Jobner

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The students READY (Rural Entrepreneurship Awareness Development Yojana) programme aims to provide rural entrepreneurship awareness, practical experience in real-life situation in rural agriculture and creating awareness to undergraduate students about practical agriculture and allied sciences. The SKNAU, Jobner started this programme from the year 2020-21. It is not only an essential requirement for the completion of B.Sc. Agri. Degree but also is a golden opportunity for the students to develop skills and confidence to discharge their responsibilities as extension workers. The study was conducted in 4 constituent and 4 affiliated colleges of SKNAU, Jobner and a sample of 60 students from both types of colleges were selected using simple random sampling through proportional allocation method. For measuring the satisfaction level of the students of SKNAU, Jobner regarding Rural Agricultural Work Experience (RAWE), a schedule was prepared by consulting various experts and through research reviews. Thus, this schedule included 35 satisfaction based questions. The investigation revealed that majority of students of constituent colleges (81.67%) had medium satisfaction level whereas, 18.33 per cent students of constituent colleges were having poor satisfaction level regarding RAWE. Among different statements of satisfaction level, the statements "RAWE placement to be decided in consultation with the students" with 99.17 MPS was found to the highest level of the satisfaction of students of constituent colleges, followed by "Oral examination at the end of RAWE Programme" (98.33 MPS) Whereas the statements " Use of ICT tools by farmers in the village" and "Placement of students every year in same village to be avoided" (75.83 and 45.83 MPS respectively) was found to the least level of satisfaction of students of constituent colleges. A significant difference was found in the satisfaction level of students of constituent and affiliated colleges regarding at most statements of RAWE. The results could be improved using the increase in sample size and the sample taken from other universities too.

Keywords: Affiliated, Constituent, RAWE, READY, Satisfaction, Programme

Theme 6: 214
Women Agri Entrepreneurship: Roles and Opportunities for Sustainable Growth in India

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Agriculture sector provides vast scope for employment generation, sustainable growth, and women empowerment. A sufficient amount of nutrition is needed to nourish the youth population in India, whose population is constantly expanding and contributes to the nation's growth. According to the current state of affairs in India, farmers are doing everything in their power to grow crops on demand in order to enhance their livelihoods and make money. Indian women have been involved in this industry as well. Increasing the number of Indian women farmers and agribusiness owners can boost their ability to generate revenue and maintain their own needs. Agriculture offers a plethora of options, including the production of products with higher economic

worth, value addition, and the potential to be crucial in the current global agricultural market. Indian Women have been actively engaged in all type of agricultural practices to earn economic gains for the family. Indian women farmers still face conditions and statuses similar to those of Labourers in the agricultural sector. They ought to receive just compensation for the hard work that has enabled them to become nationally recognized farm owners and leaders in agribusiness. Women entrepreneurs need the government to provide them with handholding, technical assistance, and skill development through programmes, initiatives, and training sessions. To attain sustained growth, women are the key to entrepreneurship. Even though the government has established a number of programmes to support women in entrepreneurship, much work needs to be done before women's organizations from rural and tribal areas can profit financially from the agriculture industry. This review study provides insights into the scope of agriculture entrepreneurship for upliftment of Indian women. Major roles, opportunities and challenges for Indian women to conquer in agriculture sector to achieve sustainable growth.

Keywords: Agriculture, Women Agripreneurship, Entrepreneurship, Indian, Sustainable, Growth, Rural and Government

Theme 6: 215
Application of Internet of Things in Agriculture

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India is one of the world's top producers of agricultural goods and agricultural industry has a major contribution to the economy. The past few decades have seen immense change in the agricultural sector with the introduction of Internet of Things (IoT) using a new era of innovation and efficiency. The potential applications of IoT in agriculture are limitless. Farming practices could undergo a transformation which will increase productivity, efficiency, and sustainability. The adoption of IoT in agriculture is revolutionizing the industry, paving the way for precision monitoring and data-driven farming, such advancements are highly based on exchange of messages between various devices in the farming. This review paper provides an overview of IoT application in agriculture, highlighting its transformative potential, and current progress in IoT based tools. IoT devices deployed in farms monitor vital parameters such as soil moisture, temperature, irrigation, fertilization, pest control, crop health, granting farmers to access real-time data and early issue detection. Farmers can use IoT-based technology to forecast weather trends and choose the best time to grow and harvest crops. Smart applications along with authentication protocols provide real time alerts and enable immediate responses to suspicious activities and provide farm security through the deployment of devices such as cameras, motion sensors, and access control systems. This assists in making optimized choices, proactive interventions, minimizing losses and maximizing yields. Automation increase farmers' productivity and their reliance on manual labor can be decreased by using IoT-based agricultural equipment. This provides flexibility by having control IoT devices on their farms even when they are away and facilitates timely interventions. This allows farmers to precisely apply their resources, ensures high-quality food products and minimal wastage and promoting resource conservation while safeguarding the environment. IoT uptake in India is currently constrained by a number of issues like high costs, lack of knowledge, and inadequate infrastructure. Collaborative decision-making platforms and awareness and training workshops can serve as central platforms for connecting farmers, researchers, and technology experts to a global network and facilitating the dissemination of important IoT information.

Keywords: Digital agriculture, IoT application, IoT Tools and devices, Smart agriculture

Theme 6: 216
Empowering Women by Reducing Occupational Stress

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Historically, the role of women in India was conventionally confined to family responsibilities, encompassing duties as a mother and homemaker. However, the role and existence of women has changed now. Comprising nearly half of the entire population, we can assert that the contribution of women to the Indian economy is not like a tiny dot on a complete page. According to the Periodic Labour Force Survey Report 2022-23, there has been a noteworthy improvement in the Female Work Participation Rate in the country with the remarkable increase, reaching 37.0% in 2023. This remarkable rise in the female work participation rate is attributed to the Government's decisive agenda, which focuses on ensuring women's empowerment through policy initiatives geared towards their long-term socio-economic and political development. In the present era, economic demands have also necessitated women's active participation in the workforce to contribute financially to their families. However, the challenge of managing both work and family commitments can substantially influence the psychological and physical well-being of women, ultimately impacting their job performance. Their multiple roles of caregivers, parents, and professionals can give rise to significant stress and strain. The consequences of prolonged exposure to occupational stress can be severe and can impact not only the individual's mental health but also their physical health, relationships, and overall quality of life. Therefore, the present study was planned to analyze the trend of women participation in workforce and what are various factors causing occupational stress. The paper also highlights the initiatives taken by the Government of India to reduce working stress and empowering women at workplace. Additionally, the strategies are also discussed to manage occupational stress at various levels. The study will provide valuable insight to policymakers and organizations to support and empower women to thrive in their personal and professional lives.

Keywords: Empowerment, Women, Occupational Stress, Government initiatives

Theme 6: 217
Impact seed production enterprises under ARYA programme : Implication of poverty reduction in Kaushambi

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Youths of rural area of Kaushambi district have the potentials needed to participate effectively in agricultural development programme and play important role in future of India's progress in agriculture. Major problems encountered by youths of rural areas in agriculture include lack of knowledge and unskilled in agriculture as a result of drudgery in farm operations, lack of competitive market for produces , lack of start-up capital, inadequate labour saving technologies for ease of operations, inadequate finance/credit facilities, among others. As a result, they are faced with serious economic challenges which result in undue poverty and vulnerability. This has also made youths to seek employment in other sectors of the economy in order to empower themselves

economically, resulting in huge rural-urban migration. KVK Kaushambi and ICAR –ATARI- Kanpur has implemented Attracting and Retaining Youth in Agriculture (ARYA) programme in the district, in the year 2018-19, out of which present study have been carried out to impact on empowerment of youth in rural areas through seed production enterprises, where the ARYA project has been focusing on three enterprises i.e., goatry, poultry and seed production. After the implementation of ARYA, among the three enterprises promoted, the performance of the seed production enterprises gave the highest net income and highest average production. Till to date, total 67 rural youth trained, four seed production groups formed, 17 entrepreneurial units established, 364 qt. Seeds produces of paddy –wheat- blackgram-greengram crops having high yielding characteristics On the other hand benefit-cost ratio was higher in seed production enterprises. Various economic performance indicators showed a positive and significant relation with the social profile of the rural youths. The implementation of programme brought the convergence of several institutions to render technical support to rural youth.

Keywords: Enterprises, Implication, Impact, Kaushambi, Production, Poverty

Theme 6: 218
Performance of PM-Kisan Scheme in Enhancing Livelihood of Small and Marginal Farmers

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The evolution of cash transfers has benefited significantly from research on the various facets of poverty and vulnerability. Cash-based Direct Benefit Transfer (DBT) is a common topic of conversation nowadays. It has major effects on reducing the pervasive corruption and middlemen's interference, which make it difficult for policy measures to reach the intended beneficiaries in a developing country like India. The performance of India's small and marginal farmers (SMFs), who make up 86 percent of the country's farmers overall, is crucial for the country's long-term agricultural growth and food and nutrition security. The Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) scheme's success at improving living conditions is seriously concerning despite the data and facts offered in numerous government reports. A research study was conducted in the states of Uttar Pradesh and Bihar selected purposively due to highest no. of SMFs. Using the simple random sampling (SRS) method, the districts of Bahraich and Bulandshahr in U.P and Bhojpur and Muzaffarpur in Bihar were chosen. Two Gram Panchayats were chosen using SRS from each of these four districts. Using ex post facto research design, data was collected from 240 SMFs (120 beneficiaries and 120 non-beneficiaries) through stratified disproportionate simple random sampling procedure. Eighteen indicators covering the underlying assets of livelihood i.e. human capital, social capital, natural capital, physical capital, and financial capital, were used to generate the Livelihood Index (LI) using Principal Component Analysis (PCA). Beneficiaries of the scheme had a mean LI score of 0.396, while non-beneficiaries had a score of 0.366. Propensity Score Matching (PSM) was used to compare beneficiaries and non-beneficiaries in order to evaluate the scheme's performance. Different matching algorithms showed that in comparison to non- beneficiaries of the programme, there was a significant 3.34 to 4.13 percentage point improvement in the beneficiaries' Livelihood Index.

Keywords: Cash transfers, Direct Benefit Transfer, PM-KISAN, Livelihood index, Propensity score matching

Theme 6: 219
Swarm-Intelligence for Strengthening Group-Decision Making in Farmers' Self-Help Groups

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Group led extension (GLE) has emerged as one prominent extension approach. Group led extension focuses on the formation of Self-Help Groups (SHGs), Farmer Interest Groups (FIGs), Commodity Interest Groups (CIGs) etc. In order to strengthen agricultural extension through group approach, boosting group dynamics is of utmost importance. Among various factors of group dynamics, group decision-making has been identified as one of the crucial factors for group effectiveness. Moreover, most of the groups also find it as a limiting factor to group effectiveness because of the multiple challenges associated with it. Group decision making is a common process in case of both human groups and honey-bees. Looking into the parallel world of honeybees, an important concept of Swarm-intelligence seems a probable answer to the emerging challenges of group-decision making in human groups. Thus, the research aimed at studying the implication of swarm-intelligence in strengthening the group-decision making of farmers' self-help groups in Uttarakhand. Swarm A.I. software was used for the intervention of the swarm-intelligence based decision making in groups. It was observed that swarm-intelligence based decision making significantly enhanced group performance by leveraging seven key factors: decision impulse, conviction, engagement, decision duration, alignment, participation extent, and real-time negotiation. Mimicking the collaborative decision-making seen in honey bee swarms, swarm-intelligence based decisions fostered active participation from all members, regardless of geographical location. It facilitates rapid decision-making, with most decisions reached within 30 seconds, while maintaining high conviction levels. The platform promotes consensus through alignment of choices and real-time interaction among participants. Through linear regression analysis, it's evident that quicker decisions lead to stronger conviction, and greater alignment and engagement further reinforce this conviction. Thus, Swarm A.I. effectively optimizes group performance by harnessing collective intelligence and fostering efficient decision-making processes. This approach enables SHGs to collectively tackle challenges and make decisions democratically, similar to honey bee swarms, thus strengthening their effectiveness and sustainability.

Keywords: Swarm-intelligence, Group-decision making, Self-help groups

Theme 6: 220
Women Empowerment Strategies to Improve their Role in Society

Priyanshu Singh

In our nation equality is, to begin with and imperative human right. A lady is entitled to live in respect and needful life, away from fear. Engaging ladies is additionally an crucial apparatus for progressing advancement and diminishing destitution. Engaged ladies contribute to the wellbeing and efficiency of entire families and societies. Women empowerment is recognized as being a key to accomplishing the other objectives related to families and societies. However separation against ladies and young ladies - counting gender-based savagery, financial separation, regenerative wellbeing Imbalances, and hurtful traditional practices - remains the foremost inescapable and persistent frame of imbalance. There are assortments of understandings of the term strengthening due to its far reaching utilization. On the off chance that empowerment is looked upon in terms of capacity to

create choices: To be disempowered hence, suggests to be denied choice. The idea of strengthening is that it is inevitably bound up with the condition of disempowerment. The present paper is an attempt to gather and to review on various researchers to know the strategies to improve their role in family and societies. Family choice making control and opportunity of development of ladies shift significantly with their age, instruction and work status. It is found that acknowledgment of unequal gender standards by ladies are still winning within the society. Country ladies are more inclined to residential savagery than that of urban ladies. A expansive sexual orientation crevice exists in political cooperation as well. The think about concludes by an perception that get to instruction and work are as it were the empowering factors to strengthening, accomplishment towards the objective, in any case, depends to a great extent on the state of mind of the individuals towards gender uniformity. The objectives of this review paper is to get it the problem and point of view of Ladies Strengthening, and endeavor to analyze the status of ladies strengthening in India utilizing different markers like women's family choice making control, legal Policies for Ladies Strengthening. Women faced many problems and partial behaviors of their families to take their decisions. Thus, the present review paper is certainly a need of the hour.

Keywords: Women empowerment, Decision making, Equality

Theme 6: 221
Agriculture Development through Information and Communication Technologies

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In developing countries like India information and communication technology has significantly impacted education, health, rural development, and agriculture. ICT is the combination of computing and telecommunications technology for information gathering, retrieval, and distribution. Information and communication technologies have significantly impacted agricultural development in nations with limited resources. This technology has significantly improved agriculture growth in third-world nations by connecting farmers with markets, merchants, customers, and meteorological departments for weather and pricing updates. In addition, information and communication technology has enhanced farmers' incomes in various countries. Farmers in rural areas sometimes lack knowledge and skills when it comes to technology, necessitating the introduction of facilities. Currently, extension professionals from both government and non-government organizations use a variety of information and communication technologies to convey agricultural innovations to the farming community, but they face numerous limits and barriers in ICT use. ICT devices used in farming activities include radios, televisions, cellular phones, computers, tablets, networking, hardware, software, and satellite systems. However, the internet provides farmers with instant access to global information on product prices and marketing. Radio remains a popular communication tool in rural locations, broadcasting agricultural programmes. Television also plays a significant role in distributing agricultural information in developing countries. New ICT can provide farmers with sufficient knowledge on agro-inputs, crop production technological advances, processing, market support, financing, and farm management. ICTs can play a crucial role in agricultural extension by facilitating information flow between farmers and other stakeholders. Entrepreneurs can use ICT to have access to relevant and up-to-date business information. This allows future generations of agro-based entrepreneurs to develop their own networks and websites, independent of time and location.

Keywords: ICT, Internet, Radio etc.

Theme 6: 222
Performance and Impact of Farmer Producer Organisations in India

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Farmer Producer Organizations (FPOs) have become a policy priority of the government of India because of land fragmentation, inefficient agri-value chain and low bargaining power of the small and marginal farmers. FPOs in the form of cooperatives have existed since the beginning of the 20th century. In 2003, a Farmer Producer Company (FPC), a new form of FPO was introduced as a hybrid between cooperatives and corporates. Since then, they have become popular among the farmers and now more than 25000 FPCs have been established. These FPOs face many challenges ranging from group dynamics, finances, and management to value chain. Owing to this, the performance of a large number of them is not satisfactory, necessitating fathoming into different aspects of the FPOs. Therefore, a study was conducted using meta-analysis framework and systematic literature review and combining both using mixed method research synthesis. The study identified a significant and heterogeneous impact of FPOs in crop and milk productivity and value of output. Performance on different financial parameters were not satisfactory for some FPOs. Education of farmers and extension contact significantly affected farmer's choice to join FPOs. Timely and quality inputs from FPOs were perceived positively by most of the respondents. Market infrastructure and financial problems were the important constraints reported by the studies. A continuous handholding of FPOs for an initial 5-6 years in the form of guidance for business plans, market avenues, technical knowledge for value addition, input services and finance is suggested. Strong FPOs need strong stakeholders like members, directors, officials etc., Therefore, capacity-building efforts are needed to be sped up.

Keywords: FPO, Mixed method analysis, Impact, Performance, Perception, Constraints

Theme 6: 223
Exploring the Research Trends in Women Empowerment and Child Nutritional Status: A Bibliometric Analysis

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Women empowerment plays a crucial role in enhancing household and community well-being, including child health and nutrition outcomes. To map the landscape of research trends in this interdisciplinary field, a study was undertaken using comprehensive bibliometric analysis to identify key research areas, influential authors, prominent journals, and emerging trends in this domain. In this study 470 documents including journal articles, conference papers, book chapters and other relevant documents on women empowerment and child nutritional status retrieved from the Scopus database followed by further analysis with Microsoft Excel, and VOS viewer. The study witnessed a growing interest of various stakeholders in this field, with an increasing number of publications focusing on various aspects from 1987 to 2024. In terms of the publication's performance analysis, the study

found that the medicine, social science, nursing, agricultural and biological science, and environmental science are the top five and most significant research areas. Plos One, and Maternal and Child Nutrition were identified as two most influential journals with significant number of publications. The citation analysis revealed that Raj, A., journal (BMC Women's Health) and Darmstadt, G.L., journal (International Journal of Environmental Research and Public Health) were the most prominent authors with highest number of citations. It was found that United States, United Kingdom, Ethiopia, India, and Australia are the leading countries in terms of significant number of publications in this area. The study revealed that in recent years, the inter-sectionality of women's empowerment and child nutritional status has gained significant attention in academic research and policy discourse with growing trend in terms of increasing number of publications from the year 2011 to till date. The study findings provide insight into future research directions and it can be used to improve policy reforms and programmatic activities focused at empowering women and improving child nutrition outcomes.

Keywords: Women empowerment, Child nutritional status, Bibliometric analysis, Research trends, Citation analysis

Theme 6: 224
Gender Gap in Integrated Farming System for Tribal Farmers in Manipur

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This research delves into the gender dynamics within the context of Integrated Farming Systems (IFS) among tribal farmers in Manipur, a region marked by cultural diversity and unique agro-ecological challenges. The study focuses on a purposive selection of 320 participants from four purposively chosen districts Kangpokpi, Chandel, Tamenglong, and Senapati to provide a comprehensive analysis of the gender gap in IFS adoption and its impact on sustainable agricultural practices. The primary objectives of this research are to identify and analyze the existing gender disparities in the adoption and execution of Integrated Farming Systems, considering the socio-economic and cultural nuances specific to tribal communities in Manipur. The study employs a mixed-methods approach, combining quantitative data obtained through surveys and qualitative insights derived from in-depth interviews and focus group discussions. The findings aim to unravel the distinctive challenges faced by male and female farmers in embracing Integrated Farming Systems, exploring factors such as access to resources, decision-making autonomy, and traditional gender roles. Bridging the gender gap in IFS not only contributes to enhanced agricultural productivity but also fosters socio-economic empowerment, fostering a more equitable and sustainable farming landscape for tribal communities in the region. The result reveals a substantial gender gap in Access to resources, decision-making, ownership and control, and drudgery. The findings also reveal that female farmers perform most of the farming activities, from sowing to harvesting, and perform different activities from house management, child caring, and social activities to earning a living than their male counterparts. Yet, their access to resources, decision-making, ownership, and control is less than their male counterparts. The methodology used for analyzing the gender gap includes descriptive statistical analysis, Principal component analysis, and Multivariate regression models.

Keywords: Gender gap, Integrated farming system, Tribal farmers, PCA

Theme 6: 225

Gender Empowerment through an Integrated Farming System among Tribal Farmers in Manipur

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A study was conducted in Kangpokpi, Tamenglong, Senapati, and Chandel Districts of Manipur to assess the level of Gender Empowerment through Integrated Farming System of Tribal farmers in Manipur. Data was collected through personal interviews with 320 participants, consisting of 160 male and female respondents. Women's lack of empowerment not only makes their struggles worse, but also puts an additional strain on the entire agricultural industry, the wider economy, and the whole of society. Consequently, empowering rural farm women in agriculture can significantly contribute to sustainable development. The study analyzed several aspects of Gender Empowerment, including Social, Psychological, Cultural, Economic, and Political empowerment. The collected data was analyzed developing an index of Gender Empowerment, which was weighted using the Analytical Hierarchy Process (AHP). The research employed appropriate descriptive and inferential statistical methods to analyze the data and the analysis showed that male respondents had an Overall Empowerment index of 0.63, while their female counterparts had an index of 0.35. This indicates that male respondents are more empowered than female respondents. It was found that years in contact with organizations, Farming experience, Education, and Age had a positive and significant impact on the male Empowerment Index, whereas, for a female respondent, the Empowerment Index had a positive and significant relationship with Years in contact with organizations, Farming experience, Occupation, Source of information, and Participation in Extension activities.

Keywords: Gender empowerment, Integrated farming system, Analytical hierarchy process, Gender empowerment index

Theme 6: 226

Assessment of Need-Based Technologies in Agricultural and Allied Sectors: A Study in Chittorgarh District, Rajasthan

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This paper focuses on evaluating the adoption of different need-based technologies in agricultural and allied sectors in Chittorgarh district, Rajasthan. The study involves data collection from a sample of 400 farm women, assessing their engagement in agricultural production, livestock activities, domestic work, and decision-making roles. The majority of respondents were found to be illiterate, with 94% being married, and 43.25% belonging to small families of 1-4 members. A significant portion (17.75%) of respondents were involved in agricultural labor activities, while 13.75% had their small businesses. The study identified that 78.25% of land was irrigated, and 21.75% was dryland in the district. The ownership of farm implements was reported by 86.75% of respondents, with 20.75% using power-operated farm implements. Approximately 91.75% of respondents

preferred to wait and take time to adopt innovative practices. Data revealed that 65% of respondents made decisions jointly, particularly in farm-related activities (66.12%). Mobile phones were the primary source of information (91.75%), followed by TV (56.05%), and 20% of respondents contacted agricultural experts and organizations for guidance. Thirty-six percent of respondents were members of Self-Help Groups (SHG). The majority of respondents owned land ranging from one to two hectares or two to five hectares. More than half (56.25%) reported an income of less than 50,000/- from farming, and 20.5% derived income from other sources. The study identified a strong need for training, particularly in water and soil management, with over 77% expressing needs related to soil conservation. Furthermore, 98% of respondents felt the need for training in solar and wind energy technologies. A hundred percent of respondents expressed a need for value addition to crop biomass and waste management. In the field of agriculture and allied sectors, 98% of respondents emphasized the need for training, with a specific demand for training in fruits and vegetables processing technologies (93%). Overall, the study highlights the diverse need-based, gender-friendly technologies essential for economic empowerment in Chittorgarh, considering the unique roles of both men and women in agriculture and related activities.

Keywords: Agriculture, Educational qualification, Marital status, Occupation, Caste, Family size, Family type, Value addition, Agricultural, Allied sectors

Theme 6: 227

Perception and Knowledge Gain Among Farmers through Multimedia-Based Farm Advisory

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Several researches have shown that information and communication technology (ICT) equipped with social media reach can play a leading role in disseminating correct information to needful farmers at the right time. ICAR-IARI inhouse initiative 'Pusa Samachar' is such an innovative multimedia-based extension advisory model, which targets to reach farmers across India with timely, location specific and customized farm information. With more than 180 Hindi Episodes and 140 Regional episodes in Telugu, Kannada, Tamil, Bangla, and Oriya it has touched 80,000 watch hours with 1.4 million views and having a subscriber base of 44000. The present study is conducted to get an overall idea about perception and knowledge gain of farmers towards multimedia-based extension along with assessment of the viewership pattern and to validate the content of this model under content, design, ease of understanding and fulfilment of information need. Analysis of secondary data from YouTube analytics and primary data collected from different stakeholders have shown that the watch time and views has increased 30% in year 2023 as compared to the previous year. Findings also indicated that number of views are dependent of episode duration (x^2= 81.077, p=0.001331) however, average view duration per episode is independent of episode duration (x^2= 5.2714, p=1.543). There was 30%, 27%, 17% knowledge gain in know-how about IARI technologies, plant protection and agronomical practices respectively with 33% farmers in high category of knowledge level. The present study has given directions for further improvement in multimedia-based farm advisory w.r.t. content, design, and dissemination.

Keywords: Multimedia-based extension, Information, Communication technology, Multimedia-based farm advisory

Theme 6: 228
Livelihood Security Analysis for Tribal Farmers in Manipur

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With the use of an Integrated Farming System, the current study has made an effort to assess the livelihood security situation of tribal farmers in Manipur, India. Data were collected through personal interviews with 400 respondents, consisting of 200 male and female respondents. In this study, the effectiveness of the Integrated Farming System in improving the well-being of tribal farmers was evaluated. To gauge the safety of one's livelihood, the livelihood security index was developed. The dimensions for the study of Livelihood Security include Food Security, Income security, Health security, educational security, Habitat security, social security, and Environmental security. The indicators of livelihood security dimensions were scored on a continuum of five points, from extremely low to very high. Farmers using IFS for the last five years provided the data. The weights were assigned to Livelihood Security dimensions with the use of Principal Component Analysis (PCA), along with an eigenvalue greater than one, and a rotated component matrix. The results demonstrate that Integrated Farming Systems have improved in several areas, improving the livelihood and general well-being of the population under study. The Composite Livelihood Security Index demonstrates that there was a significant difference in the composite index score, with males having a higher Composite Livelihood Security Index score (0.74) than females (0.48), the results provided that female respondents expressing lower levels of security compared to their male counterparts.

Keywords: Livelihood security index, Tribal farmers, Integrated farming system, PCA

Theme 6: 229
Impact of Self-Help Groups on Women Empowerment

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Women empowerment is a process in which women challenge the existing norms and culture, to effectively promote their well-being. The representation of the empowerment of women must become more important to allow women to engage increasingly in society and to eradicate this gender inequality in the current social structure. Women in rural areas want to improve their role in order for government initiatives on empowerment of women to be effective. This study addresses women empowerment through self-help groups. In this study, there were total 20 SHGs selected from 4 NGOs or 5 SHGs from each Block or each NGOs. Amongst the selected SHGs, the number of members in each of the SHGs varied ranged between 15-20. For the selection of respondents, 12 active members from each SHG were selected on random basis out of which one was leader (President). Thus, the sample size constituted of 240 SHGs members. Results revealed that the SHGs have had greater impact on economic, social and political aspects of the beneficiaries. The participation of women in Self-Help Groups (SHGs) made a significant impact on their empowerment both in social and economic aspects. It analysed the output and role of its achievements and also looked at different shortcomings of SHG and more work to support the empowerment of women in the socio-economic sector. In this study, a recommendation is proposed to support the effective mechanism to ensure SHG's economic.

Keywords: Women, Self-help groups, Empowerment, NGOs

Theme 6: 230
Effectiveness of Multimedia based Agro-advisory Model: Learnings from '*Pusa Samachar*' Model

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Multimedia-based agro-advisory offers a solution to the shortage of extension agents by providing widespread access to timely and tailored agricultural information through platforms like social media, mobile applications, and websites. The innovative multimedia-based extension model *'Pusa Samachar'* facilitates two-way information sharing through social media platforms for providing timely and location-specific information, tailored to the specific needs of farmers across India. To assess the effectiveness of multimedia-based agro-advisory model data was collected from randomly selected three states of Indo-Gangetic plains Punjab, Haryana, and Uttar Pradesh. Five districts were randomly selected in each state based on Pusa WhatsApp salah query and from each district, 15 viewers were randomly selected, resulting in a sample size of 225 viewers. The same sampling approach was applied to select non-viewers, resulting in a total of 450 respondents. To check the robustness and account for selection bias and endogeneity, full information maximum likelihood (FIML) endogenous switching regression (ESR) was employed to estimate the effectiveness of information disseminated through the Pusa Samachar model in Information utility level, knowledge level, and technology adoption level. Moderate inequality among non-viewers compared to viewers in accessibility, availability, and applicability of the information, while non-viewers experience higher inequality in timeliness and cost-effectiveness accounting for a substantial portion of the overall disparity. Pusa Samachar resulted in effectiveness in enhancing information utility, knowledge levels, and technology adoption among viewers, with potential benefits for non-viewers. Specifically, it increased information utility by 40.94% for viewers and 40.04% for non-viewers. Additionally, it enhanced knowledge levels by 57.28% among viewers, with an incremental effect of 18.14% on non-viewers. Moreover, it enhanced the technology adoption rate by 23.33% among viewers, suggesting a potential additional effect of 38.96% for non-viewers. These findings highlight Pusa Samachar's significant role in bridging information gaps and fostering knowledge dissemination and technology uptake suggesting wider in formation delivery through multimedia platforms.

Keywords: Multimedia, Agro-advisory, Information, Knowledge, Technology adoption

Theme 6: 231
Entropy and Chaos: Application of Social Physics in Extension Science

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Chaos and entropy have been integral to the creation of the universe; order and resilience go rhythmic with the progress; and these dialectically tuned to system as a whole. In the evolving extension science, the need of extrapolation of principles of physics, biology or material sciences have become a unique approach to re-engineering conceptual inputs of extension science. August Comte, the father of sociology dealt with social physics, Durkheim experiments with functionalism. Green revolution in India has triggered up technology led

development of agriculture in a swashbuckling manner. Indigenous technologies are increasingly being invaded by exotic technologies. Industrialization of agriculture has not progressed uniformly throughout India because small and marginal farmers are often confronting with the new prescribed technologies and simultaneously displaying negative cognitive behavior such as discontinuance, disagreement, rejection, conflict, dissonance, reinvention and confusion about the imposed technologies. In technology led development of agriculture farmers are motivated to adopt modern technologies by any means, but at the same time there is a gap between motivation unleashed and achievements made. This gap is nothing but negative behavior which can be referred to Social entropy. Social entropy in closed and isolated system always increases and ultimately leads to collapse or death of a system. Through an empirical study, it has been evinced the factors like failed promises, reality of lost venture against a guided imagery, fragmentation of holding, uncertainties in weather-market-income have been organically linked with increasing disillusionment, chaos and entropy. In thermal entropy, the residual energy(S) equalizes entropy; here in this study residual motivation can be responsible for psychic entropy.

Keywords: Social entropy, Social metabolism, Technology socialization, Farm modernization, Urbanization

Theme 6: 232
Exploring Innovative Approaches in Agricultural Extension: A Path Towards Sustainable Farming Practices

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In recent years, the agricultural sector has witnessed a paradigm shift towards innovative approaches in extension services aimed at enhancing productivity, sustainability, and resilience. The evolving landscape of agricultural extension focuses on novel methodologies and technologies driving advancements in the field. Traditional agricultural extension services have historically relied on face-to-face interactions between extension agents and farmers. However, the emergence of digital technologies has revolutionized this landscape, enabling the dissemination of information and knowledge through various platforms such as mobile applications, social media, and online portals. These digital tools facilitate real-time communication, remote advisory services, and access to vast repositories of agricultural information, empowering farmers with timely and relevant insights to improve decision-making processes. Furthermore, the integration of data analytics, artificial intelligence, and machine learning algorithms has enabled the development of predictive models and decision support systems tailored to the specific needs of farmers. These tools leverage data from various sources, including satellite imagery, weather forecasts, soil sensors, and crop monitoring systems, to provide personalized recommendations and optimize resource utilization, ultimately leading to enhanced productivity and sustainability. Moreover, participatory approaches and farmer-led initiatives have gained momentum within agricultural extension programs, emphasizing the importance of involving local communities in problem-solving and decision-making processes. By fostering collaboration, knowledge sharing, and experiential learning, these approaches promote bottom-up innovation and facilitate the adoption of context-specific solutions that are culturally and environmentally appropriate. Additionally, the concept of holistic extension services has gained traction, emphasizing the integration of agricultural practices with broader socio-economic and environmental considerations. This holistic approach recognizes the interconnectedness of farming systems with factors such as climate change, biodiversity conservation, market dynamics, and rural livelihoods, thereby promoting more resilient and inclusive agricultural development pathways.

Keywords: Advancements, Digital tools, Extension, Productivity, Technologies

Theme 6: 233
Fostering Skill Based Agricultural Education: Challenges and Way Ahead

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Education is the most important instrument for achieving desired social change among villages. Realizing the importance of education UN's, SDG-4 focuses on "ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all". The NARES of India is one of the largest in the world with 76 Agricultural Universities (AUs), the thrust of these universities is to produce well educated, skilled and competent HR which will act as workforce in all diverse sectors taking India towards becoming developed nation. There are several challenges in front of these universities: whether universities are fulfilling their goals or merely distributing degrees? Despite this extensive, connected system, the linkage between extension education and extension practices is uncoordinated and ineffective. Recently GOI has introduced NEP 2020, which Aims to incorporate 21st-century skills, includes 12 skills across 3 dimensions and is in alignment with the SDG 4.4, Integration of vocational education with educational offerings in all institutions by choosing focus areas based on skills gap analysis and mapping of local opportunities will develop entrepreneurial competencies and capacities. In the changing scenario of exhausting public sector jobs, agriculture students compelled to go for corporate sectors where the responsibility is more of a manager, strategist and entrepreneur. So, to fit into the management cadre and to be proficient in it, agricultural graduates need to develop their soft skills, along with skills with respect to 'Extension Management', 'Development Communication' and 'Human Resource Management/ Training'. These skills must be developed at UG and PG level through appropriate teaching methodologies to foster information need of rural development in recent paradigm shift that made Indian agriculture export oriented based on market intelligence.

Keywords: Skill, Agricultural Education

Theme 6: 234
Role of Value Addition in Economic Empowerment of Self-Help Groups

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Value addition refers to the process of increasing the value of agricultural products by transforming them into processed goods. As a rural enterprise, this venture has the potential to generate more local jobs, better income and services. The value addition cannot just enhance the farm income and provide employment opportunities, but also could contribute towards reduction of wastage in this sector particularly after the post-harvest period of the highly perishable agricultural commodities. Blessed with a diverse topography, district Kangra has a variety of seasonal fruits and vegetables but due to the unorganized agricultural produce, lack of awareness about scientific post-harvest and value addition knowledge and limited marketing avenues the available produce was not economically utilized by the rural households. Thus, to boost the economy of Self-Help Groups through scientific conservation of agricultural produce, appropriate use of wastes and by-products of agriculture, Krishi Vigyan Kendra Kangra, Himachal Pradesh successfully introduced value addition and processing technologies among Self-Help groups of the district. The technical guidance, regular follow up and advisory services provided by the Kendra have motivated about hundred women self-help groups of the district to establish small scale enterprises. The SHGs associated with the interventions are generating a profit ranging from Rs. 1-7 lakhs/annum.

Keywords: Empowerment, Value addition, Self help groups

Theme 6: 235
Impact Assessment of Training Programmes on the Adoption of Technology

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It is crucial to disseminate modern technologies to the farming community through various extension strategies. Training programs are crucial in this context. This study was conducted in Pratapgarh district of Uttar Pradesh, India. Ex-post facto research design was used for the study. Respondents were selected from five blocks viz., Kalakankar, Babaganj, Rampur, Vihar and Kunda who had received trainings from Krishi Vigyan Kendra, Pratapgarh in distinctive areas and adopting new agriculture technologies. A sampling frame was constructed by enlisting names of all farmers who received the training during 2020-2023. A sample of 210 respondents were selected randomly to examine the impact of KVK training programme. The result showed that the majority (52.86%) of the respondents were from young age group, followed by 43.33 per cent of the respondents had medium sized family, 37.14 per cent of the respondents had secondary level of schooling, 62.38 per cent of the respondents had crop farming as their primary occupation. 49.52 per cent of the respondents had medium income level 45.71 per cent of the respondents had medium level of experience in farming, 51.43 per cent of respondents were marginal land holders. In case of Adoption of new technology, Majority (12.38%) of the trainees adopt Salt tolerant varieties (Mustard/Pulses/Cereals), followed by 10.48 per cent trainees adopt Integrated Nutrient management. Least number of trainees adopt Cultivation of off-season vegetable (1.43%). Only one and half per cent of trainees adopt the nursery management technique in horticultural crops. In case of incremental growth in different sectors under which, a large group of farmers are adopting the resource conservation technologies in cereal crops (27.62%) and only six per cent of belongs to fisheries.

Keywords: Impact, Adoption, Knowledge, Training

Theme 6: 236
Impact of KVK's trainings on Knowledge Level of Farm Women

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With India's growing malnutrition problem, both under-nutrition (vitamin, mineral, and protein deficiencies) and over-nutrition (obesity, metabolic syndrome, and lifestyle diseases), there is a growing awareness of the need to move to healthier, more accessible, and inexpensive diets that include millets. Since the outbreak of the novel coronavirus disease (COVID-19), 'immunity foods' have gained traction. In this context, micro-nutrient-rich millets are suitable substitutes for reviving our traditional food systems and maintaining ecological harmony with nature. Therefore, under the 'Vocal for Local' campaign, indigenous crops must be lent more support and focus. A sustainable way to pursue this is to empower women farmers and self-help groups (SHG), by equipping them with advanced packaging techniques, agro-marketing, financial literacy and other entrepreneurial skills. Grassroots workers like the Anganwadi and ASHA workers must be further involved as nutrition ambassadors and entrepreneurs in the millet revolution. Keeping in view, all these aspects of millet, Krishi Vigyan Kendra, Raibareli has conducted various training programmes to increase Knowledge level of farm women regarding millet. Total sample of 120 farm women who were the part of K.V.K. training on millet farming have been selected purposely for the study. Knowledge level of farm women regarding millets varieties, health benefits of millets, environmental benefits of millets had been checked before and after KVK training which was found significant in all respect.

Keywords: Knowledge level, KVK, Training, Farm women, Millet

Theme 6: 237
ICT for Transfer of Technology in Agriculture

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ICT plays a vital role in transferring technology in agriculture by facilitating the distribution of knowledge, innovations, and best practices to farmers globally. This abstract examines how Information and Communication Technology (ICT) speeds up technology transmission in agriculture and its effects on agricultural productivity, sustainability, and resilience. ICT platforms including mobile apps, websites, and online portals act as digital storage spaces for agricultural information, resources, and expertise. Farmers can obtain a wide range of information on crop management, pest control, soil health, and post-harvest handling through these platforms. Agricultural extension services may effectively reach a wider range of farmers, particularly those in distant or underserved locations, by utilising ICT to provide timely, relevant, and tailored information to meet their specific requirements and concerns. ICT enables farmers to engage in interactive and participatory learning through webinars, online forums, and virtual training sessions. Farmers can interact with agricultural professionals, researchers, and other farmers to trade ideas, share experiences, and learn from each other's triumphs and failures. This peer-to-peer knowledge sharing promotes innovation, adaptation, and implementation of new technology and methods, leading to ongoing enhancement and resilience in agricultural systems. ICT is crucial in improving smallholder farmers' access to agricultural inputs, markets, and financial services. Mobile platforms for e-commerce, digital payments, and mobile banking allow farmers to buy agricultural supplies online, access market data, and sell their crops directly to customers without using middlemen. ICT-enabled financial services including mobile banking, digital credit, and crop insurance empower farmers to manage their money, invest in their farms, and reduce risks related to climatic variability and market changes. ICT can transform technology transfer in agriculture by providing equal access to information, promoting cooperation and sharing of knowledge, and equipping farmers with tools and resources to improve their productivity, sustainability, and livelihoods. Providing equal access to ICT infrastructure, overcoming digital literacy challenges, and customising ICT solutions for smallholder farmers are important to utilise ICT-enabled technology transfer in agriculture.

Keywords: Digital agriculture, ICT, Technology, Farmer

Theme 6: 238
A Study on Knowledge of Farmers on Organic Farming in Bundelkhand Region of Uttar Pradesh

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Organic farming is a type of farming that avoids or limits the use of synthetically produced fertilizers, pesticides, growth regulators, and livestock feed additives. Crop rotations, crop residues, animal manures, legumes, green manures, off-farm organic wastes, mechanical cultivation, mineral-bearing rocks, and aspects of biological pest control are used to maintain soil productivity and tilt, supply plant nutrients, and control insects, weeds, and other pests to the greatest extent possible in organic farming systems. (1980, US Department of Agriculture) As

a result, a natural balance must be maintained for the survival and well-being of humans, plants, and animals. Bundelkhand region of Uttar Pradesh is spread over about 29,000 sq. km. of land in seven districts of Uttar Pradesh namely Chitrakut, Banda, Jhansi, Jalaun, Hamirpur, Mahoba and Lalitpur. The study was purposely conducted in the Hamirpur district region and the district Hamirpur was declared an Organic district in the year 2014 by the Government of Uttar Pradesh. Ex-post-facto analysis was used to present the findings of the study while the Correlation coefficient (r) and Multiple Regression (b) analysis were used to test the study hypotheses. The study revealed that the majority (81.66%) of respondents had a medium level of knowledge of organic farming. A Study also revealed that the majority (45.83%) of the respondents were educated up to the higher secondary level of education and the majority (76.67%) of the respondents had members of at least one organization, the maximum number of the respondents (95.83%) had a medium level of extension contact. There were significant relationships (pd" 0.05) between respondents' age, educational background, family type, land holding, annual income, social participation, farming experience, extension contact and scientific orientation of organic farming.

Keywords: Organic farming, Knowledge, Pollution, Chemical fertilizer, Productivity

Theme 6: 239

Camel Yarn Macramé Products: An Approach for Women Empowerment in Rural Areas

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Camel holds a respectable place in Rajasthan's social and cultural life. Camel hair comes under the category specialty fibre. The fibre includes a variety of unique properties, including warmth, softness, durability, and the ability to wick away moisture. This study investigates the distinctive intersection of traditional handicraft and sustainable economic empowerment in rural villages by means of the production of macramé products using camel yarn. The study, which focuses on empowering women in these areas, investigates the socioeconomic effects of teaching women to make macramé items out of camel yarn, an eco-friendly and locally accessible material. The research emphasises the importance of camel rearing in these areas culturally and its potential as a sustainable supply of raw materials for handcrafted goods. The research aims to give women a platform to channel their creativity and skills into income-generating activities by exploring the complex art of macramé. The study highlights the significance of skill development and capacity-building activities by looking at the full value chain, from the production of camel yarn to the creation of macramé goods. Through a series of case studies and on-the-ground interviews, the abstract explores the transformative effects of women's involvement in camel yarn macramé production. It sheds light on the economic independence gained by women, their increased decision-making power within households, and the positive impact on community development. Additionally, the research considers the role of these products in preserving cultural heritage and promoting sustainable practices. Furthermore, the abstract discusses the market potential of camel yarn macramé products, both domestically and internationally, contributing to the economic sustainability of the villages involved. The findings aim to inform policymakers, NGOs, and businesses about the potential of supporting and scaling up such initiatives to foster women empowerment in rural areas.

Keywords: Camel Yarn, Macramé, Women Empowerment

Theme 6: 240

Developing Sustainable Agricultural Model Village Through Integrated Technology Approach

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The percolation and diffusion of the GR technologies to the large number of farmers in various parts of the country was made possible through the strategic extension approach; National Demonstration. Innovative extension approaches of IARI such as Community farming approach, Integrated Whole Village Development Approach, Effective Utilization of Mass Media in Agricultural Development, Single Window System, Farmer-to-farmer Quality Seed Production Program, Indigenous Knowledge System, Farming System Research and Extension, Institute Village Linkage Program, Post Office Linkage Program, IARI Partnership Program, Seed Production Hub, Networking with innovative farmers, to name a few, have contributed immensely to the transfer of technology leading to development of the farming community particularly the small and marginal farmers as well as farm women. The need for developing and evolving model Agricultural village has been felt since a long time as it can play a crucial and potent role in replicating them in other places. The present study was carried out in this backdrop with the following twin objectives; (1) to identify and assess suitable technologies for enhancing farm income and (2) to evolve a cropping pattern for sustainable production system. The approach of Integrated village development model was adopted in this study. The location of the study being the village Rajpur, block Khair, district Aligarh in Uttar Pradesh. The village Rajpur was purposively adopted for a period of five years (20015-20) as the village presented divergent agro-climatic situations, the low land area having clay loam soil type whereas the upland region with sandy loam soil. Integrated development model approach implied testing and demonstrating diversified crop technologies such as field crops, pulses, oilseed and even vegetable crops in kharif, rabi and zaid seasons during the 5 years. Technological interventions like improved varieties of paddy (PB 1121), wheat (HD 2967), green gram (Pusa Vishal), pigeon pea (Pusa 991), lentil (L 4076) and mustard (Pusa Vijay) were integrated into different crop rotations followed in the area and it has been tested to evolve and establish sustainable production system. The intervention of improved paddy variety PB 1121 led to an increase in the productivity level of 10-15% over the existing farming practice. Likewise, Introduction of high yielding wheat variety HD 2967 augmented the productivity level up to 15-18% higher as compared to the local cultivars. The intervention with early maturing paddy variety PB 1509 has enabled the farmers to take potato and other vegetable crops timely in rabi season. Short duration pigeon pea P 991 has made it feasible to take late wheat crop variety HD 3059 followed by green gram (Pusa Vishal) as summer crop in a year-round rotation. Green gram intervention has benefitted farmers as an additional crop in the zaid season. In the most widely practiced rotation of paddy-wheat in the region, green gram as summer crop has proved to be an additional source of income with farmers getting an average net income of Rs 52500/ha from this crop alone. Improved lentil variety L 4076 and mustard Pusa Vijay proved to be a profitable intervening rabi crops in paddy and maize based rotations in which farmers were able to take either bajra or water melon as the third crop. The technological interventions have made possible to accommodate three crops in a year-round rotation and alongside have improved the productivity and income of the farming community of the village. The major thrust is given in the project to diversify cropping with improved cereals, pulses and oilseed crops which has resulted into sustainable utilization of natural resources and evolution of model Agricultural village.

Keywords: Sustainable production, Innovation, Cropping pattern, Demonstration

Theme 6: 241

A Study on Farmers, Required Need of Training and Knowledge for Extent Adoption of Groundnut Production in Satna District of M.P.

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India is the largest oilseed grower and importer of edible oils, accounting for 13% of the Gross Croped Area, 3% of the Gross National Product, and 10% value of all agricultural commodities. Oilseed crops play a crucial role in India's agricultural economy, with large areas under oilseed crops. Groundnuts are rich in oil and protein, with kernels having 25% easily digestible protein, which is 1.3 times higher than meat, eggs, and fruits. Groundnut oil is used in soaps, hair oil, cosmetics, cold cream, and various industrial uses. Its oil is now used in pharmaceuticals as a substitute to oleic oil. Groundnuts are also known as a rotation crop, which can synthesize atmospheric nitrogen and enhance soil fertility. They are used for both edible and non-edible purposes. The shell or pod of groundnuts contains two or three kernels, and the nuts are egg-shaped. They contain monounsaturated and polyunsaturated fats that keep the heart healthy, lowering blood cholesterol levels and reducing the risk of coronary heart diseases. Groundnuts are an extremely high source of dietary protein composed of fine quality amino acids, including antioxidant polyphenols like p-coumaric acid and oleic acid. Regular consumption of groundnuts ensures a healthy heart and minimizes the risk of mineral diseases. Vitamins are essential for overall growth and development, regulating metabolism, converting fat and carbohydrates into energy compounds, and facilitating bone and tissue formation.

Keywords: Compounds, Growth, Oilseeds, Soil fertility, Vitamins

Theme 6: 242

Unveiling Gender Dynamics and Advancing Equality for Sustainable Progress

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A gender-equal society represents the pinnacle of progress, where both men and women actively participate in the developmental process. Achieving gender equality is an essential and ideal goal for any society or nation in the 21st century. Among the vulnerable groups, the tea garden workers stand out as they are deprived of proper amenities and convenience. The growth of the tea industry holds significant importance, not only for generating local and international revenue but also for preserving the environmental balance. In this study, an exploratory sequential design was followed and 120 respondents were selected. Among these, 40 are women workers, and 20 are male workers, selected from two different tea gardens each. The objectives of the study are to highlight the gender disparity index, gender ratio, work participation rate, literacy rate, and socio-economic conditions of the tea garden workers. By understanding these aspects, aim to gain insights into the gender dynamics, gender-related issues, social progress, and the overall empowerment and status of women in this region. The findings indicated unanimous dissatisfaction among tea workers regarding remuneration and training. This study provides crucial insights into gender equality, shedding light on the status and empowerment of women in the tea garden community. Addressing these issues could pave the way for a more gender-equal society, contributing not only to the well-being of tea workers but also to broader societal progress and harmony.

Keywords: Gender disparity index, Gender dimensions, Gender roles, Living conditions, Tea garden workers

Theme 6: 243
Scaling up ITK Practices for a Sustainable Agriculture Through Expert Validation, Documentation and ICT Extension Strategies

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In recent years, Indigenous Technical Knowledge (ITK) has been one of the centrepieces of agriculture policy in India. This is also in line with the increasing focus on sustainable and organic agriculture, for which the ITK practices are vital. While the ITK practices have been in continuous use in Indian agriculture from times immemorial, their use has been significantly limited, and they face the risk of obscurity because of their undocumented nature and the widespread proliferation of modern technology. The ITK practices have failed to scale up because they mostly remain unvalidated and unverified by the scientific community as opposed to modern practices. These practices, therefore, require further testing by scientists at research stations and, if need be, a blend with modern technologies. This paper proposes a novel approach to documenting the ITK practices after their validation and verification by experts. The paper argues that this will not only help in their preservation and widespread propagation but also impart greater credibility and acceptability among the farmers. Documenting and examining the rationality of indigenous knowledge in this manner will also be helpful in modifying it according to the current needs of sustainable and organic farming and blending it with modern practices. Further, as the ITK practices are limited in their geographic spread and are often heavily localised, the paper also argues for the use of information and communication technology as an effective extension strategy to disseminate the knowledge about these practices to the wider farmer community, which will help to scale up the use of these practices.

Keywords: Scaling up, ITK, Sustainable agriculture, Expert validation, Documentation, ICT

Theme 6: 244
Impact of Intervention on Social-Awareness Among Rural Women

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The study aimed to analyse the impact of intervention on social awareness among rural women. By employing experimental research design in the study, a sample of 60 rural women age ranged from 18 to 35 years from four villages of Haryana, was selected by using purposive sampling method. An interview schedule was developed to collect the data in two phases i.e. before and after the intervention to assess the effectiveness of the prepared intervention on social awareness. The collected data were then coded and analyzed by using suitable statistical methods i.e. frequency, percentage, mean, and paired t-test to derive the research results. The pre-test results indicated that before the intervention, very few of the respondents (3%) had high level of social-awareness; nearly half of them (45%) had moderate level whereas more than half of them (52%) had low level of social-awareness. A need-based intervention was developed and offered to the respondents for 14 days. Post-intervention changes were observed and it was found that the respondents falling under the high level had remarkably shifted from 3% to 30% i.e., nearly one-third of the rural women acquired high social-awareness after the intervention. Slightly less than two-thirds (63%) acquired moderate level and only 7% of the respondents were found to have low level of social-awareness after the intervention. The study concluded that the intervention was effective in increasing social-awareness among rural women as the calculated t-value was found to be significant at 0.01 level of probability.

Keywords: Social awareness, Social development, Rural women, Intervention

Theme 6: 245
Constraints Faced in Utilizing ICT Services by Rural Students of Haryana

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Information and communication technologies or ICT is a comprehensive word that encompasses all technological advancements for the management and transmission of digital data including cellphones, computers, tablets, laptops, televisions, radios, smart bands, etc. Its imperative use in education sectors has risen the need to learn the constraints faced by the students to smoothen the teaching learning process. To assess the constraints or challenges the current study was conducted in the Haryana state in Hisar district in Hisar-I and Hisar-II block selected randomly. Government Senior Secondary schools were selected from two villages for collection of data. The study targeted the students from 9th-12th class. From the selected schools, total of 100 students were selected. Data was collected personally by the researcher through well-structured questionnaire. For the study, constraints were categorized under four different components and were analyzed using Composite Index method. Constraints perceived at the personal/physical level by the students of School-I revealed that 'Eye strain' ranked 1st with highest index value 72.00 contrary to lack of ICT skills by School-II. At Infrastructural level, limited number of computers in school lab was ranked 1st and Poor ICT infrastructure in School-II. At Economical level, Expensive recharge plans was the major constraint faced by both the school students. At Social level, Parental prohibition on usage of ICT gadgets was ranked 1st with the highest index value 82.00 by both the school students.

Keywords: ICT services, Students, Haryana

Theme 6: 246
The 21st Century's Higher Education and Information and Communication Technology Role

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The purpose of this topic is to emphasise the importance of ICT in higher education in the twenty-first century. The study specifically argues that although ICTs have had a relatively minor influence on educational practice so far, that impact will rise significantly over the next coming years and that ICT will become a powerful force for change across a wide range of educational practises. The report clearly shows that ICT use in education is rising quickly across different Indian states. Making decisions based on technical potential rather than educational requirements is one of the most frequent issues when employing information and communication technologies (ICTs) in education. There is a growing demand to ensure that technology potential is examined in the context of educational needs in developing nations where higher education is beset with major issues at numerous levels. ICT in education encourages more student-centred learning environments, which frequently causes friction between certain professors and students. But as the world quickly transitions to digital media and information, the relevance of ICT in education is only going to increase throughout the twenty-first century. As a result, the article contends that ICT in higher education not only contributes to educational advancement but also to the country's socioeconomic development.

Keywords: ICT, Technology, Digital media, Education

Theme 6: 247
Analysis of Income Generation activities among SHG Women through Need Based Training Programmes

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The need based training programmes mostly focussed on the economic, social and managerial aspects of women in enhancing income through SHGs. Thus, each five days need based training programmes on candle making, chalk making, tye & dye were organised at Bilari block of Moradabad district of Uttar Pradesh in September to December (2023) by Krishi Vigyan Kendra Moradabad-I. A random sample of 75 women of eight self help groups belonged to three villages was selected as the trainees of the training programme. An interview schedule was used to document the prioritization of different need based training programmes among SHG trainees. The findings of the different training programmes concluded that women who never used to step outside the four walls of their home is now taking interest in these income generation activities and want to start their business through SHGs to contribute towards their family income. The data concluded that, most (63.49%) of the SHG members had taken up candle making as their economic activity other than agricultural activities in their SHGs and less than half (47.23%) of the respondents had Tye & Dye as the major SHG enterprise. Whereas only few (13.88%) of SHG members prioritise the Chalk making as their economic activity in their SHGs. It indicates that such type of need based training programmes among self help groups helps to bring economic upliftment, decision making skills, marketing skills, selection skills of income generation activity according to their local market availability, leadership skills in managing the group and inculcate great confidence in the members of selected groups to succeed in their day to day life.

Keywords: Economic, Enterprise, SHG, Income, Women

Theme 6: 248
Probing into Livelihood enhancement through the lens of Self-Help Groups: A Multidimensional Perspective

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Exploring the multifaceted dimensions of livelihood enhancement through the lens of self-help groups (SHGs), provides a comprehensive understanding of the various mechanisms and impacts involved. Livelihood enhancement, essential for poverty alleviation and sustainable development, has increasingly become a focal point of interventions worldwide, with SHGs emerging as effective platforms for fostering economic empowerment and socio-economic advancement, particularly among marginalized communities. By contextualizing the significance of livelihood enhancement within the broader framework of socio-economic development, emphasizing its role in improving the well-being and resilience of individuals and communities. It highlights the unique attributes of SHGs, such as collective savings, credit access, skill-building, and entrepreneurship promotion, which contribute to livelihood enhancement through diverse pathways. Furthermore, delving into the economic dimension of livelihood enhancement facilitated by SHGs, illustrating how access to financial

services, income-generating activities, and market linkages empower members to increase their incomes, build assets, and enhance their economic security. Additionally, SHGs foster social capital and community networks, which play a crucial role in accessing resources, sharing knowledge, and mobilizing support for livelihood initiatives. Moreover, the socio-cultural dimension of livelihood enhancement, examining how participation in SHGs can challenge traditional gender roles, empower women, and promote social inclusion and cohesion within communities. By providing a platform for collective decision-making, skill-sharing, and mutual assistance, SHGs empower marginalized individuals to overcome barriers and pursue diverse livelihood opportunities. Last but not least, that adopting a multidimensional perspective in analyzing the impacts of SHGs on livelihood enhancement, recognizing the interconnectedness of economic, social, cultural, and environmental factors. By integrating diverse perspectives and methodologies, policymakers, practitioners, and researchers can develop more contextually relevant and sustainable interventions to promote inclusive growth and improve livelihoods for all.

Keywords: Livelihood enhancement, Self-Help Groups (SHGs), Women empowerment, Capacity building

Theme 6: 249
Socio-economic Analysis of Jammu Region Farmers

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Farm income disparity is a critical and multifaceted issue that has far-reaching implications for the agricultural sector and the overall socio-economic fabric of a region. In the context of Jammu, a region with a significant dependence on agriculture, understanding the dynamics of farm income disparities becomes imperative. The disparities in income within the farming community often reflect underlying challenges related to resource distribution, access to technology, market dynamics, and policy support. Agriculture, being a primary source of livelihood for a substantial portion of the population in Jammu, contributes significantly to the region's economic growth. However, the benefits of this economic activity are not uniformly distributed among farmers. Farm income disparities manifest in variations in the financial well-being of agricultural households, leading to differing living standards and opportunities. Several factors contribute to farm income disparities in the Jammu region. Landholding size, access to irrigation, technology adoption, market linkages, and socio-economic factors are among the key determinants influencing the earning capacity of farmers. Additionally, the impact of global and national economic trends, climate change, and fluctuations in commodity prices further exacerbate income inequalities within the agricultural community. Understanding and addressing farm income disparities is crucial for sustainable agricultural development and rural upliftment. The consequences of unequal distribution of income include increased poverty levels, reduced agricultural productivity, and hindered overall economic growth. In order to formulate effective policies and interventions, a comprehensive analysis of the socio-economic factors contributing to farm income disparities is essential. This study seeks to explore the intricacies of farm income disparities in the Jammu region, employing a holistic approach that combines quantitative data analysis with qualitative insights from the farming community. This research aims to provide a foundation for evidence-based policy recommendations that promote equitable growth, improved living standards, and overall socio-economic development in the agricultural sector of Jammu.

Keywords: Farm income disparity, Agriculture, Socio-economic analysis, Rural development, Income inequality

Theme 6: 250
Impact of Digital Technologies in Agriculture Sector

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The term "Agricultural technology" means machinery and other equipment engineered for an applicable and novel use in agriculture, natural resources and food relating to the research and development of qualified products and projects. Mobile applications and web-based platforms have facilitated the dissemination of agricultural knowledge, empowering farmers with up-to-date practices. By reducing the digital divide, ICT-based extension services promote equitable access to information, leading to enhanced agricultural productivity and sustainability. Digital technologies provide new opportunities to farmers, supply chain actors, including consumers and policy makers to improve the productivity, sustainability and resilience of food systems. The impact of e-extension on agriculture development is evaluated, demonstrating how it has improved agricultural productivity and livelihoods through increased yields, better quality crops and enhanced market opportunities. Applying technology and technical innovations in agriculture have significantly increased efficiency and output. Agri tech helps farmers in various aspects of their farming operations. Increasing crop production to reducing water, fertilizer and pesticides to improving working conditions for farm workers. Biotechnology and genetic engineering have resulted in pest resistance and increased crop yields. Mechanization has led to efficient tilling, harvesting and reduction in manual labour. The scenario for Digital Agriculture is promising in India. The key factors that will determine the success of Digital Agriculture in India are affordability of technology, ease of access and operations, easy maintenance of system, timely redressal and appropriate policy support. Satellite and GPS technology, sensors, smart irrigation, drones and automation to list a few provide the means for precision agriculture which further aids in effective resource utilization.

Keywords: Digital technology, E-extension, Digital agriculture, Opportunities, Mobile Application, Mechanization, Harvesting

Theme 6: 251
Knowledge Assessment of Farm Women Regarding Improved Maize Cultivation Practices

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The present study was undertaken to assess the knowledge of improved maize cultivation practices among farm women. The study was conducted in two purposively selected panchayat samities of Udaipur district of Rajasthan state viz. Girwa and Badgaon. Four villages from each panchayat samiti were selected on random basis. Thus, there were total eight villages. For selection of sample, total 159 farm women from the selected villages who were involved in maize cultivation were taken. The findings of the study revealed that majority of the respondents (69.81%) possessed average knowledge regarding improved maize cultivation practices followed by 16.98 per cent of the respondents who possessed poor knowledge and only 13.20 per cent of respondents belonged to good knowledge category.

Keywords: Knowledge assessment, Farm women, Maize cultivation practices

Theme 6: 252
Indigenous Technical Knowledge for Sustainable development of Agriculture

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Indigenous Technical Knowledge (ITK) has immense potential for innovation. India is a country of indigenous communities, most of which have their own set of unique traditional knowledge and technology base. The population of India is growing rapidly and demand for food is also increasing. ITK is the sum total knowledge and practices which are based on people's accumulated experiences in dealing with situations and problems in various aspects of life and such knowledge and practices are special to a particular culture. Many of these knowledge and technologies are at par with the modern knowledge and technology system and have been provided the indigenous communities with comfort and self-sufficiency. These traditional knowledge and technologies can play a significant role in the overall socio-economic development of the communities. It has been observed that there is an instant need to document and preserve the Indigenous Technical Knowledge (ITK) of different communities, many of which are at the brink of extinction. There is a lack of proper alliance between the practice of indigenous and modern knowledge. There are serious issues related to intellectual property rights. An appropriate association between the traditional and modern knowledge and technology systems has immense potential to benefit the society. These ITKs are able to maintain the agricultural sustainability as well as food and nutritional security.

Keywords: Agricultural sustainability, Indigenous technical knowledge, Communities

Theme 6: 253
IARI Tech Talk- an IARI Initiative for Digital Awareness at IARI

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Covid-19 Pandemic has changed our style of working unprecedently. To overcome the challenges the organizations had to accelerate digitization and apparently has become a blessing in disguise. The rate of adoption of technology is way ahead as compared to previous rate. Online/virtual meetings, webinar, e-office, e-mail are becoming more popular day by day. With this comes the challenges to have an up-to-date knowledge about the digital technology which is also required to handle the increasing innovative modes of cyber-crimes. The use of information, communication and dissemination system has a vast potential to transform the knowledge into information for an efficient management. Sensitizing the users about using digital technologies is one of the important factors enhancing the adoption rate of technologies. Therefore, an attempt has been initiated to create online "IARI Tech Talk" to bridge the knowledge gap between the users and frequently changing/ upgrading technologies. The end users, though experts in their own domains, sometimes lack the information on the latest IT related events or technologies. "IARI Tech talk" is an effort to update the users about various tools and techniques helping them performing the day-to-day activities efficiently. It also is an initiative to provide the information to the users for the troubleshooting the day-to-day issues and to spread awareness about the cyber security, phishing attacks, identity theft and cyber-crimes. This not only provides them the necessary information but also shields them from becoming a victim of such events. Bioinformatics also plays a significant role in almost every field of agriculture science. It provides different computational tools and techniques for analysis and interpretation of biological data.

Keywords: IT technologies, Awareness, Cyber-crimes, Digital technology, Bioinformatics

Theme 6: 254
Harnessing Plant Genetic Resources for Sustainable Agriculture: A Comprehensive Review

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Plant genetic resources (PGR) play a pivotal role in ensuring global food security and agricultural sustainability. This review provides a comprehensive overview of the significance, conservation, utilization, and management of PGR in the context of sustainable agriculture. Plant genetic resources (PGRs) are the total hereditary material, which includes all the alleles of various genes, present in a crop species and its wild relatives. They are a major resource that humans depend on to increase farming resilience and profit. Hence, the demand for genetic resources will increase as the world population increases. There is a need to conserve and maintain the genetic diversity of these valuable resources for sustainable food security. Due to environmental changes and genetic erosion, some valuable genetic resources have already become extinct. The landraces, wild relatives, wild species, genetic stock, advanced breeding material, and modern varieties are some of the important plant genetic resources. These diverse resources have contributed to maintaining sustainable biodiversity. New crop varieties with desirable traits have been developed using these resources. Novel genes/alleles linked to the trait of interest are transferred into the commercially cultivated varieties using biotechnological tools. Diversity should be maintained as a genetic resource for the sustainable development of new crop varieties. Additionally, advances in biotechnological tools, such as next-generation sequencing, molecular markers, in vitro culture technology, cryopreservation, and gene banks, help in the precise characterization and conservation of rare and endangered species. Genomic tools help in the identification of quantitative trait loci (QTLs) and novel genes in plants that can be transferred through marker-assisted selection and marker-assisted backcrossing breeding approaches. This article focuses on the recent development in maintaining the diversity of genetic resources, their conservation, and their sustainable utilization to secure global food security.

Keywords: Plant genetic resources, Genetic diversity, Conservation, Crop breeding, Climate change adaptation, Genetic improvement

Theme 6: 255
Empowering Kerala's Entrepreneurs: A Comprehensive Review of Entrepreneurial Training Programs

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Kerala, known for its high literacy rate and skilled workforce, has witnessed a surge in entrepreneurial endeavors across various sectors. Recognizing the potential of entrepreneurship in driving innovation and employment, governmental and non-governmental organizations have introduced a myriad of training programs tailored to meet the needs of aspiring entrepreneurs. This abstract presents a comprehensive review of entrepreneurial training programs in Kerala, aiming to shed light on the initiatives undertaken to nurture and empower budding entrepreneurs in the region. We examined the structure, content, and methodologies employed in imparting essential entrepreneurial skills and knowledge, including business planning, financial management, market analysis, and networking. It also explores the diverse range of entrepreneurial training programs implemented by

government bodies, educational institutions, and private organizations. Also aiming to assess their effectiveness in nurturing and empowering local entrepreneurs. Drawing upon empirical evidence and case studies, it highlights the transformative potential of these programs in fostering a culture of entrepreneurship and innovation in Kerala. The impact of entrepreneurial training programs on participants can be witnessed in the form of improved entrepreneurial skills, a better understanding of risk management, improved financial literacy, business success rates, and socio-economic empowerment. There are only a few comparative studies on the effectiveness of entrepreneurship development training across different institutions, lack of market information, lack of financial resources, more competition, inadequate publicity, and lack of guidance are some of the commonly identified gaps and challenges in the existing entrepreneurial training landscape in Kerala. Ultimately, this review aims to contribute to the ongoing discourse on entrepreneurial development in Kerala and provide valuable insights for policymakers, educators, and practitioners striving to build a vibrant entrepreneurial ecosystem.

Keywords: Kerala, Entrepreneurs, Entrepreneurial Trainings

Theme 6: 256
Cultivating Self-reliance: Transforming Agricultural Education for Atmanirbhar Bharat

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Atmanirbhar Bharat is a vision to make India a self-reliant nation. This was first publicly mentioned by the Prime Minister of India on 12 May 2020 when he was announcing an economic package related to the coronavirus pandemic. In the pursuit of self-reliance in agriculture, India's focus has shifted towards leveraging agricultural education imparted by universities and institutions. Reports indicate that agricultural growth has been averaging around 3% annually which shows the urgency of enhancing agricultural productivity and sustainability. Amidst these challenges, there is a pressing need for pedagogical adjustments within agricultural universities to align teaching methodologies with the demands of Atmanirbhar Bharat. The report of the Fifth Dean's Committee, Division of Agricultural Education, Indian Council of Agricultural Research (2017) has clarified that the teaching effectiveness of agricultural education in India is not adequate as there is no effective link between agricultural education and employment and industry needs. Agricultural universities, as hubs of innovation and knowledge dissemination, play a pivotal role in facilitating this transition. With over 6.5 million students annually, these institutions serve as platforms for interdisciplinary learning, entrepreneurship development, and technology transfer. Furthermore, agricultural education extends beyond classroom instruction to include hands-on training, extension services, and capacity-building programs for farmers and rural communities. Initiatives such as the National Agricultural Higher Education Project (NAHEP) enhance the quality and relevance of agricultural education, aligning it with emerging trends such as climate-smart agriculture and digital farming. By harnessing the potential of agricultural universities as hubs of excellence and innovation, India seeks to transform its agricultural landscape, ensuring food security, rural prosperity, and sustainable development. Collaborations between agricultural universities, research institutions, and industry partners further amplify the impact of teaching initiatives, fostering a culture of innovation and self-reliance in rural communities. By embracing pedagogical adjustments and promoting learner-centric approaches, India aims to cultivate a dynamic and knowledgeable workforce capable of driving innovation and sustainable growth in the agricultural sector, thereby realizing the vision of Atmanirbhar Bharat.

Keywords: Self-reliance, Agricultural education, Atmanirbhar Bharat

Theme 6: 257

Maternal Autonomy Assessment Scale: Developing a Comprehensive Measure for Maternal Decision-Making

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A scale was constructed and validated to measure the maternal autonomy of the married women aged between 15-49 years across the states of Uttar Pradesh and Haryana. This work was carried out under the in-house research project entitled "Enhancing Nutritional Security and Gender Empowerment". The scale was constructed by employing Confirmatory Factor Analysis. The chi-square value was found significant. RMSEA (Root Mean Square Error Approximation) value was less than 0.05. CFI (Comparative fit index) and TLI (Tucker Lewis Index) values were above 0.90 and SRMR (Standardised Root Mean Square Residual) value was less than 0.05. This indicates that the model fitted well. All the values of factor loadings and variance contributed by each variable in the three subscales of Maternal autonomy scale were found significant. Higher values indicated greater contribution towards the scale. The scale developed consists of three subscales, namely Household Decision Making, Justification of Violence and Economic Independence. In household decision-making, approximately 80% made decisions regarding the listed aspects, either on their own or with their husbands. With regard to maternal caregiver's justification of violence, majority of the respondents reported that wife beating was not justified in any of the mentioned conditions. With regard to economic independence, 48% of respondents had knowledge of loan programs available to them but 21% actually availed the loan; the majority of the respondents did have a savings account (80%); 25% were employed and approximately 50% had money for their own personal use. 45% respondents owned house and 36% owned land either alone or jointly. The validity of the scale was established by assessing the convergent and discriminant validity of the scale which was done by examining the correlations between the scale and other measures of the same and different constructs. The correlations between the items on the scale were examined and it was found that the items on the scale were significantly correlated with each other, thus indicating that they are measuring the same underlying construct. The scale developed can be utilised in multiple locations in rural settings to understand the status of the maternal autonomy of the female respondents of the study area. This will help in further identifying the possible likelihood of the gender issues influencing the health and nutritional outcomes in rural households.

Keywords: Maternal Autonomy scale, Decision-making

Theme 7: 258
Integrated Agricultural Interventions for Livelihood and Nutritional Security of Tribal Farmers of Sonbhadra (Uttar Pradesh)

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Sonbhadra district of Uttar Pradesh is a backward Naxalite region, water scarce, undulated hilly area and habitated by tribal people. The major tribes reside there are Chero, Bhagia, Panika, Aghariya, Gond, Dhuriya, Nayak, Pathari, Rajgond, Kharwar etc. The tribal people were forest dwellers and used to cultivate primitive cultivar of cereal crops whose production was very less. Due to scarcity of irrigation water, the agricultural situation was very scanty there. ICAR- Indian Institute of Vegetable Research intervened in that area by adopting 1506 tribal families in 14 villages of 2 most tribal populated blocks under Scheduled Tribe Component (STC) earlier Tribal Sub Plan (TSP) programme. The intervention was conducted in integrated agricultural approach through demonstration of modern agricultural technologies and training for capacity building of the tribal community. As per the need assessed, demonstrations of drought tolerant varieties of paddy, wheat, pulses were conducted. For promotion of nutritional security, 6500 planting material of mango, guava, custard apple, bael, jackfruit and bamboo were distributed along with seasonal vegetable kitchen garden kits consisting improved vegetable varieties developed by ICAR-IIVR. A special emphasis was given to vermi compost production in that area. Keeping in mind the agricultural off season, 10000 day old chicks were distributed to popularize backyard poultry to boost up their livelihood. Besides that, in situ training programmes and exposure visits were also arranged for knowledge updation and capacity building of the beneficiaries. Due to the action research-oriented intervention, changes has been observed in food habit of the tribal people which has given boost to the nutritional security. Due to the intervention, positive changes have been observed in their income status, social status which is thriving towards a better livelihood.

Keywords: Livelihood, Nutritional security, Tribal, Integrated agricultural system

Theme 7: 259
Food Preservation Practices Used by Rural Women in Mainpuri District

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Food preservation refers to any one of a number of techniques used to prevent food from spoilage. All foods begin to spoil as soon as they are harvested or slaughtered. Some spoilage is caused by microorganisms such as bacteria and mould. Other spoilage results from chemical changes within the food itself due to natural processes such as enzyme action or oxidation. Preservation enables foods that are seasonally produced to be available all the year. Traditional forms of food preservation include salting, smoking, pickling, drying, bottling and preserving in sugar. Modern food technology also uses many novel processes and additives, which allow a wider range of foodstuffs to be preserved. All foods undergo some changes in qualifies and nutritional value when subjected to preservation processes. No preserved food is identical in quality to its fresh counterpart therefore only food of the highest quality should be preserved.

Keywords: Food preservation, Rural women, Additives

Theme 7: 260
Empowerment of Rural Women through Processing and Marketing of Millets Value Added Products: A Case Study in Barmer

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Barmer, Rajasthan is keen in training the farmers, farm women, rural youth and Self Help Group women in the area of processing and value addition of millets. KVK focused on establishment of small-scale food processing units at village level by motivating and involving SHG women in rural areas with locally grown crops. This success story is about one group of women who is successfully running a millet processing and value addition unit in Aati village at Barmer block of Barmer district. The rural mobilization under this study focused on SHGs constituted by small and landless rural women of Aati village in Barmer district. The nutritional status of women of this village revealed 50-60% nutrient adequacy with low Hb levels in 45% of them. The pattern of group savings and lending showed that most of the credit was used for improving the sustainability of their agriculture and subsidiary activities. Empowerment of women was undertaken through trainings based on the need assessment carried out in a participatory mode. The training was imparted for preparation of value-added products of pearl millet. Quality control, labeling, marketing of the produce with attractive cost benefit ratio. With the technical support from the KVK, Barmer began to prepare and market many millets-based products such as namkeen bhujia, namakpara, shakarpara, pearl millet laddu, millet dalia, cake etc. in retail market. At present the group is earning Rs. 60,000/- to 70,000 per month from these products. The income is divided among the members of the group. Empowerment of SHG women through training and nutrition education had positive impact on leadership qualities, enhanced self-confidence; skills to undertake value added products and their marketing, domestic consumption, income generation.

Keywords: Marketing, Millets, Value added products, Women

Theme 7: 261
Impact of Social-Cultural Factors on Health Seeking Behaviour of Women during Pregnancy in Rural Punjab

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In India, the infrastructure for providing access to healthcare facilities in rural areas is still far from developed. Women are prevented from accessing health facility services by a number of social, religious, and financial obstacles. To understand people's health status, it will be necessary to consider the social dynamics in their daily lives, the demands placed on their decisions by their circumstances, and their cultural predispositions. This is primarily caused by deeply ingrained dysfunctional gender relations that are a result of outmoded social and cultural norms and are further supported by literalist readings of religious texts. This naturally has a knock-on effect on women's health-seeking behaviours. This study aims to investigate the health status and health support seeking behaviour of pregnant women living in rural areas, based on socio-cultural factors. For this study, two districts from the state viz. Ludhiana and Amritsar were chosen at random. Twenty SCs and twenty non-SCs were selected from each district. There were eighty respondents in all, from both districts, in the sample. Poor level of education, unemployment and dependency on husband were major findings behind poor health-seeking behaviour among women in rural Punjab.

Keywords: Health, Rural, Health seeking behaviour, Primary healthcare

Theme 7: 262
Enhancing the Lentil Crop Growth and Yield Under Cluster Frontline Demonstrations

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In response to the decline in pulses cultivation and the resulting scarcity of pulses, the Government of India has initiated a program under the National Food Security Mission to promote pulses cultivation in cluster mode through Krishi Vigyan Kendras (KVKs). In Uttar Pradesh, lentils have become the preferred pulse crop. A study conducted by Krishi Vigyan Kendra in Ankushpur Ghazipur aimed to revitalize lentil cultivation during the rabi season of 2020-21 and 2021-2022 in various villages of the Ghazipur district. Cluster Front Line Demonstrations (CFLD) focused on the lentil variety Pant Lentil 8, with 20 and 61 clusters in different years. The outcomes were promising, with integrated crop management practices reducing wilt disease incidence by 90.66 percent compared to traditional methods. The application of the systemic insecticide imidacloprid 17.8 SL resulted in 68.04 percent reduction in aphid populations per plant on average. Under improved technology adoption, lentil seed yields reached an average of 19.67 quintals per hectare, a remarkable 102.05 percent increase over conventional farming practices (9.73 quintals per hectare). Moreover, the adoption of improved technologies led to significantly higher gross returns, averaging Rs. 88,823 per hectare, with an impressive benefit-cost ratio of 8.68. This was in stark contrast to the farmer's practice, which yielded Rs. 44,077 per hectare. The study found that 100 percent of respondents adopted good land preparation and timely sowing, with 67.21 percent opting for high-yield varieties. However, constraints were identified, with 100 percent of respondents citing the absence of a reliable market, 91.80 percent facing a lack of technical guidance, and 85.25 percent encountering issues related to the unavailability of potential markets.

Keywords: Lentil, Yield, CFLD, Net return

Theme 7: 263
Ascertaining the Factors in Achieving Doubling of Farmers Income through Zero Tillage Oilseed Mustard Cultivation in Thoubal District, Manipur

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Oilseed crops are one of the important determinants of Indian economy especially in agricultural sector next to cereals within field crops as it is import dependent. Production of edible oils plays a vital role in reducing the import dependency as well as in human nutrition for meeting calorie requirement. With the aim to achieve doubling of farmers' income in the country, it is necessary to improve the cultivation practices to more scientific, profitable, and sustainable technology practices. One of the important practices is Zero tillage which is a low-cost cultivation practice where the crop is sown directly into soil not tilled since the harvest of the previous crop. The present study revealed that successful adoption of Zero tillage oilseed mustard cultivation by majority of the farmers in Thoubal district, Manipur in comparison to conventional system is based on the successful utilization of the principal factors such as Age of the farmer, timely sowing of seed, timely application of fertilizer, skill of the farmers and use of growth hormones.

Keyword: Oilseed, Economy, Import, Income, Zero tillage, Scientific, Profitable and Sustainable

Theme 7: 264
COVID-19 and its Aftermath on Commodity Value Chain and Agricultural Marketing: A Study in Uttar Pradesh and Haryana

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The arrival of COVID-19 was no less than any apocalypse for the global economy. The growth of global GDP spiralled down to a very low point. The condition in India was not an exception to it. Almost all the sectors of the economy were severely affected. Notwithstanding this, agriculture emerged as a bright spot in the dark horizon. Even though the growth rate was positive, there were serious impediments in the commodity value chain and agricultural marketing. Paucity in input supply, restriction in movement, closure of market, reduced demand of food products brought challenges that existed never before. In this backdrop, a study was conducted to find out the effects of COVID-19 on the value chain and marketing of Pusa Basmati 1121 and Pusa Rudhira. The research design was ex-post facto in nature and a total number of 160 farmers and 50 stakeholders including exporters and millers were consulted for the study. The locale of the study was Gautam Budha Nagar (U.P), Karnal (Haryana), Hapur (U.P) and Nizampur (New Delhi). From extant review of literature, pilot study and discussion with experts, several constraints faced by the value chain stakeholders were identified and rank ordered using Rank Based Quotient Method (R.B.Q). Results showed that in case of farmers "difficulty in getting buyer, price fluctuation and wastage" were among the top constraints, and for stakeholders such as millers, wholesalers and retailers, "unavailability of labour and price fluctuations" were the causes of concern. Moreover, for exporters "hike in freight charges" was the most severe constraint.

Keywords: Commodity value chain, Agricultural marketing, Pusa Basmati 1121, Pusa Rudhira, Constraints

Theme 7: 265
Women's Role and Strategic Approaches for Food and Nutrition Security

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Ensuring Food and Nutrition Security (FNS) has consistently held significant importance in both India and globally. Recent estimates suggest that over 820 million individuals, approximately one in nine worldwide, are currently experiencing hunger. India is one of the 88 nations that will fail to achieve the global nutrition targets on four nutritional parameters in 2025. Despite a significant increase in food production and per capita income, India has not achieved the Millennium Development Goals (MDGs) or the World Food Summit (WFS) targets. India, the leading producer of milk, wheat, fruits, rice, lentils, and vegetables globally, holds the 101st position in the Global Hunger Index (GHI) for 2021. This review paper highlights different roles played by women in food and nutrition security at household level such as food producers, livestock managers, decision maker in food preparation, income generator and in community development. It also put light on role of extension and advisory services in food and nutrition security by using various pathways and strategies such as biofortification, promoting diverse and nutritious food, promoting kitchen garden, reducing post-harvest loss through value addition and processing, empowering rural women, integration of ICT in nutrition, millet production in order to overcome nutritional problems in India.

Keywords: Food and nutrition security, Women role, Strategic approaches

Theme 7: 266
Availability, Awareness, and Utilization of Moringa Oleifera in Nutri-Smart and Non-Nutri-Smart Villages-A Comparative Study

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Moringa tree also known as the miracle tree is an important and fast-growing tree, in the tropics. It is recognized for its nutritional, medicinal, and industrial values for humans, and livestock. The exploratory research was conducted in Nutri- Smart villages Pachpukhra and Anooppur and Non-nutri-smart villages Pachaiypurva and Rudapur of district Kannauj and Kanpur Dehat respectively selected under the Gender and Nutrition scheme of ICAR in the year 2021-2023. The main objective of the present study was to assess the availability, awareness, and utilization of the Moringa oleifera among selected households of nutri-smart and non-nutri-smart villages. Multi-stage purposive random sampling technique was used to select 20 households having at least two-year-old nutritional gardens from each Nutri-smart village and 20 households from each non-nutri-smart village of both districts. Thus, the total sample for the study comprises 80 households. The results of the study reveal that most of the respondents in the nutri-smart villages had 150-200 sq.m. nutritional gardens whereas in non-nutri-smart villages nutritional gardens ranged between 25-50 sq.m. The nutritional gardens of nutri-smart villages in both districts have 15- 20 beds with 10-12 types of vegetables and 5-6 fruit plants whereas nutritional gardens in non-nutri-smart villages have only 4-5 beds with 3-4 vegetables and 0-2 fruit plants. About 83.33 percent of households of nutri-smart villages were aware of the nutritional value of different parts of the moringa plant, 48.33 percent of the medicinal benefits of its leaf, seed, flower, root, and oil, 68.00 percent of its use as a forage plant for livestock and 18.00 percent were aware of its use as a growth enhancer. In non-nutri-smart villages 18.33 percent of households were aware of the nutritional value of different parts of the moringa plant, 13.33 percent of the medicinal benefits of its leaf, seed, flower, root, and oil, 12.00 percent of its use as a forage plant for livestock and none of the families were aware of its use as a growth enhancer. About 60 percent and 5 percent of households in nutri and non-nutri-smart villages respectively in both districts were using moringa leaf as a forage plant for livestock.

Keyword: Moringa, Availability, Awareness, Utilization, Nutri-smart

Theme 7: 267
Dietary Diversification of Rural women Labourers: A pilot Study in Kadapa District of Andhra Pradesh

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Diet and nutrition are important factors in the promotion and maintenance of good health throughout the life cycle. A diet consisting of foods from several groups is essential for proper growth and development. As a normal balanced diet must include daily foods from the various food groups in sufficient amounts to meet the needs of an individual and to increase immunity. A pilot study was conducted to assess the nutritional status and dietary diversity of rural women labourers in Kadapa district of Andhra Pradesh. Data was collected with interview schedule from 50 physiologically fit non-pregnant, non-lactating rural women labourers of reproductive

age group (15-49 years) who are actively engaged in farm and allied activities along with household chores. In the present investigation dietary assessment was done using frequency of food consumption and dietary intake survey by 24-hour recall method. Physiological characteristics and anthropometric measurements related to nutrition like weight, height, mid upper arm circumference (MUAC), calf circumference (CC) and Body Mass Index (BMI) of respondents were recorded using standard procedures and equipment's. It was found that majority of the respondents had medium and low dietary diversity with 42 and 40 percent respectively, as they were mainly consuming foods from cereals, pulses, oils/fats, vegetables, milk and milk products, and sweets. On the basis of BMI, about 54 per cent of respondents were undernourished with a BMI of less than 18.5 kg/ m^2. It is an established fact that inadequate food intake leads to low BMI and Chronic Energy Deficiency. Low dietary diversity is due to lack of awareness, limited availability and accessibility of fruits and green leafy vegetables was found in the area. Based on the findings of the study, interventions on promotion of diversified food among the rural labourers, creating awareness and making them self-sufficient in modifying food behavior and life style pattern within their accessible environment, kitchen gardening and gender mainstreaming can go a long way in improving nutritional security.

Keywords*:* Dietary diversification, Nutritional status and Rural women labourers

Theme 7: 268
Adoption and Diffusion of Improved High Yielding Field pea Variety through CFLds-Pulses

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Field pea is an important rabi pulse crop grown in 0.64 m ha with annual production of 0.88 m tonnes during 2020-21. The average productivity of this crop has increased considerably over the years which is now to the tune of 1.4 t/ha. Farmers of Bundelkhand region of Uttar Pradesh (UP) have been growing Field pea in irrigated timely sown conditions and are harvesting maximum yields. Field pea production can further be increased by introducing new improved Field pea varieties among farmers of UP. The introduction of new varieties with high yield potential and wide range of its adaptability is an important factor for enhancing Field pea production. A new Field pea variety, IPFD 12-2 has been developed by IIPR, Kanpur and got it released and notified by the Government for cultivation under timely sown irrigated conditions of Gujrat, south part of Rajasthan, Bundelkhand region of UP, Madhya Pradesh & Chhattisgarh. A study was conducted by KVK, Lalitpur (UP) for assessment of the performance of IPFD12-2 in 100 farmer in cluster field trials in four villages of Lalitpur district, UP under the CFLDs-Pulses project. The grain yield of IPFD 12-2 were found to be significantly higher compared with popular local variety Rachna (used by farmers). While the cost of cultivation of both the Field pea varieties was similar in farmers' fields, and huge differences were witnessed in gross income from Field pea crop of IPFD12-2. Huge net returns were gained by farmers who grew IPFD 12-2. The highest cost-benefit ratio of 1:3.2 was found for IPFD 12-2 compared to 1: 2.7 for Rachna. Farmers have developed positive perceptions on IPFD 12-2 Field pea variety. Adoption curves were generated to ascertain the rate of adoption of IPFD 12-2 among farmers of project as well as neighbouring villages. The rate of adoption of IPFD 12-2 has escalated from as low as 100 acres in first year of introduction to 3780 acres in the second year in the Lalitpur district.

Keywords: Adoption, Diffusion, Field pea

Theme 7: 269
Extent of Financial Inclusion Among Rural People in Banaskantha District of Gujarat

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The present study entitled, "Extent of financial inclusion among rural people in Banaskantha District of Gujarat" was conducted to assess knowledge and utilization of financial services and constraints faced in availing these services. Fifteen villages of three talukas namely Palanpur, Deesa and Vadgam of Banaskantha district were randomly selected. The total sample of the study was 300 respondents consisting of 150 male and 150 female. Multi stage random sampling was used for drawing sample. Data was collected by using interview technique and analyzed by using frequency, percentage, mean per cent score, 'Z' test and correlation. Findings revealed that majority of respondents were in the middle age group, educated up to primary level, married, belonged to socially and economically backward caste and nuclear families with 5 to 8 members. The main occupation was agriculture along with animal husbandry. They had low mass media exposure and participation in social organization. Further, majority of respondents had medium level of knowledge and utilization of financial services. Male exhibited higher knowledge as well as utilization of financial services than female. The major constraints faced by the respondents in availing financial services were distance from bank, difficult banking process, poor financial literacy, uncooperative behaviour of employees of the financial institutions *etc.* Thus, efforts should be made to address these issues so that the marginal population may be included in the main stream of financial inclusion.

Keywords: Constraints, Financial inclusion, Knowledge, Rural people

Theme 7: 270
Impact on Consumption of Mushroom Blended Recipes Training Given by KVK Kannauj

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In case of oyster mushrooms (*Pleurotus ostreatus*), India becomes third largest producer on worldwide. Research studies are reported the poor consumption of mushrooms have been in practice especially among the rural population of India. The causes behind this poor eating practice are ignorance about its product development and utilization in fortification and so on. KVK trained 120 rural women of five villages named Khudalapur, Digasara, Baheliyanpurwa, Pachpukhara and Pachhayapurawa of Kannauj distract under the training programme, regarding production of oyster mushroom and its incorporation in different prevalent starchy food products. The pre-post research design was adopted to investigate the impact of training on consumption practices of oyster mushroom. It was recorded in present investigation that 81.7% rural women were unknown to products formed by oyster mushroom, most of the respondents (44%) were found to be unaware about its nutritional and medicinal facts of oyster mushroom. The post test scores on consumption practices had increased (67%) significantly. Therefore, it is prime need to aware and trained the people to utilize this nutritious food in their daily dietary consumption to achieving good health of population.

Keywords: Oyster mushroom, Consumption pattern, Training programme, Malnutrition, Fortification

Theme 7: 271
Spectacular Effects of Drumstick Leaf Powder: Potential to Improve Hemoglobin Level among Farm Women

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Mal-nutrition is an alarming problem in the developing world, with serious consequences for human health and socio-economic development. It is estimated that over 43% women of childbearing age suffer from anemia. Prevention and control against anemia rely on iron supplementation and food fortification on a large scale. Both these methods are not affordable and feasible for the farming community. The green leafy vegetables are always considered as an excellent component of the habitual diet in India. They are also protective foods and highly beneficial for the maintenance of health and prevention from diseases. Moringa has lots of minerals that are essential for growth and development among which, iron and calcium is considered as one of the important minerals for human growth. Moringa can also be preserved by solar dryer for a longer duration without loss of nutrients. Preservation by dehydration improves the shelf life of Moringa without change in nutritional value. Moringa powder can be used to supplement iron (substitute for iron tablets) as a treatment for anemia. By keeping in mind, KVK Pratapgarh under the guidance of ICAR-ATARI, Kanpur has developed Moringa leaf powder after drying it in solar dryer under the proposed on-farm trial. It has been distributed to 30 farm women to assess the efficacy of drumstick leaf powder as iron supplement (replacement of iron tablet) @10 gram /day to the farm women who were anemic (Hb- 8.00 g/dl) for 90 days continuously. After 90 days, Data revealed that Hb of those farm women were increased 1.25g/dl after post haematology report and drastic result was observed. After successful trial, training has been given to self-help groups to impart the methodology of processing and drying of moringa leaves which includes selection, plucking the fresh and tender leaves, washing thoroughly 2-3 times and dry in solar dryer.

Keywords: Anemia, Fssai, Hb, Moringa leaf powder, Nutritional value and solar dryer

Theme 7: 272
Credit Utilization Pattern of Rural Women in Udaipur District of Rajasthan

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The present study was undertaken to find out the rural credit utilization pattern of rural women of Udaipur district. The study was conducted in four villages of randomly selected Mavli panchayat samiti of Udaipur district of Rajasthan. A sample of 100 rural women was selected randomly for the present study. Personal interview technique was used for collection of data. Frequency, percentage, mean and percent score were used for analysis of the data. It was found that women generally have no control over land and other productive assets which largely exclude them from access to institutional credit and left them dependent on high-cost informal sources of credit to secure capital for consumption and/or productive purposes. Rural women's access to financial services is a key factor of successful rural development strategies for inclusive growth. Regarding utilization of rural credit majority of the respondents 62 per cent had low utilization of rural credit followed by 37 percent of the respondents with medium utilization with overall MPS of 22.71. Majority of the respondents used loan amount for production purposes i.e. repayments of old debts, purchase of animal feed, social obligations and medical treatment.

Keywords: Credit, Pattern, Rural, Utilization, Women

Theme 7: 273
Utilization of Bathua (*Chenopodium album*) for Nutritional Security

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Vitamin A is essential for healthy vision, skin, and immunity, so a deficiency can have serious health consequences. It can lead to blindness, weakened immunity, and diarrhea, which can lead to malnutrition and death. A dietary approach, rather than the medicinal (supplementing pills) approach, is the most economical and sustainable way to correct micro nutrient deficiencies. India, being blessed with diverse climatic conditions, has a wide array of edible green leafy vegetables (GLV). Many of these GLV are found as weeds in the crop fields which are resilient, adaptive and tolerant to adverse climatic conditions. Out of these weeds one very popular weed is Bathua (*Chenopodium album*) that grows in waste places and with other cultivated crops. It occurs throughout the tropical regions of world. In per hundred grams of edible Bathua leaves there is about: Water 84 grams, energy 44 kcal, carbohydrate 7g, fat 0.8 g, protein 4.3 g, fibre 2.1 g, iron 4g, Calcium 280 mg, Phosphorous 81 mg, Vitamin A 11,300IU, thiamine 0.15 mg, Riboflavin 0.4 mg, niacin 1.3 mg and Vitamin C 90 mg. The leaves are rich in fibre having laxative properties and cures constipation therefore bathua is also useful in piles. In spite of being highly nutritious consumption of bathua is less as compare to other leafy vegetables. Hence to motivate farm families to eat bathua A study was conducted among 20 farm families of Nutri-smart village of Kanpur and Kannauj District, firstly information was furnished regarding use of bathua in different recipes only 22.00 percent of farmwomen use bathua in parathas and raita. Majority i.e. 78.00 percent farmwomen prepare curry from bathua. Further bathua powder was prepared and different recipes were cooked by blending 10.0 per cent bathua powder. Over all acceptability along with taste, texture, aroma etc. were tested and results revealed that mathri was liked very much by 67.00 percent whereas; pua is liked by 45.00 percent respondents. Texture of curry was smooth, while colour is pleasant yellowish green. As far as overall acceptability is concerned all the products were accepted by more than 55.00% respondents. It is suggested scientific bathua cultivation should be started and preserved in some manner so that it will be available to each and every one all along the year.

Keywords: Nutri-smart, Bathua, Nutritional security, Recipes, Blending

Theme 7: 274
Assessment of Nutritional Status of Children and Mitigation Strategy to Address Malnutrition

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Early childhood fall under the age of six month to two year. During this period early child in our country thrive on breast milk. Breast milk alone is not able to provide sufficient amounts of all the nutrients needed to maintain growth after the first six months. Mother's milk is also a poor source of vitamin C and vitamin D. Iron stores in liver of the infant would last only up to 4-6 month. So, if the child is to maintain the expected rate of growth and remain healthy and well-nourished supplementation with other grain and pulses is essential. Also this is the period of rapid growth in cognitive and physical development of child. At this stage if children do not get sufficient or balanced nutrient diet they undergo through malnutrition. An on-farm trial was conducted on North Eastern area of Gorakhpur in Utter Pradesh by Krishi Vigyan Kendra, Belipar, Gorakhpur. This area of

district is below poverty line and education is also not up to the mark due to which it is one of the worst performing districts on child health with high rate of malnutrition. According to National Family Health Survey-IV (NFHS 2015-16) more than 42.1 percent children are malnourished or under nutrition in district. Mother wean their child into the traditional adult diet because of their poor knowledge about preparing low-cost weaning foods from locally available material with very low cost and also because of incapacity to buy expensive commercial food that in turn lead to obesity, stunting, wasting and high mortality. Sample of 5 children for six months were selected purposively after PRA to conduct OFT on intervention of supplementary food prepared by locally grown maize, groundnut, pulses, and jaggery. The composition of supplementary food was taken from NIN (National Institute of Nutrition). The prior adopted food habit increases the bulkiness and high bulk food reduces the food intake by child results in malnutrition of their children, therefore nutritionally balanced calories, dense, low dietary bulk and easily digestible weaning foods are being sought for. This involves the use of simple technique of selection of low-cost material and their ratio and the process of preparation like roasting. The collected data was analyzed with the help of simul consult of website simulconsult.com to calculate height and weight percentile. After the course of supplementary feeding program significant increase in height and weight of children was observed.

Keywords: Supplementary food, Nutrition, Weaning food, Children

Theme 7: 275

Popularization of Ragi Millet Through Frontline Demonstrations in District Gonda, Uttar Pradesh

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The frontline demonstration is one of the most powerful tools for the transfer of Technology. The present study was done to find out the yield gap through FLDs on Ragi millets during two consecutive years Kharif 2022 and Kharif 2023 at Krishi Vigyan Kendra Mankapur Gonda under Aacharya Narendra Dev University of Agriculture and Technology Kumarganj Ayodhya. The objective of the frontline demonstration was to demonstrate scientific practices for getting higher yields as well as higher net returns per unit area. Ragi crop was selected for demonstration. Ragi is also known as finger millet, madua, etc. It is an important millet grown extensively in various regions of India and Africa. Its scientific name is *Eleusine coracona.* It ranks 6th in production after wheat, rice, maize, sorghum, and bajra in India. In India, it is mostly grown in Karnataka, Andhra Pradesh, Tamil Nadu, Odisha, Maharashtra etc. It is known as the most nutritious cereal crop. It is rich in calcium so it is used as baby food also. It is very useful for women suffering from knee pain.100 g Ragi contains 7.16 g protein, 67.0 g carbohydrate 1.92 g fat, 364 mg calcium, 210 mg phosphorus, 320 kilo calorie energy, 146 mg magnesium, and 2.50 mg zinc. Millet crop Ragi variety VL 376 was sown under FLD while local variety was sown in farmer's practice in both years. The recommended dose of N:P:K @ 40:40:0 kg per hectare was applied in the demonstration as well as in the farmer's practice. Seed treatment by PSB culture biofertilizer was done before the sowing of seed in the demonstration. PSB culture was not used in farmer's practice. A total number of 50 farmers having an area of 5.0 hectares were selected to conduct FLD. The mean yield of the demonstration of Ragi was 23.87 q per hectare in comparison to 18.50 q in farmer's practice. More net returns, as well as a more benefit-cost ratio, were obtained in demonstration in comparison to farmer's practice. Net returns of Rs. 66683 per hectare were recorded in demonstration while Rs 47273 was found in farmer's practice. The benefit-cost ratio in the demonstration was 4.16 while it was 3.26 in the farmer's practice.

Keywords: FLD, Mean yield, Net returns, Benefit-cost ratio

Theme 7: 276
Technological Gap in the Cultivation of Wheat crop in District Kanpur Nagar

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Wheat compares well with other important cereals in its nutritive value. It contains more protein than other cereals. Wheat has a relatively high content of Niacin and thiamine. Wheat proteins are of special significance. This study was conducted in the district, of Kanpur Nagar, situated in the North-West of the Kanpur division, belonging to the central region of Uttar Pradesh. It lies along the Ganga which forms the northern and eastern boundary of all the districts. District Kanpur Nagar is comprised of a community development of 10 blocks, farmers were cultivating popular and recommended wheat crop technology. Two community development blocks i.e. Kalyanpur and Chaubepur were taken randomly to draw the sample of respondents. For collecting the information about the present study, the instructions and devices must be pre-tested in the situation for their use before finalizing the schedules. The statistical methods used for analyzing data include percentage, mean score chi-square test, etc. The technological gap with the result of wheat cultivation ranged from (5.0 to 42.5 percent). The highest gap was found in farmers knowing of the seed treatment. The second major technological gap of 28.33% was noticed in weed Management and 25.0% in varieties and their characteristics. A gap of 23.00% was found in harvesting and 21.25% was found in plant protection, and 18.75% was found in land preparation. In remaining practices such as seed rate, manure and fertilizer method of application, intercultural operation, sowing method, selection soil, and irrigation the gap was reduced from 16.66% to 10.00%.

Keywords: Cereals, Technological gap, Community development, Significance

Theme 7: 277
Analysis of Post-harvest Losses of Top Crops and its Determinants Under Operation Greens

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Operation greens scheme of Government of India is focussing on management of post-harvest losses through long term and short-term interventions with a focus on increasing value addition through processing. The study conducted during 2022-2023 has focussed on analysing the post-harvest losses along the TOP value chain with the help of category method developed by International Food Policy Research Institute. The data was collected using a semi structured schedule, with a sample size of 270 farmers (90 farmers from each crop i.e., tomato, onion, and potato). In tomato total post-harvest losses in Gujarat were observed at 21.51 per cent ± 1.004 standard error followed by onion (12.59% ± 0.513 SE) and potato (13.67% ± 0.591 SE) in Maharashtra and Uttar Pradesh, respectively. It was observed that education, farming experience, cost to reach market, total production of TOP crops, number of inputs applied, storage of TOP crops, number of post-harvest activities, unavailability of skilled labour, market risk and uncertainty, lack of training on better cultivation practices and post-harvest management and lack of government support were found statistically significant (5% level) effect on post-harvest losses in TOP crops.

Keywords: Post-harvest losses, Top crops, Operation greens

Theme 7: 278
Constraints Faced by Farmers in the Adoption of Paramparagat Krishi Vikas Yojana (PKVY)

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Among all the states of India, Madhya Pradesh has covered the largest area under organic certification, followed by Rajasthan and Maharashtra. Rajasthan state of India is well known for its rainfed areas in which agriculture is a gambler of Indian monsoon and it can act as a potential zone for PKVY. The government of Rajasthan has also taken an initiative to bring many areas under organic farming through Paramparagat Krishi Vikas Yojana (PKVY) in Bikaner District. Hence, in 2015-18 highest numbers of clusters were formed under PKVY. Thus, the study was conducted in the Bikaner district of Rajasthan state to delineate the constraints being faced by farmers in adopting the Paramparagat Krishi Vikas Yojana. The Bikaner district comprises eight tehsils. Out of three tehsils, namely Nokha, Sridungarhgarh and Bikaner, were selected purposely for the present investigation based on the highest number of registered farmers under PKVY. One village from each selected tehsil constituted the sample of the study and PKVY beneficiary farmers were selected purposely using a proportionate random sampling method and the non-beneficiary farmers were randomly selected from the same villages to constitute the other half of the sample size. Thus, 180 respondents, i.e., 90 beneficiary and 90 non-beneficiary respondents were included in the present investigation. The data were gathered from 180 respondents through an interview schedule. It was found that the main constraints faced by the farmers in the adoption of PKVY were a 'time-consuming process', 'lack of literacy among farmers', 'low yield during transition period', 'lack of knowledge about geo-tagging', and 'incentive is too low. This may be because farmers in the study area were not aware of the complete procedure involved in the adoption of PKVY and required more exposure through various extension activities like awareness programmes, trainings, workshops, and interactive sessions. Progressive organic farmers who have adopted all the practices of organic farming and have advanced knowledge should be used as referent extension persons for increasing the rate of adoption of PKVY.

Keywords: PKVY, Organic farming, Farmers, Adoption, Constraints

Theme 7: 279
Cruciferous Waste as a Source of Food Additive

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The vegetables from the brassica family are very important for human consumption because of their taste as well as agricultural and horticultural perspectives. Cruciferous vegetables including cabbage, cauliflower, broccoli, turnip, and radish are among the agricultural crops produced in the largest quantities, and their residues have become a big environmental problem. Cruciferous vegetables are rich source of sulfur which is needed in the body to build and fix DNA and protect against the cellular damage that leads to serious diseases. Sulfur also assists in the metabolism of foods and contributes to the health of skin, tendons, and ligaments. Cruciferous vegetables like broccoli, cabbage, cauliflower, radish, and mustard green are rich in bioactive compounds, especially sulphur-rich compounds (methyl cysteine sulfoxide and glucosinolates), colouring pigments (carotenoids, anthocyanins), minerals(Se, Fe, K, Ca) & vitamins(B complex and C). Food preservatives play a vital role in the

food industries, but the various adverse effects associated with them remain a problem that needs to be fought. Synthetic food preservatives react with the cellular component of the body leading to various food disturbances. If we must use food additives, because of their advantages, they should be the natural ones because chemical preservatives may be harmful. The use of natural antimicrobial compounds is receiving much attention and becoming crucial as the importance that nowadays is given to natural resources. These vegetables are rich in glucosinolates secondary sulfurous plant constituents which are particularly present in vacuoles of plant cells of the Brassicaceae family. Glucosinolate hydrolysis products (GSHP) are isothiocyanates (ITC), nitriles, epithionitriles, and thiocyanates. These are recognized for their antimicrobial activity. In addition, these compounds are anticarcinogenic and antioxidants. Phenolic compounds and ascorbic acid are the major antioxidants of brassica vegetables. With technological advancement, these compounds pave the way for the production of enriched or fortified foods and food additives.

Keywords: Cruciferous vegetables, Glucosinolates, Natural preservatives, GHP

Theme 7: 280
An Interventional Study on Malnutrition and it's Assessment

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Early childhood fall under the age of six month to two year. During this period early child in our country thrive on breast milk. Breast milk alone is not able to provide sufficient amounts of all the nutrients needed to maintain growth after the first six months. Mother's milk is also a poor source of vitamin C and D. Iron stores in liver of the infant would last only up to 4-6 month. So, if the child is to maintain the expected rate of growth and remain healthy and well-nourished supplementation with other grain and pulses is essential. Also this is the period of rapid growth in cognitive and physical development of child. At this stage if children do not get sufficient or balanced nutrient diet they undergo through malnutrition. An ON-FARM TRAIL was conducted on North Eastern area of Gorakhpur in Utter Pradesh by Krishi Vigyan Kendra, Belipar, Gorakhpur. This area of district is below poverty line and education is also not up to the mark due to which it is one of the worst performing district on child health with high rate of malnutrition. According to latest National Family Health Survey (HFHS 2015-16) more than 42.1percent children are malnourished or under nutrition in district. Mother wean their child into the traditional adult diet because of their poor knowledge about preparing low-cost weaning foods from locally available material with very low cost and also because of incapacity to buy expensive commercial food that in turn lead to obesity, stunting, wasting and high mortality. Sample of 5 children for six months were selected purposively after PRA to conduct OFT on intervention of supplementary food prepared by locally grown maize, groundnut, pulses, and jaggery. The composition of supplementary food was taken from NIN (National Institute of Nutrition). The prior adopted food habit increases the bulkiness and high bulk food reduces the food intake by child results in malnutrition of their children, therefore nutritionally balanced calories, dense, low dietary bulk and easily digestible weaning foods are being sought for. this involves the use of simple technique of selection of low-cost material and their ratio and the process of preparation like roasting. The collected data was analyzed with the help of simul consult of website simulconsult.com to calculate height and weight percentile. After the course of supplementary feeding program significant increase in height and weight of children was observed.

Keywords: ON-farm trail, Nutritionally balanced, National family health survey, Intervention

Theme 7: 281
Somatic Hybrids of *Sinapis alba + Brassica juncea* and their Backcross Progeny: Reservoir for Drought and High Temperature Tolerance Genes

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Allohexaploid Brassica (AB) is unavailable in nature like wheat, rye and beetroot. However, several attempts have been made in the past to synthesize allohexaploid Brassicas. However, the efforts to synthesize stable and fertile AB were not successful before the present study. We developed the first stable and fertile AB through PEG mediated protoplast fusion between *B. juncea* and *S. alba*. The somatic hybrids or allohexaploids developed by us are novel genetic resource containing potential tolerance for drought, heat including host resistance for major diseases of *B. juncea*. Subsequently, we succeeded to derive their fertile backcross progeny that carried the genes for drought and heat tolerance. These AB and their backcross progeny were evaluated for yield parameters grown under drought and high-temperature conditions. The backcross lines yielded at par when compared with checks when provided pre-sowing irrigation only. Moreover, the backcross lines set seeds up to 38°C Day temperatures. We analyzed the chromosomal constitutions of the AB, their first and second backcross progeny. The complete chromosomal constitution of *S. alba* has been hybridized during Genomic *in-situ* hybridization (GISH) studies of somatic cells. During GISH, the haploid and a half of haploid set of *S. alba* chromosomes were evident in the first and second backcross generations, respectively. We also studied their constitutive self-generations for chromosomal count in their somatic cells. The appropriate chromosomal pairing was evident at meiosis in AB and their backcross progeny during GISH. Therefore, these AB and their backcross progeny are valuable genetic resources for introgression of genes responsible for high temperature and drought tolerance and biotic stresses.

Keywords: Allohexaploid brassica, Drought and heat tolerance, GISH

Theme 7: 282
Constraints Faced by the Farmers Regarding Kitchen Gardening Trained by KVK Jalandhar

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With increase in population of our country and improvement in dietary habits, the consumption of vegetable has improved. People have realized the importance of vegetable in their diet as vegetable have high nutritive values which are vital for the body. In the present scenario, the cultivable land is decreasing day by day due to rapid urbanization, industrialization and shrinking land holdings. Indian society is predominantly vegetarian and as such consumption of meat and fish is generally avoided. Milk and fruits being costly are virtually out of reach of the common man. The study entitled on problems faced by the farmers. The study was conducted purposively in the Jalandhar district of Punjab. A list of 348 trained farmers in Kitchen Gardening during the period of 2011-2015 was obtained from KVK, Jalandhar. Out of the procured list, a total sample

of 200 respondents was selected based on probability proportional to the number of trainees in each year from 2011-2015. The information gathered during the time of inquiry was open-ended questions asked from the trainees. The response of the respondents was analyzed with the help of appropriate statistical tools such as frequency, percentage, mean score, range method and linear regression. Farmers have their kitchen gardening but the majority of the farmers have their kitchen gardens on the farm. The majority of the farmers grow recommended vegetables provided in the seed kit from PAU. The main problem faced by them was stray animals and overflow water during the rainy season. Most farmers faced the problem of attack by insect- pests and diseases in the summer season due to high-temperature increases. There was a significant increase in age, education and experience relatively farmers faced fewer problems while practicing Kitchen Garden. Most of the farmers suggested creating awareness among farmers and giving special training to women regarding kitchen gardening.

Keywords: Kitchen gardening, Problem, Trainees

Theme 7: 283
Total Quality Management Practices for Safeguarding Food Safety: A Review

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Total Quality Management (TQM) represents an integrated framework of principles, methods, and best practices aimed at fostering organizational excellence. Its origins trace back to the teachings of influential figures such as Drucker, Juran, Deming, Ishikawa, Crosby, and Feigenbaum, who dedicated their efforts to refining the field of organizational management. TQM embodies a comprehensive array of principles, techniques, processes, and best practices that have demonstrated effectiveness over time, with most leading organizations exhibiting behaviors synonymous with TQM. Although each organization's implementation of TQM varies, there is no singular recipe for success. Organizations seeking performance enhancement can benefit from selecting and conducting a self-assessment based on one of these models. At the core of the TQM model lies a profound understanding of customer needs. TQM-driven organizations continuously gather, analyze, and act upon customer feedback, extending their efforts to comprehend competitors' customer bases. This intimate understanding enables TQM organizations to anticipate future customer behavior. TQM organizations seamlessly integrate customer insights with other data, utilizing the planning process to coordinate actions across the organization, managing day-to-day operations while striving for future objectives. Regular review and adjustment of plans serve as the linchpin that binds all TQM activities together. Recognizing that customer satisfaction hinges on consistent delivery of products and services meeting their needs, TQM organizations employ process management techniques to develop cost-effective, stable processes capable of meeting customer expectations. Moreover, TQM organizations acknowledge that today's exceptional performance may fall short in the future. Therefore, they embrace the concepts of process improvement to achieve both breakthrough advancements and continuous incremental enhancements, applying these principles even to refine the TQM system itself. Finally, the cornerstone of the TQM model lies in total participation. TQM-driven organizations understand that all endeavors rely on people. Beginning with leadership, top management in TQM organizations takes personal accountability for implementing, nurturing, and refining all TQM initiatives.

Keywords: Total quality management, Customer satisfaction, Organizational excellence

Theme 7: 284
Contemporary Trends in Microbial Detection for Food Quality Assurance: A Review

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Food spoilage presents a significant economic challenge globally, with approximately a quarter of the world's food supply lost due to microbial activity. Milk, being highly nutritious, provides an ideal environment for various microorganisms to thrive, impacting its microbiological quality. Factors such as the initial microbial composition of raw milk, processing conditions, and post-treatment contamination influence the microbiological quality of dairy products. Undesirable microbes including gram-negative psychrotrophs, coliforms, lactic acid bacteria, yeasts, molds, and pathogenic bacteria such as *Salmonella spp.*, *Listeria monocytogenes*, *Campylobacter jejuni*, *Yersinia enterocolitica*, *Escherichia coli*, and enterotoxigenic *Staphylococcus aureus* can lead to spoilage and pose health risks. Hence, there's a growing need for thorough microbiological examination of milk and dairy products to ensure quality, safety, compliance with standards, and regulatory requirements. While bacteria are commonly associated with food safety concerns, other pathogenic microorganisms like mycotoxin-producing molds, human enteric viruses, protozoan parasites, and marine biotoxins also pose risks. Also, due to the extended incubation periods often associated with traditional enumeration procedures, there is a demand for swift techniques to identify foodborne pathogens, indicator organisms, and spoilage microorganisms. However, routine screening of foods typically focuses on bacteria. This review concentrates on various rapid methods employed to detect bacterial contamination and quality assurance in dairy and food products.

Keywords: Spoilage, Food safety, Quality, Health

Theme 7: 285
Nutritional Quality of Millets and their Value added Products

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Millet is one of the oldest foods known to man and probably the first grain to be used for domestic purposes. Millet has been a staple food for centuries for people in the semi- arid tropics of Asia and Africa where other crops do not grow well. Since ancient times, millet has been widely consumed in Asia and India as well. Millet has an important role in the traditional diet of many regions throughout the country. The aim of the study was to determine the efficiency of millets and their value added product in improving health status and well being of target population. As a group of crops, millets include sorghum (jawae), pearl millet (bajra), finger millet (ragi), and lesser millets as banyard millet (sawa), prosa millet (cheena), kodo millet, and foxtail millet (kangni). They are also referred to as "nutritious cereals" because they are a great source of critical nutrients. Millets contain a host of micronutrient such as iron, calcium and phosphorus. They also have a lot of zinc, magnesium, potassium, dietary fiber, and essential vitamins like thiamine, riboflavin, folic acid, and niacin. Many studies show that these millets are beneficial in provide most of the daily dietary requirement of an average person. Also they help strengthen immunity, regulate blood cholesterol, improve cardiovascular and maintain blood glucose level. Value added products of millets have the potential to add value to the health business and have huge potential for growth as consumers increasingly believe that millets & millet based foods directly contribute to their health.

Keywords: Millets, Value addition, Nutritive value, Processing, Millets product

Theme 7: 286
Environmental Hygiene's Role in Food Quality and Safety

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Food contamination can occur at various stages, starting from the growth and harvesting of raw materials, through storage and transportation to processing into finished products. Even the final product can be susceptible to re-contamination during subsequent storage, transportation to retail outlets, and handling by consumers. The primary sources of contamination include the environment, animals, and human activities. Contamination vectors encompass contaminated surfaces, air, water, human contact, and pests. Additionally, processing equipment, packaging materials, and transport vehicles can serve as vectors. Contact between food and inert surfaces leaves behind residual debris that fosters microbial growth, potentially leading to significant contamination levels over time. Lubricants in equipment with moving parts can also contribute to chemical contamination. Non-contact surfaces like floors, walls, and equipment supports can harbor microbial contaminants and chemical residues, necessitating durable designs for effective cleaning. Livestock, acting as reservoirs of microorganisms, introduce substantial microbial loads into processing plants, with many harboring zoonotic pathogens on their skin and in their gastrointestinal and respiratory tracts. Pathogens transmitted through hand contact represent another significant contamination source. Effective control measures must address each stage of the food production process, from farm to table, to minimize the risk of contamination and ensure food safety. This includes implementing stringent hygiene practices, maintaining clean production environments, and employing robust cleaning and sanitation procedures for equipment and facilities. Furthermore, comprehensive training for personnel involved in food handling and processing is essential to prevent contamination incidents and uphold consumer safety standards.

Keywords: Food contamination, Food safety measures, Hygiene practices

Theme 7: 287
Role of Hazard Analysis and Critical Control Points in Promoting Food Safety : A Review

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HACCP (Hazard Analysis and Critical Control Points) represents a proactive and internationally recognized system pivotal in safeguarding food safety within the realm of food processing. Unlike conventional quality inspections, HACCP prioritizes preventive measures, serving as a robust framework endorsed by scientific authorities and global organizations. Its primary objective is to anticipate, identify, and mitigate potential hazards encompassing biological, chemical, and physical aspects inherent in food production processes. This systematic approach begins with a comprehensive analysis of each processing step, coupled with scientific insights, to discern significant hazards. These hazards are then strategically addressed through the establishment of critical control points, where preventive measures like temperature and time regulations are rigorously implemented. Continuous monitoring and evaluation ensure strict adherence to these predefined limits, bolstered by the swift enactment of predefined corrective actions if deviations occur, thereby thwarting potential product defects

before they compromise consumer safety. Moreover, HACCP is underpinned by meticulous verification and documentation practices, which serve as integral component in upholding stringent food safety standards across all stages of production. This robust documentation not only facilitates traceability but also provides a structured mechanism for assessing risks and validating the efficacy of preventive measures employed. Furthermore, HACCP's global recognition underscores its adaptability and applicability across diverse food processing environments, from large-scale industrial operations to smaller food establishments. Its emphasis on preventive strategies not only minimizes risks associated with foodborne illnesses but also cultivates consumer trust by ensuring the consistent delivery of safe and wholesome food products. In essence, HACCP stands as a cornerstone in the food processing industry, embodying a proactive and science-based approach that transcends geographical boundaries to safeguard public health and maintain the integrity of the global food supply chain.

Keywords: Food safety, HACCP, Nutrition and quality

Theme 7: 288
Strategies for Addressing Malnutrition and Food Waste Management: Towards Sustainable Food Systems

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Malnutrition, encompassing undernutrition, micronutrient deficiencies, and overnutrition, remains a pervasive global issue, affecting millions of individuals, particularly in low- and middle-income countries. Simultaneously, food waste poses significant environmental, economic and social challenges, exacerbating resource scarcity and contributing to greenhouse gas emissions. The relationship between food waste and hunger is highlighted by recent studies, underscoring the necessity for multisectoral and integrated approaches to address both problems comprehensively. One strategy involves promoting sustainable food production and consumption patterns that prioritize nutrition-sensitive agriculture, diversified diets and reduced food waste throughout the supply chain. By adopting agroecological practices, promoting local food systems and encouraging dietary diversity, communities can enhance food quality, nutritional adequacy, and environmental sustainability. Furthermore, targeted interventions aimed at improving food access, affordability and utilization are essential for addressing malnutrition effectively. Social protection programs, nutrition education initiatives, and fortification efforts play crucial roles in ensuring equitable access to nutritious foods and promoting healthy eating behaviours, particularly among vulnerable population such as children, pregnant women, and marginalized communities. In addition, innovative food waste management strategies offer promising opportunities to minimize post-harvest losses, reduce food waste and optimize resource utilization. These strategies encompass a range of interventions, including improved storage facilities, value chain optimization, surplus food redistribution and composting initiatives, which contribute to mitigating environmental degradation and enhancing food security. Moreover, policy frameworks and governance mechanisms are indispensable for fostering an enabling environment conducive to addressing malnutrition and food waste management effectively. Integrated policies that align nutrition, agriculture, and environmental objectives can facilitate coordinated action, resource mobilization, and stakeholder collaboration across sectors, driving transformative change toward building resilient food systems that ensure food security, promote human health, and sustainable food systems, and safeguard the planet for future generations.

Keywords: Malnutrition, Food waste, Sustainability, Integrated approaches and Resilient food systems

Theme 7: 289
Enhancing Nutrition through Processing and Value Addition of Millets

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Millets often referred to as "nutri-cereals," which are gaining recognition for their diverse health benefits and resilience to climate change. Millets, including sorghum, pearl millet, finger millet, and foxtail millet, are traditional grains rich in essential nutrients, fiber, and phytochemicals, making them valuable components of a balanced diet. A growing body of research highlights the significance of implementing value-addition and processing strategies to make millets to reach their maximum nutrition potential and encourage mass adoption. Processing methods such as milling, dehusking, and fermentation can enhance the bioavailability of nutrients, improve digestibility and reduce anti-nutritional factors, thereby enhancing the nutritional quality and sensory attributes of millet-based products. Furthermore, value addition through product diversification and innovation offers opportunities to expand the market reach of millets and create value-added products that cater to diverse consumer preferences. Value-added millet products such as fortified flours, ready-to-eat snacks, breakfast cereals, and beverages not only provide convenient and nutritious options for consumers but also contribute to income generation and livelihood opportunities for smallholder farmers and agri-entrepreneurs. In addition to enhancing the nutritional quality and market value, processing and value-addition interventions can contribute to the sustainability of food systems by reducing post-harvest losses, optimizing resource utilization, and promoting circular economy principles. By integrating millets into sustainable food production and consumption patterns, stakeholders can enhance food security, promote biodiversity and mitigate environmental degradation associated with conventional monoculture crops. Moreover, policy support and institutional frameworks are essential for creating an enabling environment conducive to the promotion of millet processing and value-addition initiatives. Policy interventions that incentivize research and development, provide market infrastructure, and facilitate value chain integration can stimulate investments and innovations in the millet sector, driving transformative change towards more resilient and inclusive food systems.

Keywords: Millets, Value addition, Resilience to climate change, Food security, Agri-entrepreneurs

Theme 7: 290
A Composite Index for Evaluating the Effectiveness of Public Distribution Systems on Nutritional Security

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The majority of Indian households rely heavily on PDS for their nutritional needs. The purpose of the public distribution system (PDS) in India is to ensure food security for all by subsidising the distribution of essential goods to the marginalised population. Therefore, grain entitlements (rice and wheat) provided through the PDS serve as the primary staple food for many beneficiary households. One of the causes of malnutrition is the insufficient inclusion of pulses, vegetables, meat, and dairy products in beneficiary households' diets. In addition, households lack knowledge of nutritional best practises. The PDS should shift its focus from "Food Security" to "Nutritional Security." There are however persistent problems with India's PDS, such as the distribution of fake ration cards that exclude the poor, the sale of commodities on the open market, the inability of fair price shops to supply the permitted amount of food grains, and the substitution of high-quality food grains with

cheaper varieties, among others. The research was conducted in Bundelkhand, one of the most nutritionally vulnerable regions in the country. The Bundelkhand region is made up of two state portions, namely Uttar Pradesh and Madhya Pradesh. The districts of Jhansi, Chitrakoot, Tikamgarh, and Chhatarpur were chosen based on the Multidimensional Poverty Index (MPI) and aspirational districts. Consequently, 320 respondents from four districts constituted the study's sample. To study the effectiveness of the public distribution system, the "Nutri-PDS Effectiveness Index" was created with six indicators: accessibility, supply-management mechanism, degree of satisfaction, cost savings, viability, and nutrition. Each indicator had two attributes, for a total of twelve attributes and forty-seven indicators. Using the integrated weightage method, an attempt was made to calculate the weights of the index's dimensions and attributes. The districts were categorised and ranked according to their final Nutri-PDS effectiveness index score. On the Nutri-PDS effectiveness index, Tikamgarh ranked first, indicating that this district utilised PDS with proficiency and efficiency. In the Bundelkund region, the districts of Chitrakoot, Chhatarpur, and Jhansi ranked second, third, and fourth, respectively. The three dimensions with the highest scores on the Nutri-PDS effectiveness index were accessibility, level of contentment, and cost savings. The effectiveness of PDS was significantly impacted by the accessibility of services, the level of customer satisfaction, and the expenditures made. Focusing on these dimensions can improve the effectiveness of existing PDS in other regions to combat malnutrition. The highest-scoring criterion for attributes indicating the costs associated with PDS's smooth operation and ability to reach poor people in order to meet their dietary needs was the operating cost. The ranking of exclusive allocation as the second-best attribute on the Nutri-PDS effectiveness index suggests that PDS is widely accessible in the study area. In spite of the fact that beneficiary satisfaction received the lowest score on the Nutri-PDS effectiveness index, indicating inadequate quality assurance from PDS, dissatisfied beneficiaries were discovered in the study area.

Keywords: Effectiveness index, Integrated weightage method, Nutritional security, Public distribution system

Theme 7: 291

A Study on Farmers' Training Need, Knowledge Level and Extent of Adoption in Groundnut Production in Satna District of Madhya Pradesh

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India is the largest oilseed grower and importer of edible oils, accounting for 13% of the Gross Cropped Area, 3% of the Gross National Product, and 10% value of all agricultural commodities. Groundnuts are rich in oil and protein, with kernels having 25% easily digestible protein. Groundnut oil is used in soaps, hair oil, cosmetics, cold creams, and various industrial uses. Its oil is now used in pharmaceuticals as a substitute for oleic oil. Groundnuts are also known as a rotation crop, which can synthesize atmospheric nitrogen and enhance soil fertility. They are used for both edible and non-edible purposes. The shell or pod of groundnuts contains two or three kernels, and the nuts are egg-shaped. They contain monounsaturated and polyunsaturated fats that keep the heart healthy, lowering blood cholesterol levels and reducing the risk of coronary heart diseases. Groundnuts are an extremely high source of dietary protein composed of fine-quality amino acids, including antioxidant polyphenols like p-coumaric acid and oleic acid. Regular consumption of groundnuts ensures a healthy heart and minimizes the risk of mineral diseases. Vitamins are essential for overall growth and development, regulating metabolism, converting fat and carbohydrates into energy compounds, and facilitating bone and tissue formation.

Keywords: Oilseeds, Pharmaceuticals, Soil fertility, Vitamins, Growth, Compounds

Theme 7: 292
Resilient Local Food System for Ensuring Food and Nutritional Security

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Climate change, war conflicts, socio-economic crisis and the recent Covid-19 have brought to light the vulnerabilities of a global food system. Despite the advancement in the field of agriculture, the plight of hunger and malnutrition is still critical therefore, a paradigm shift from the global to local food system is imperative to develop a self-reliant and sustainable food system for tackling the food and nutritional insecurity. A local food system's resiliency is its ability to provide sufficient, appropriate and nutritious food with the capacity to withstand and recover from disruptions, thereby providing a nutritionally secure food system. In order to explore these intricacies of an active local food system on the household food and nutritional security, a study was conducted in the two distinct topographies of North Bengal i.e. the Hilly and the Dooars/Tarai region. Data was collected from 255 households through personal interview where the performance of the local food scene in the region was calculated using the Vitality of the Local Food System Index (VLFSI) whereas the food and nutritional security of the households was calculated using the Household Food and Nutritional Security Index (HFNSI). The study found that the hilly region performed better than the dooars region in both the vitality of the local food system and the household food and nutritional security with an index score of 4.93 and 0.63, respectively. In the local food system, the hilly region performed better in the dimensions of community engagement performance (2.1) and local food promotion performance (1.93) whereas the contribution of the utilization pattern of food (0.31) in the hilly region was higher to their overall household food and nutritional security index score. Therefore, it can be concluded that a resilient local food system can promote a better household food and nutritional security.

Keywords: Local food system, Activeness of the local food, Household food and nutritional security

Theme 7: 293
Microbial and Chemical Quality of Water in Dairy Industry: A Review

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The microbial and chemical quality of water in the dairy industry is critical for ensuring the safety and quality of dairy products. This abstract discusses the significance of assessing both microbial and chemical parameters in water used throughout dairy operations, highlighting key concerns and methodologies for monitoring and maintaining water quality. Water serves as a fundamental component in various stages of dairy production, including cleaning and sanitation, as well as in direct contact with dairy products. Contaminated water can introduce harmful microorganisms and chemical pollutants, posing serious risks to product safety and consumer health. Therefore, evaluating microbial and chemical parameters is essential to prevent contamination and uphold stringent quality standards. Microbial quality assessment involves monitoring for the presence of pathogens such as Escherichia coli, Salmonella spp., and Listeria monocytogenes, which can cause foodborne illnesses if present in water used during dairy processing. Techniques such as membrane filtration, polymerase chain reaction (PCR), and microbial culture methods are employed to detect and quantify microbial contaminants, ensuring compliance

with regulatory requirements and industry best practices. Furthermore, chemical quality analysis is necessary to identify and quantify various chemical constituents and pollutants present in water sources. Common chemical contaminants in dairy water include heavy metals, pesticides, residual disinfectants, and organic pollutants. Analytical techniques such as atomic absorption spectroscopy (AAS), gas chromatography-mass spectrometry (GC-MS), and ion chromatography (IC) enable accurate determination of chemical concentrations, facilitating risk assessment and mitigation strategies. Maintaining optimal microbial and chemical quality in water necessitates robust monitoring programs, effective sanitation practices, and appropriate water treatment technologies. Implementing Hazard Analysis and Critical Control Points (HACCP) principles and Good Manufacturing Practices (GMPs) is essential to mitigate potential hazards and ensure water safety throughout dairy operations. In conclusion, assessing the microbial and chemical quality of water in the dairy industry is imperative for safeguarding product integrity and consumer health. By employing comprehensive monitoring and control measures, dairy producers can mitigate risks associated with waterborne contaminants and uphold the highest standards of quality and safety in dairy production.

Keywords: Good manufacturing practices, Water quality, Dairy industry

Theme 7: 294
Effect of Defoliation of Scion and Plant Growth Regulators on Wedge Grafting and Growth of Sapling in Guava

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The experiment was carried out at modal nursery unit of Krishi Vigyan Kendra, Borkhera, Kota under the subdivision of Department of Horticulture, College of Agriculture, Ummedganj, Kota (Agricultural University, Kota) during November 2020 to find out the graft success, survival and subsequent growth of grafted guava plant. Total 21 treatment combinations consisting three levels of prior defoliation of scion i.e. no defoliation, defoliation of scion at 5 days before grafting and defoliation of scion 10 days before grafting and 7 levels of plant growth regulators i.e. (no defoliation, NAA 50 ppm at rootstock, NAA 50 ppm at scion, BA 25 ppm at rootstock, BA 25 ppm on scion, NAA 50 ppm on scion at instant dip, BA 25 ppm on scion at instant dip) were attempted in present study. The significance levels of theses treatments evaluated under Factorial completely randomized design with three replications. It is evident of study the earliness in the graft union, per cent graft success and per cent graft survival and their subsequent growth were significantly influenced by various treatment combinations. The earliest graft union (9.75 days) and maximum graft survival (91.00%) was exhibited at defoliation of scion 10 days before grafting with spray of 50 ppm NAA on scion before 24 hr of grafting. Whereas, the application of defoliation 10 days before grafting with 50ppm NAA on rootstock resulted maximum success of graft (93.00%). However, the subsequent growth of graft sapling in respect to length of scion shoot, diameter of scion shoot, increases in diameter of rootstock, number of leaves, number of lateral shoots, dry weight and fresh weight of leaves and roots are significantly increases due to different treatment combinations, defoliation of scion, 10 days before grafting with spray of BA 25 ppm on scion/rootstock before 24 hr in grafting.

Keywords: Defoliation, Grafting, Plant growth regulator, Sapling, Wedge

Theme 7: 295
Genetic Resources and Varietal Improvement for Food and Nutritional Security

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Food and nutritional security remains a critical global concern, particularly in the face of increasing population growth, climate change, and diminishing natural resources. Genetic resources and varietal improvement play a pivotal role in addressing these challenges by enhancing crop productivity, nutritional content, and resilience to environmental stressors. This abstract discusses the significance of genetic advancements and variety improvement techniques in achieving food and nutritional security. Genetic resources serve as the foundation for breeding programs aimed at developing high-yielding, nutritious, and resilient crop varieties. Advances in molecular genetics, such as marker-assisted selection and genomic breeding, have revolutionized the process of varietal improvement by enabling precise trait selection and accelerated breeding cycles. Through conventional breeding methods, such as hybridization and selection, as well as modern biotechnological approaches like genetic engineering and genome editing, breeders can introduce desirable traits into crop varieties more efficiently and effectively. These traits may include increased yield potential, resistance to pests and diseases, tolerance to abiotic stresses such as drought and salinity, and enhanced nutritional quality. Furthermore, the conservation and utilization of genetic diversity are essential for maintaining resilience in agricultural systems. By preserving a broad genetic base, breeders can access valuable traits to adapt crops to changing environmental conditions and evolving pest and disease pressures. The successful deployment of improved crop varieties has significantly contributed to enhancing food and nutritional security worldwide. High-yielding varieties have increased agricultural productivity, helping to meet the growing demand for food while reducing pressure on natural ecosystems. Moreover, biofortified crops, enriched with essential vitamins, minerals, and micronutrients, offer a sustainable solution to address malnutrition and improve public health outcomes, particularly in resource-constrained regions. In conclusion, genetic resources and varietal improvement techniques are indispensable tools for promoting food and nutritional security. Continued investment in research, conservation, and breeding efforts is crucial to harnessing the full potential of genetic diversity and ensuring a sustainable and resilient food supply for future generations.

Keywords: Genetic resources, Varietal improvement, Food and nutritional security

Theme 7: 296
Utilization of Jackfruit Seed for the Development of Value Added Noodles and Their Quality Evaluation

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In the present investigation, utilization of jackfruit (*Artocarpus heterophyllus* lam.) seed for the development of value added products and their quality evaluation was undertaken. Noodles were developed by incorporating jack fruit seed flour in wheat flour. Wheat and other raw ingredients- sugar, salt, vegetable fat, oil, baking powder etc. were purchased in a single lot from Udaipur (Rajasthan). Processing techniques *i.e.,* drying (oven drying and sun drying) roasting, baking, boiling (20, 40 and 60 minutes) and combination of boiling+ oven drying + baking were used to reduce anti-nutritional factors. Processed seeds in combination of boiling 60 minutes+ oven drying baking having lesser anti-nutritional factors were later milled using mini grain mil to 80-

200 mesh size. Functional properties of JFSF were flour; yield (56.70%), particle size (180µ), bulk density (0.32g/ml) LGC (12.83%), FC (27.34%), FS (33.33%), WAC (5.50g/g), OAC (3.01 g/g), swelling capacity (4.77g/g), solubility capacity (14.30%), wet ability (20.25sec) and dispersibility (90.31%). Nutrient composition of JFSF were found as moisture (6.25%), protein (18.41g), fat (3.30g), ash (3.78g), fiber (5.19g), carbohydrate (63.07g), energy (356kcal), calcium (295 mg), iron (12.12 mg), magnesium (330 mg), copper (3.25 mg), zinc (1.50 mg), potassium (1385 mg) and phosphorus (167.28 mg) per 100g. Standardization of value added noodle was done by incorporating jackfruit seed flour with wheat flour in different combinations *i.e.,* 5, 10, 15, 20, 25, 30 and 35 percent. Sensory evaluation of the products revealed that 15-20 per cent incorporation of jackfruit seed flour in wheat flour was acceptable. For the study purpose 15 per cent incorporation of JFSF was used as it was acceptable in noodles. The sensory evaluation of JFSF incorporated noodles revealed that the noodle scored between 8.0 to 8.5 on 9 point hedonic scale for color, texture, taste, flavor and appearance and were acceptable.

Keywords: Jackfruit seed, Value added noodles, Evaluation

Theme 7: 297
A Comparative Study of Wheat: Organically and Conventionally Grown Variety of Rajasthan, Udaipur

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The discovery of agriculture was the first big step towards a civilized life. Currently farmers of India are aware to grow more and more pesticide free cereals crops due to increasing allergies and diseases. Cereal crops possess various nutrients like fibre content, protein content, minerals and anti-oxidant which define them as energy giving food with prominent nutritional influence and added health benefits. The aim of the present study was to assess including proximate composition, anti-nutritional factors- phytic acid and total anti-oxidant content in the selected samples of wheat. The study was conducted in laboratories of CCAS, College of DFT and Department of Soil Science, RAC, MPUAT Udaipur. Staple cereal food crops of Rajasthan namely wheat variety - Raj 4120 grown under "organic and conventional management" were purposively selected for the study. To avoid varietal difference, the same variety of wheat (Raj 4120) were taken for "organic and conventional management" with the similar climatic and soil conditions in the organic field of RCA, MPUAT, Udaipur under the Network Project on Organic Farming. The samples of organic and conventional management was named as OSW (100% organic sources), IOSW (100% inorganic nutrient sources) for wheat samples respectively. Organically grown wheat contained highest moisture in OSW (13.33±0.89 per cent), Crude protein content (8.69±0.26), Ash (3.93±0.10) and carbohydrates (71.79±3.52) whereas in inorganically grown wheat observed highest amount of fat content (3.00±0.07) crude fire content (0.85±0.01) and energy content (353.24±5.93). Phytic acid content of wheat was found to be lowest (3.49±0.06 mg/g) and total anti-oxidant content and (210.60±5.06 mg/g) in inorganic wheat respectively. Pesticide content (Chlorpyriphos residue) was observed in highest quantity (0.11±0.00) in inorganically grown wheat which was in acceptable daily intake under (0.01mg/kg body wt.). Thus, it can be concluded from the above results that the organic management samples were superior in nutritional properties like moisture content, crude protein, ash and carbohydrate content along with negligible presence of pesticide residues. The products developed from organic management namely Chapatti and Dalia were developed and standardized were "liked very much" compared to conventional management.

Keywords: Wheat, Nutrients, Proximate composition, Anti-nutritional factor, Anti-oxidant content, Pesticide content, Organic and Conventional

Theme 7: 298
Millet Processing and Quality Evaluation for Nutrition Security

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Millets are small seeded grass crops of the semi-arid tropics of Asia and Africa (especially in India). Sorghum, Pearl, Finger, Foxtail, Proso, Kodo, Barnyard and Little Millet along with two Pseudo Millets i.e. Buck-wheat and Amaranthus are the important millet crops in India. India is the largest producer of millet as of 2021, with a total share of 41% millet production. They are the principal source of energy, protein, fibre, vitamins and minerals for millions of the poorest people. Millet are gluten free, non acid forming, low GI food, aids in digestion, harmonize stomach, prevent heart diseases, reduce blood pressure, respiratory disorders, and eliminates gastric problems like ulcers, bloating, colon cancers. Millet acts as a pre biotic and improves gut health. Natural source of antioxidant, nutraceutical and functional food promoting health and reduce the risk of non communicable disease. Looking to the health benefits, study was undertaken to develop millet based healthy food products. Objectives were to assess the sensory and nutritional quality of the millet based products and to evaluate the antioxidant property. Three products namely (i)Ragi – Amaranth Bar, (ii) Buckwheat pasta (iii) Buckwheat-Amaranth muffins were developed and standardized in the laboratory using scientific methods. A panel of ten judges was selected for sensory evaluation. Proximate composition, minerals like iron, calcium, and antioxidant properties (DPPH method) were analysed using standard procedures. The color of food products was assessed using color spectrophotometer. Results revealed that products were liked very much by the panellist with scores ranging from 7.5 to 8.5 on 9 point Hedonic scale. Nutrient composition revealed that the products contained moisture 3.68-6.80g, carbohydrate 64.53 to 72.37g, protein 10.1 to 12.25g, fat 2.8 to 3.97g, ash 1.7 to 4.0g, fibre 5.3 to 11.8g and energy 323 to 359.28 kcal, iron 3.70 to 9.8mg, calcium 174.20 to 264.50 mg per 100g. The L, a, b values revealed that the color of the products was good and DPPH radical scavenging activity exhibited high antioxidant properties. It was concluded that role of millets cannot be ignored for achieving sustainable means of food and nutritional security and improving health status of population.

Keywords: Millet processing, Quality evaluation, Nutrition security

Theme 7: 299
Trend Analysis of Major Agricultural Commodities in Rajasthan: Implications for Regional Development

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Understanding the trends in agricultural commodities is crucial for assessing the development and performance of the agricultural sector in specific regions. This study analyzed the trends in area, production, and yield of major agricultural commodities in Rajasthan, focusing on cereals (Wheat and Bajra) over the period 2001-2022. In the state of Rajasthan, wheat and bajra are the major cereal crops with the highest area and production. Various mathematical models including linear, quadratic, cubic, and exponential functions were employed to assess the trends in wheat and bajra. The best-fitted models were chosen based on significance and goodness of fit criteria, with emphasis on R-squared values and P values. For wheat, the quadratic model was identified as the most reliable for both area and production trends, while a linear model best represented yield trends. Despite a moderate fit, the quadratic model for wheat area explained a significant portion of the variability, albeit not as

much as the production and yield models. Conversely, the production model exhibited the highest R-squared value, indicating its strong fit in explaining wheat production variability. This suggested a significant decrease in the wheat area over time, while production levels remained relatively stable, and yields showed improvement. For bajra, the cubic model was identified as the best-fit for area trends, an exponential model for production, and a quadratic model for yield. These models explained a portion of the variability in bajra's area, production, and yield, with varying degrees of fit. The trend analysis indicated an overall increase in bajra production except in the year 2022, with slight fluctuations in area and yield. In conclusion, understanding the trends in agricultural commodities provides valuable insights for policy formulation aimed at addressing regional imbalances and promoting sustainable agricultural development. Policy recommendations include targeted interventions to address declining trends in crop area, while enhancing support for improving production and yield levels. Further research is needed to explore the underlying factors influencing these trends and to develop tailored strategies for enhancing agricultural productivity in Rajasthan.

Keywords: Wheat, Bajra, Trend analysis, Linear, Quadratic, Cubic, Exponential, Regional development

Theme 7: 300

Knowledge of Kinnow Growers about Improved Kinnow Production Technology: A Case of Rajasthan

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Presently Indian agriculture is diversifying into production of high value commodities to increase the farm income. Horticulture sector is one of the important sectors of agriculture which plays an important role in enhancing the socio-economic status of farmers by increasing their income. Therefore, for the second revolution, horticulture can be promoted as a means of agro-diversification. Due to the availability of all suitable agro-climatic conditions in India, many fruit crops are grown in a large acreage and out of this citrus cover a large area & production after mango and banana. Among citrus crops, Kinnow occupies a distinctive place in horticulture. Recognizing the enormous importance of horticulture in stimulating the growth of Indian agriculture, the Government of India launched the National Horticulture Mission (NHM) for the growth and development of this sector. The main objective of NHM was to promote a complete and holistic development of the horticulture sector with the help of research, technology promotion, extension and post harvest technology. Therefore, in order to measure the knowledge of the farmers pertaining to improved kinnow production technology under National Horticulture Mission, the present investigation was conducted in Sriganganagar district of Rajasthan state which was selected purposely. Out of the ten *panchayat samiti in* Sri ganganagar district; three *Panchayat Samitis* namely Sri Ganganagar, Sri Karanpur and Padampur were purposely selected for the present study on the basis of highest area and production of kinnow. With the help of proportionate random sampling method, 90 beneficiary and 90 non-beneficiary respondents were selected who were benefitted or not under NHM. The results of the present investigation revealed that majority of the kinnow growers had middle level of knowledge about improved kinnow production technology under National Horticulture Mission. The highest knowledge was on the aspect of "general information" and least knowledge was about "plant material". There was a significant association observed amongst education, occupation, mass media exposure and extension agency contact with knowledge level of the kinnow growers about improved kinnow production technology under NHM.

Keywords: Improved kinnow, Kinnow growers, Knowledge, National, Production technology

Theme 7: 301
A Comprehensive Approach to Combat Malnutrition through Waste Management of Horticultural Crops

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Malnutrition remains a global health challenge, affecting millions of individuals across diverse populations. In an era where sustainable solutions are imperative, addressing malnutrition requires innovative strategies. In this article presents a comprehensive approach to combat malnutrition by focusing on the efficient waste management of horticultural crops. The utilization of horticultural crop waste not only mitigates environmental concerns but also provides a rich source of nutrition, contributing to a sustainable and holistic solution. A large number of by-products are produced from food industries. These are the secondary products generated during manufacturing of primary products. This includes peels, seeds, residual pulp, stones and discarded pieces from various sources. These by-products serve as a valuable source of bioactive compounds, nutraceuticals and other functional foods. A significant amount of peel waste is generated by fruit and vegetable-based industries and household kitchens, resulting in considerable nutritional and economic loss as well as environmental problems. Common wastes include pomace, peels, rind, and seeds, which are rich in valuable bioactive compounds such as carotenoids, enzymes, polyphenols, oils, vitamins, and other compounds. These bioactive compounds show their application in various industries such as food to develop edible films, food industries for probiotics and other industries for valuable products. Exploring horticultural waste generation options, implementing sustainable recycling strategies, and realizing the potential of recycled products across different industries can contribute to improving the well-being of the population, ensuring a green environment, and promoting sustainable ecology.

Keywords: Fruits, Vegetables, Waste management, By-products, Processing

Theme 7: 302
Millets: A Forgotten Superfood

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Millets are one of the most important food crops for human consumption. The production of millets has been increasing continuously in recent decades to satisfy the dietary needs of the growing global population. Millets are a great source of all key nutrients such as protein, carbohydrate, fat, mineral, vitamin, and bioactive compound. Millet can also be used to make commercial food products like Puffed millet, Millet juice, and Millet noodless. In general, millets have a protein content of 7–12%. They have a fat content of 2–5%. They have a carbohydrate content of 65–75%. They have a dietary fiber content of 15–20%. A training program on value addition of millets was conducted by Krishi Vigyan Kendra, Amroha for the women working in FPOs in which 50 women participated. In the program women were given practical training to make millets namkeen, biscuits and flour of different millets such as finger millet, pearl millet, mixed millets. As a result of training the 35 women started making different value added products of millets in their FPO for income generation. Owing to the easy access to nutrients and energy found in millets, researchers, the agricultural sector, and food security programs are focusing more on millet processing and production in order to better utilize it and reduce the amount of hidden hunger that exists in the globe.

Keywords: Health, Millets, Nutrients, Value addition

Theme 7: 303
Analysis of Constraints Faced by Blackgram Growers in Humid South Eastern Plain Zone of Rajasthan

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The main focus of the study was to identify the constraints faced by the farmers in blackgram production. Initially, constraints faced by the farmers were identified though pilot study. The intensity of the identified constraints in the actual field situation was measured to prove their validity and to find out the extent to which they were perceived by farmers as impediments to production of crop. For this study Bundi district of Rajasthan was selected purposively. A multistage sampling technique was used to select respondents. A total of 120 farmers were selected as sample respondent for the study. The quantification of data was done by first ranking the constraints based on the responses obtained from the respondents and then calculating the Rank Based Quotient. Findings of the study indicated that Weed infestation, insect-pest and disease infestation, Unfavorable weather conditions, Lack of timely availability of fertilizers, Problematic soil, Inadequate irrigation facility, Bad quality of irrigation water, Lack of guidance for availing credit facilities, Low price of produce at the time of harvesting, Higher prices of pesticides, Non availability of labour during peak period, Non availability of weedicides, insecticides at required time, Lack of market information about inputs and outputs, Price fluctuation, Higher prices of fertilizers, Lack of awareness about improved storage structure were emerged as important constraints faced by the farmers.

Keywords: Agriculture, Blackgram, Constraints, Sampling

Theme 7: 304
Pulse Production in Arid Region of Rajasthan: Facts, Prospects and Challenges

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The state of Rajasthan, which occupies 10.4% of India's total land area, exhibits diverse agro-climatic conditions, ranging from arid to sub-humid monsoon regions with highly uneven rainfall distribution. Rajasthan produces 4.02 million tonnes of pulses during 2021-22 (fourth advance estimate) which is 14.51% of the country's total pulse production. Arid pulses can withstand adverse situations like water scarcity, changes due to climate change, and other weather aberrations. Hence, they become alternate options for sustainable agriculture and food security in the arid region. Their cultivation offers sustainable income options to the farmers as well as helpful in environmental conservation and resilience-building efforts. In the production process, arid pulses enhance soil fertility through nitrogen fixation, having different mechanisms to survive during prolonged drought periods without much compromise with yield, require much less water than cereals and their rotation with cereals controls diseases and pests. On the consumption side, arid pulses have diverse and rich nutritional profiles and relatively cheaper sources of protein and also constitute a significant part of the animal feed in the arid region. This paper discussed the facts, prospects, and challenges faced by the arid region of Rajasthan during pulse

production. The study is based on secondary data collected from the internet and published sources. Results of the study showed that productivity (kg/ha) of pulses in Rajasthan is low as compared to the country's national average. The productivity of pulses in Rajasthan was 627 kg/ha during 2021-22 (fourth advance estimate) while the country's average productivity was 892 kg/ha. This may be due to limited access to improved technology, low level of awareness about enhanced arid pulses production technologies, low adoption rates of improved varieties, and many other socio-economic factors. To overcome the existing constraints, governments must focus on technological improvements and their dissemination to smallholder farmers in a cost-effective way; marketing infrastructure, and need-based specialized training support to farmers interested in arid pulse cultivation. The introduction of key interventions leads to an increase in the arid pulse production and farmer's income in the region.

Keywords: Pulses, Sustainable income, Nutritional profiles, Productivity, Awareness

Theme 7: 305
Ensuring Food Safety and Quality in Food Service: A Comprehensive Analysis and Strategies for Improvement

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Food safety and quality are paramount in the food service industry, influencing both public health and customer satisfaction. This comprehensive review delves into the multifaceted dimensions of ensuring food safety and quality in food service establishments. By conducting a meticulous analysis, the review identifies prevalent challenges and explores current practices. Furthermore, it proposes a set of strategic measures to enhance overall standards, addressing the dynamic landscape of the industry. The review begins by examining the existing literature on food safety and quality, highlighting the interconnected nature of these two vital components. It underscores the significance of upholding stringent standards in food service establishments, considering the potential impact on public health and the reputation of businesses. A critical aspect of the review involves the identification and analysis of challenges faced by the food service industry in maintaining food safety and quality. This includes issues such as cross-contamination, inadequate storage practices, and compliance with regulatory requirements. By understanding these challenges, the review aims to provide a foundation for developing targeted strategies. Current practices in the food service industry are scrutinized to assess their effectiveness in ensuring food safety and quality. This involves an exploration of sanitation protocols, employee training programs, and technology adoption. The review also examines the role of certifications and audits in validating compliance with established standards. The core contribution of this review lies in the proposal of strategic measures for improvement. Drawing on the identified challenges and insights from current practices, the review suggests a holistic approach encompassing training programs, technology integration, and regulatory compliance. It emphasizes the importance of fostering a culture of continuous improvement within food service establishments. In conclusion, this review serves as a valuable resource for stakeholders in the food service industry, offering insights into the challenges, current practices, and strategic measures for ensuring food safety and quality. By addressing these crucial aspects, the industry can not only safeguard public health but also elevate its overall standards, meeting the expectations of an increasingly discerning consumer base.

Keywords: Food safety, Quality assurance, Food service, Industry standards, Improvement strategies

Theme 7: 306

Nutritional Resilience: Exploring Malnutrition Differences in Geriatric Individuals Post COVID-19 and Non-COVID-19 in Jodhpur City

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The objective of this study was to compare the prevalence of malnutrition among the elderly population in Jodhpur, India, following COVID-19 and before COVID-19. In a cross-sectional study, we used the Mini Nutritional Assessment (MNA) to assess the nutritional status of elderly subjects both with and without COVID-19. Patients were classified into three groups based on their MNA scores *viz*. non-malnutrition (MNA e" 24), risk of malnutrition (MNA 17-23.5), and malnutrition (MNA < 17). The study included 200 elderly subjects, 100 of whom were post-COVID-19 and 100 of whom were not. Of these, 18% were malnourished after COVID-19, while 15% were malnourished in non-COVID-19 subjects. The health status was assessed for both physical and co-morbidity. There were statistical differences in the incidence of co-morbid diabetes mellitus and body mass index (BMI) between the two groups. The results show that education, BMI, protein intake, fluid intake, and MUAC factors all had a significant effect on the nutrition status of post-COVID-19 subjects. This study investigates the nuanced landscape of malnutrition among geriatric individuals in Jodhpur, with a particular focus on discerning disparities between those affected by COVID-19 and those untouched by the virus. As the global population ages, understanding the multifaceted impact of health crises on the nutritional well-being of older individuals becomes imperative. Malnutrition was more prevalent in post-COVID-19 elderly patients when compared to non-COVID-19 patients, and nutritional support should be increased during treatment, particularly for those with diabetes mellitus, hypertension, and other conditions.

Keywords: Malnutrition, Post COVID-19, Non COVID-19, MNA, Elderly population, Jodhpur City

Theme 7: 307

Vocational Training Programmes: An Effective Strategy for Promotion of Entrepreneurship in Agriculture

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Knowledge of modern agricultural technologies and relevant skills plays an important role in the field of agricultural development. It helps the farmers in becoming successful entrepreneurs. The vocational training programme are extremely effective for attracting and motivating rural youth towards entrepreneurship in agriculture and allied areas. The skills and technological support provided during these medium to long duration courses helps rural youth in establishing their agro-based ventures. The Krishi Vigyan Kendras having an important mandate to conduct regular vocational training programmes for rural youth to motivate them towards agricultural entrepreneurship. The Farmer Producer Organizations (FPOs) is one of the focused area being promoted by the Government as movement for sustainable and collaborative agriculture has enormous potential for agri-preneurship. This movement of promoting agri-horti-preneurship can be given impetus through regular training programmes by imparting scientific knowledge, appropriate skills, branding of their products, marketing support

for fetching local and digital customers and orienting them towards organizational principles and group dynamics. The constituent units of RVSKVV, Gwalior like Krishi Vigyan Kendras (KVKs), Agricultural Technology Information Centre (ATIC) and Centre for Agribusiness Incubation and Entrepreneurship (CAIE) are working on this strategy to get impactful results by promoting backward-forward linkages and agri-business for food and nutritional security. The KVKs are imparting need–based, skill oriented vocational training programmes for rural youth in various disciplines namely Crop Sciences, Animal Science, Horticulture, Home Science, Plant Protection, Soil Science and Seed Production Technology whereas ATIC is giving technological information and marketing support to the clients entering into the field. The CAIE established in the university with support from NABARD is nurturing entrepreneurial ambitions of by promoting agri-business ideas in the farm of agri-startups.

Keywords: Vocational training Programme, Entrepreneurship

Theme 7: 308
Varietal Improvements in Crops

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Varietal improvement in agriculture constitutes a cornerstone in enhancing crop productivity, resilience, and sustainability. The pursuit of varietal improvements involves the systematic breeding, selection, and genetic modification of plant varieties to optimize desirable traits such as yield, disease resistance, drought tolerance, nutritional content, and adaptability to changing environmental conditions. In recent decades, advancements in molecular biology, genomic technologies, and computational methods have revolutionized varietal improvement strategies, enabling breeders to expedite the development of high-performing crop varieties. These innovations have facilitated the identification and introgression of beneficial genes, markers, and genomic regions associated with key agronomic traits, thereby accelerating the breeding process and enhancing precision in trait selection. Moreover, varietal improvements encompass not only the enhancement of agronomic traits but also the diversification and customization of crop varieties to suit specific agroecological zones, cropping systems, and consumer preferences. Furthermore, varietal improvements play a pivotal role in promoting agricultural sustainability by mitigating environmental degradation, conserving biodiversity, and reducing the reliance on agrochemical inputs. Resilient crop varieties with built-in resistance to pests, diseases, and abiotic stresses contribute to the reduction of chemical pesticide and fertilizer usage, thereby minimizing adverse environmental impacts and promoting ecological balance within agroecosystems. However, the widespread adoption of improved crop varieties necessitates effective dissemination mechanisms, robust seed systems, and supportive policies to ensure equitable access for smallholder farmers, particularly in resource-constrained regions. Collaborative efforts among breeders, policymakers, extension services, and agricultural stakeholders are crucial for facilitating the adoption and dissemination of varietal improvements, fostering innovation diffusion, and strengthening agricultural resilience in the face of emerging challenges such as climate change, pest outbreaks, and market volatility. Varietal improvements represent a multifaceted approach to enhancing agricultural productivity, resilience, and sustainability. By harnessing the power of genetics, genomics, and biotechnology, varietal improvement programs hold immense potential to transform global food systems, alleviate hunger, and promote sustainable development while safeguarding the planet's natural resources for future generations.

Keywords: varietal improvements, drought tolerance

Theme 7: 309
A Study on Nutritional Value of Unripe Banana Powder in "Thekua"

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Banana (*Musa sp.*) is one of the most cultivated tropical fruits in the world. Worldwide more than 1000 varieties of banana are produced. Tamil Nadu is the leading producer of bananas followed by Maharashtra in India. Unripe bananas have a high amount of dietary fibers and resistant starch, which aid digestion, keep us full for a long time, and help in weight management. They are also beneficial in various stomach ailments, such as gastric ulcers, bloating, constipation, diarrhea, and bacterial infection of the digestive system. This study has been carried out with the objective to prepare 'thekua' by incorporating prepared unripe banana powder. Product prepared without any incorporation served as control (T_0). The Wheat flour (T_1) 80%, (T_2) 60%, (T_3) 40% was blended with Unripe banana powder (T_1) 20%, (T_2) 40%, (T_3) 60%. This combination of these two in knitted form is termed "thekua" and is an incredibly healthy Indian cookie. It Boosts energy levels, enhances digestion, builds immunity. Consuming the highly nutritious thekua helps to prevent flu infection and other common diseases during the cold season. Each treatment was replicated thrice. Sensory evaluation of thekua product was carried out by using a 9-point 'Hedonic Scale'. The nutritive value of thekua with highest energy content was observed in T_3 (354 kcal), Carbohydrate content was highest in T_0 (110.91g), Likewise, highest protein was found in T_0 (7.04), Fat content was also found highest in T_3 (8.32 g), Calcium content showed highest in T_3 (205.95). Phosphorus content was found highest in T_3 (92.54 mg), Fiber and Iron content were also found highest in T_3 (15.39 mg) and T_0 (2.56 mg) respectively.

Keywords: Nutritional value, *Thekua,* unripe banana, Traditional practice, ITK

Theme 7: 310
Traditional Spice Cultivation in Reasi District of J&K

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From mythology to history, from history to the modern political economy, spices have got a beautiful and aromatic continuity across nations and cultures. The quality of food and its palatability, the nutritive value of food and its therapeutics are nicely contributed by spices. Spices constitute an essential social occasion of cultivating things which are in every way that really matters crucial in the cooking art. Spices may be either bark, buds, blossoms, common items, leaves, roots, seeds, characteristics of disgrace and styles or the entire plant tops. They are outstanding as appetizers or added substances and countless have rich helpful properties and are used in pharmaceutical, perfumery and religious traditions. India is known as "The home of spices". The environment of the country is found suitable for building up all spices. Spices are ideal crop best fit to be integrated into small-scale farming systems and are suitable for small scale garden production. This enterprise can offer additional opportunities for employment within the family and income earned can be used as a 'safety net' in times of exigency. Spices are a particularly viable enterprise for women as they can conveniently be grown in gardens in and around the homestead as well as providing an opportunity for women to start a commercial enterprise and be able to participate in the local economy. District Reasi is selected for spices under 'One district one product' scheme. A survey was conducted to find out the spice cultivation status and uses in district Reasi of J&K.

Keywords: Spices, Kandi area, Herbal medicine, Reasi

Theme 7: 311
Current Market Scenario and Future Thrust for Food and Nutritional Security: A Scientific Perspective

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Ensuring global food and nutritional security is a paramount challenge facing humanity, as the world population continues to grow and environmental pressures intensify. The current market scenario is characterized by a delicate balance between increasing demand and the challenges posed by climate change, resource depletion, and socio-economic disparities. Modern agricultural practices, including intensive monoculture and excessive use of agrochemicals, contribute to environmental degradation, affecting soil health and water quality. Additionally, the food supply chain faces disruptions due to factors such as global pandemics, geopolitical conflicts, and trade imbalances, impacting the accessibility and affordability of nutritious food. To navigate these challenges, a multifaceted scientific approach is essential. Future thrusts must focus on sustainable and regenerative agricultural practices that promote biodiversity, soil conservation, and efficient water use. Precision agriculture, incorporating advanced technologies such as artificial intelligence and robotics, can optimize resource utilization and minimize environmental impact. Research and development efforts should also prioritize the breeding of climate-resilient crop varieties. Nutritional security demands a holistic approach, encompassing both access to a sufficient quantity of food and its quality. Scientific interventions must address malnutrition, obesity, and diet-related non-communicable diseases through personalized nutrition strategies, fortified foods, and public awareness campaigns. Collaborative efforts between scientists, policymakers, and industry stakeholders are essential to formulate and implement policies that support sustainable food systems, fair trade practices, and equitable distribution of resources. In conclusion, the scientific community plays a pivotal role in shaping the future of food and nutritional security.

Keywords: Climate change, Malnutrition, Nutritional security, Precision agriculture

Theme 7: 312
Analytical Strategies for Quantifying Pesticides, Antibiotics, and Heavy Metals: A Review

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Residues of antibiotics and pesticides pose significant health risks to consumers and can compromise the quality of dairy products. These contaminants find their way into milk and its derivatives primarily through the indiscriminate use of antibiotics in cattle health management and the excessive application of pesticides in agricultural fields. Their presence not only jeopardizes consumer health and product quality but also diminishes the export/import potential of dairy products. Similarly, heavy metals present another health hazard. In today's globalized landscape, prioritizing quality is paramount for sustaining business operations. Given that these contaminants occur in trace amounts, which are challenging to detect using conventional or traditional methods, the adoption of highly sensitive techniques becomes imperative. The implementation of advanced analytical

methods is essential to accurately identify and quantify these minute traces of contaminants in dairy products. These sophisticated methodologies enable the detection of even the slightest presence of antibiotics, pesticides, and heavy metals, safeguarding consumer health and ensuring the high quality and safety standards of dairy products in the global market. Moreover, stringent regulatory frameworks and quality control measures must be in place to address the issue of contaminants effectively. This entails robust monitoring systems and adherence to international standards to mitigate the risks associated with antibiotic, pesticide, and heavy metal residues in dairy products. By prioritizing quality assurance through the utilization of sensitive detection methods and comprehensive regulatory oversight, the dairy industry can uphold consumer trust and maintain its competitiveness in the global market landscape.

Keywords: Analytical, Antibiotics, Heavy metals, Pesticides, Quantifying, Strategies

Theme 7: 313
Post-harvest Processing and Value Addition for Food Safety and Security

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In recent years, advancements in post-harvest processing and value addition have revolutionized the agricultural landscape, significantly contributing to the attainment of food safety and security goals. This abstract delves into the transformative impact of innovative post-harvest processing techniques on food safety and security, highlighting key advancements and their implications. Modern post-harvest processing technologies have revolutionized the way agricultural produce is handled, stored, and distributed. From novel sanitization methods leveraging advanced antimicrobial agents to cutting-edge packaging technologies designed for extended shelf life, these advancements have significantly reduced the risk of contamination and spoilage, thereby enhancing food safety. Moreover, the evolution of value addition techniques has played a pivotal role in improving the nutritional quality and marketability of agricultural products. Through processes such as fortification and enrichment, essential nutrients are added to foods, addressing micronutrient deficiencies and enhancing consumer health outcomes. Additionally, the diversification of value-added products, including ready-to-eat meals and functional foods, has catered to changing consumer preferences while promoting food security through increased market access and demand. Furthermore, advancements in post-harvest processing have led to remarkable reductions in food losses along the supply chain. Sophisticated storage technologies, such as controlled atmosphere storage and cold chain management systems, have extended the shelf life of perishable goods, minimising wastage and ensuring a more efficient utilization of resources. This reduction in losses not only contributes to food security by maximizing food availability but also mitigates environmental impacts associated with food production. However, realizing the full potential of these advancements requires concerted efforts in capacity building, infrastructure development, and policy support. Training programs aimed at farmers and food processors are essential to ensure the adoption of best practices and technologies. Additionally, investments in research and development are crucial for the continuous innovation and improvement of post-harvest processing methods. In conclusion, advancements in post-harvest processing and value addition have emerged as powerful tools in the pursuit of food safety and security. Through their transformative impact on food quality, nutrition, and supply chain efficiency, these innovations hold immense promise for addressing the challenges of a rapidly evolving global food system.

Keywords: Food Safety, Post-harvest, Processing, Security, Value addition

Theme 7: 314
Equipment Hygiene's Role in Ensuring Food Safety: A Review

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Pathogenic microorganisms present a significant safety concern within the food industry, with the majority of foodborne illness outbreaks being linked to these microbial agents. The effective management of these pathogens relies heavily on a thorough comprehension of the environmental factors that support their proliferation. This knowledge serves as a foundation for strategies aimed at reducing the contamination of raw materials, inactivating bacteria during processing, and preventing the reintroduction of contaminants into previously sanitized food products. The presence of hygiene-related issues in equipment exacerbates the risk posed by microbial pathogens. When microorganisms adhere to surfaces, persist, and subsequently detach, they can contaminate food products, leading to a decline in overall quality. Poor design choices that create areas where soil, debris, and microorganisms accumulate-such as dead ends, sharp corners, and substandard seals-aggravate this issue. Despite efforts to eliminate stagnant areas within equipment systems, some residue from food products may still cling to surfaces, providing a fertile environment for microbial growth and subsequent contamination. Moreover, the infiltration of microorganisms through tiny leaks further complicates matters. Evidence suggests that these microbes can traverse minuscule openings with surprising speed, propelled either by pressure differentials or their inherent motility. This underscores the need for meticulous attention to detail in both hygiene practices and equipment design to minimize the risks associated with microbial contamination in the food industry.

Keywords: Equipment Hygiene, Food Safety

Theme 7: 315
Formulation and Promotion of Finger Millet Innovative Products for Achieving Nutrition and Economic Security

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Finger millet (*Eleusine coracana*) is a Nutri-Cereal mostly cultivated and consumed in several semi-arid and tropical parts of the world. In India, finger millet is the most cultivated amongst all small millets. It is comparable to rice with regard to protein (6-8%) and fat (1-2%) and is superior to rice and wheat with respect to mineral and micronutrient contents. Finger millet is an ideal crop for cultivation under less than favorable climate due its resilient nature and ability to adapt in semi-arid climate. Therefore, it is an ideal crop for providing nutritional and economic security in developing countries like Africa and Asia. Unfortunately, use of finger millet is confined to rural areas due to lack of awareness and proper processing technologies. Hence, the present study was carried out with the aim of formulation of a variety of innovative products from finger millet and their promotion. Products such as coconut cookies, *elachi* cookies, chocolate brownie, spice cake, noodles and baked *shakkarpara* were prepared and evaluated for their sensory qualities on 9 point Hedonic scale. The mean sensory acceptability scores of developed products ranged from 8.1- 8.6 indicating that these products were very much liked by the panel members. For the promotions of products, various popular literature were developed and distributed to visitors during fairs and exhibitions. Standardized recipes of these innovative products were also be demonstrated among the participants in various training programmes. The study concluded that finger millet based innovative products had high micronutrient profile as well as very good sensory qualities.

Keywords: Formulation, Finger millet, Innovative products, Nutrition, Economic security

Theme 7: 316

Performance of Frontline Demonstrations on Productivity and Profitability of Groundnut in Rainfed Condition of Chittorgarh, Rajasthan

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Groundnut had played a pivotal role in socio-economic transformation of majority of small and marginal farming community of central India and continued to contribute significantly to the oil economy of India. A study therefore was carried out by Krishi Vigyan Kendra, Chittorgarh (Rajasthan) to know the yield gaps between improved package and practices under front line demonstration (FLD) and farmer's practice (FP) of groundnut crop under rainfed conditions. Front line demonstrations (FLDs) were conducted on total 100 farmer's fields each year to demonstrate the impact of improved agro-techniques on production and economic benefits under rainfed conditions of Chittorgarh in Zone 1V A Sub Humid Southern and Plain Aravalli Hills region during *Kharif* seasons of two consecutive years *i.e.* 2022 and 2023 for evaluation of the performance of GJG-32 variety of Groundnut in Kherpura block of Begun and Nanana, Panchdevela block of Bhadesar in Chittorgarh district and record the feedback information of farmers. The results revealed that the average yield of Groundnut in frontline demonstrations were 18.35 q ha^{-1} as compare to 15.00 q ha^{-1} recorded in farmer's practice with average yield increment of 22.34 per cent and additional return of 75065 and 173119 Rs ha^{-1}, respectively. It was observed that the benefit cost ratio (B: C) of recommended practice (FLD's) were 2.96 as compared to 2.66 in farmer's practice during consecutive years of study. The average extension gap 3.35 q ha^{-1} and average technology gap 2.65 q ha^{-1} was recorded. Therefore, the results clearly indicates that the use of improved varieties and package and practices with scientific intervention under frontline demonstration programme contribute to increase the productivity and profitability of Groundnut in Begun and Bhadesar block district of Chittorgarh. It can be concluded that the oilseed production could be enhanced by encouraging the farmers through adoption of recommended technologies which were followed in the FLDs.

Keywords: Groundnut yield, Economics, Extension gap, FLD, Technology gap, Technology index

Theme 7: 317

Construction and Standardization of Knowledge Test for Marigold Farmers

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Marigold is a prominent and popular flower in India, ranking third in popularity behind roses and chrysanthemums. Marigold is mostly grown as a loose flower crop in India and is mostly utilized in marriages and religious functions. The knowledge of the respondents plays an important role in the adoption of marigold cultivation. Due to the lack of a suitable scale to measure the knowledge of marigold farmers on the scientific practices of marigold cultivation, it was necessary to construct a knowledge test for the purpose. Relevant areas that covered the major aspects of marigold cultivation practices were included and discussed with scientists. The study was conducted in the Jammu region of Jammu and Kashmir for item analysis in December 2023. Item analysis provided item difficulty and an item discrimination index. The respondents were given one mark for each correct answer and zero marks for each wrong answer. The reliability of the instrument was measured with the help of the split-half method and was found to be 0.77. The reliability coefficient of the full test was computed by employing the Spearman-Brown prophecy and found to be 0.87, which shows that the test is highly reliable.

Content validity was assessed in two rounds. In the first round, the Content Validity Ratio (CVR) was computed; the value 0.59 or above was accepted, and then the Content Validity Index (CVI) was computed in the second round. The Kappa statistic was also computed. The item content analysis values (I-CVI) were computed to finalize the items in the final instrument; the value ranges from 0.45-1.00. The I-CVI value above 0.78 was considered fit for the instrument, while the scale content validity index (S-CVI) was 0.85. The final test includes twenty-six items.

Keywords: CVR, CVI, Discrimination & difficulty indices, Kappa, Knowledge test, Marigold, Reliability, Split-half, Validity

Theme 7: 318

Post-harvest Management of Bael Fruit at Different days of Harvesting and their Value Addition

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Bael fruit [*Aegle marmelos* (L.) Correa] is one of the most important underutilized fruit in India. It is known for medicinal properties and most nutritious fruit. The studies were carried out on 20 year old uniform and healthy trees growing at N.D. University of Agriculture & Technology, Kumarganj, Faizabad (U.P.). It was found that bael fruits followed increasing trend in fruit weight, size, fibre content and mucilage content during growth whereas pulp/skull ratio was initially decreased and then increased and became constant later stage of development. The maximum fruit weight was recorded in NB-7 on 240 DAFS while minimum in NB-4 on same day of observation. On 30th DAFS, mucilage content & fibre content could not be detected in all the cultivars. Highest (30.10%) T.S.S. was recorded in NB-9 cultivar on 30th day after fruit setting followed by NB-4 (29.10%) on 240th DAFS and minimum (14.10%) T.S.S. was observed in NB-9 on 120th DAFS. The acidity content was decreased with advancement of maturity in all the cultivars during entire period of growth and development of bael fruits. The ascorbic acid content was increased with advancement of maturity of fruits in all the cultivars. Total carotenoids content showed increasing trend in all the cultivars during growth and development of bael fruits. Out of all the cultivars NB-5 was appeared to be the best in respect of less fibre, seed and mucilage content followed by NB-9. However, NB-9 was better in respect of maximum retention of ascorbic acid, total carotenoids, total sugars content and lower in acidity content with slightly higher in fibre, seed and mucilage content in comparison to NB-5. The storage life of the fruit depends upon the stage of harvesting. Bael fruit can be stored for 10-15 days at normal temperature, whereas fruit harvested at ripe stage can be stored for a week. The ethrel @1000ppm was found to be most effective for early ripening of bael fruits with minimum PLW and highest retention of ascorbic acid, total carotenoids, minimum acidity and alar and CCC delayed ripening of bael fruits. The cultivar NB-4 was most responsive for early ripening while NB-9 delayed ripening in comparison to other cultivars. Due to its curative properties it is the most useful medicinal plants of India. It is utilized in day-to-day life in various forms. The fruit have excellent aroma which is not destroyed even during processing. Thus there is untapped potential for its processing into various highly nutritive and therapeutically important products which can be very easily popularized in domestic as well as International markets. A large number of bael processed products (Preserve, candy, panjiri, toffee, jam etc.) are prepared.

Keywords: Post-harvest management, Bael, Value addition

Theme 7: 319
To Study the Effectiveness of Structured Nutrition Programs in Modifying Dietary Habits: A Systematic Review

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Research investigates the efficacy of structured nutrition programs in modifying dietary habits among diverse populations. By analyzing various interventional studies, Research aim to provide insights into the effectiveness of nutritional education and support for promoting healthier food choices and lifestyle patterns. The prevalence of non-communicable diseases (NCDs) continues to rise globally due to unhealthy eating behaviors, necessitating effective interventions. This systematic review explores the efficacy of structured nutrition programs in promoting healthier dietary habits across diverse populations. Through the analysis of randomized controlled trials and quasi-experimental designs, research aims to identify the effectiveness of structured nutrition programs in modifying dietary, effective strategies, and potential barriers to successful implementation. Findings from numerous eligible studies indicate significant improvements in participants' dietary habits, including increased consumption of fruits, vegetables, and whole grains, alongside reduced intake of saturated fats, sugars, and sodium. However, the heterogeneity in intervention design, duration, and target populations poses challenges in drawing definitive conclusions. Nonetheless, the results suggest that nutrition interventions can positively influence dietary behaviors when implemented effectively. Future research directions should focus on identifying optimal intervention components, tailoring approaches based on demographic variables, and addressing sustainability and scalability challenges.

Keywords: Nutrition intervention, Dietary habits, Behavioral modification, Systematic analysis, Randomized controlled trial, Dietary behavior change

Theme 7: 320
Constraint Analysis in Mushroom Production Among Mushroom Growers of Jammu Region of J&K (UT)

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Mushroom cultivation is considered as one of the most suitable venture which helps improve socio- economic status and decipher problems like unemployment and malnutrition. It is highly promoted as a self employed enterprise and has proved to be highly profitable especially to marginal and landless farmers. Though there are various constraints faced by the mushroom growers in mushroom production. In this research, we have addressed the various problems faced in the mushroom production among button mushroom growers. The study was conducted in four districts namely Udhampur, Jammu, Kathua and Samba having maximum number of mushroom growers with a total sample size of 250 mushroom growers. The results highlighted that majority of the mushroom growers were facing high labour cost (53.60%), non-availability of quality spawn (94.00%), lack of storage facility (93.60%) and problems of pest and diseases (82.40%).

Keywords: Mushroom, Constraints, Self employed, Enterprise

Theme 8: 321
Constraints Faced by the Farmer Producers Organization Staff in Telangana

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Farmer Producer Organization (FPO) is a type of organization founded to reduce the participation of middlemen, address the marketing and value addition, constraints of small and marginal farmers, empower farmers, and increase the profitability of farming. Even though the government and supporting agencies provide required facilities FPOs still face a variety of constraints while running the organization. The goal of this study was to identify and assess the constraints perceived by the staff of the FPOs. The present study was conducted during 2022-2023 in zone III (Rajanna Siricilla) of Telangana which has five districts namely, Karimnagar, Rajanna Siricilla, Medak, Siddipet and Kamareddy. The total numbers of FPOs in the zone were 66 FPOs. Out of which 40 FPOs were selected using proportionate sampling from each district and randomly within the district. From each FPO, five staff members were interviewed randomly constituting a sample of 200 respondents using interview schedule. The Garrett Ranking Technique proposed by Garrett was used to rank the constraints. The constraints were classified under technical and operational, marketing, financial and input supply constraints. The results showed lack of trained manpower, lack of own office buildings, lack of transportation facilities, lack of godowns and store houses for storage, lack of enough capital, lack of government funds for promotion of FPOs, advance payment is required for getting inputs and sudden spurt in demand for inputs during the season were perceived as the most severe constraints among technical and operational, marketing, financial and input supply constraints, respectively.

Keywords: Farmer producer organization, Constraints, Garrett Ranking, Staff

Theme 8: 322
Study of Personnel Traits of Farmers Producer Organisation (FPOs) Members in Eastern Region of Uttar Pradesh

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The study was carried out in Gorakhpur and Basti District of eastern region of Uttar Pradesh state by conducting a personal interview with 400 FPO members those were selected through proportionate random sampling technique from 10 FPO and 20 members were selected from each of the FPO. In this study it was found that majority of FPO members were middle aged and literate including formal and informal education. Maximum numbers of FPO member were married. General caste FPO members were found dominantly. majority of nuclear family system were found in existence having less than 5 members in their families and have pacca type of housing pattern. Maximum members were marginal farmers. Members were found such who had low earning of Rs. up to 100000. Maximum members have medium level of material possession. The majority of members were have participate in one organization. The scientific orientation and risk-orientations were observed medium levels.

Keywords: FPO, Personnel traits, Socio-economic condition, FPOs members, Social participation, Psychological variable

Theme 8: 323
Technological Backstopping by Leveraging FPC FPC-based Technology Delivery Model in Vegetable Sector

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Many promising agricultural technologies are available which can enhance farmer's income. But how these technologies can be delivered to the right farmers' group followed by effective marketing strategy is a researchable issue. An efficient technology delivery system is required and hence studies are being carried out in the Varanasi region to develop an effective technology delivery model (TDM) through FPC. Complying with the objectives of the project, a new FPC, Sumrat Bhumi Producer Company Limited was formed on 16th September 2021 at Ghorawal, Sonbhadra after overcoming all hurdles of FPC formation. A brainstorming was conducted among the BODs of the FPCs to identify the working priorities and 87.5% said that FPCs should work on product-specific agriculture. According to 78.66% of BODs, FPC should focus on the maximum diversity of one single product and 73.8% were in common consensus that agriculture input business should be the priority for FPC for quick earning. Needs were assessed for the members of FPCs and the top most need was managing low or marginal profit from agriculture with an R^2 value of 0.430 and a weighted average of 4.98. To encounter this, interventions were carried out through mushroom production, beekeeping, protected cultivation, and vegetable cultivation in open conditions. Training were organised and knowledge, skill, and attitude were measured before and after training. In the case of mushroom training knowledge increased from 38.65% to 92.45%, skill increased from 29.33% to 86.75% and attitude changed from 54.55% to 75.55%. Likewise changes in knowledge, skill, and attitude were recorded for beekeeping and protected cultivation training. Demonstrations of improved vegetable varieties from ICAR-IIVR were conducted at the farmer's field and results were compared with the existing cultivar.

Keywords: FPC, Technology delivery, Vegetable

Theme 8: 324
Farmer Producer Organization's (FPOS): An Approach for Doubling Farmer Income by 2024

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The small farmer found himself at the receiving end – his livelihood threatened in an environment of instability, competition and fragmentation of farm holdings. The farmer had to deal with a variety of problems, such as difficulty in accessing funds, market, and new technology. Increased productivity, lower cultivation costs, transparent price discovery procedures, integration of allied activities between the farm and non-farm sectors, and wage employment during the agricultural off-season all can boost farmer income. Organizing the Farmer Producer Organizations (FPOs) will be a suitable solution for attaining this target. This paper will provide an insight into the concept of Producer Organizations, forms and benefits of joining in Farmer Producer Organizations.

Keywords: Producer company, Liberalization, Privatization, Agricultural credit, Productivity

Theme 8: 325
Prospects and Challenges of Agriculture Marketing in India

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Agriculture is the heart of the Indian economy. Agriculture contributes to the overall economic growth of the nation and determines the standard of life of more than 50% of the Indian population. Agriculture contributes only about 15% to the overall GDP but its impact is felt in the manufacturing sector as well as the service sector as the rural population has become a significant consumer of goods and services in the last couple of decades. The term agriculture marketing includes all these activities like procurement, grading, storing, transporting, and selling of agricultural products. In India, numerous numbers of agriculture producers produce and marketing is a tough challenge for these agriculture products. There has been a big concern in recent years regarding the efficiency of agricultural products in India. The main reason for this concern is poor linkage in the marketing channels and poor marketing infrastructure. The major defects of the system are lack of output quality, market news, lack of storage and credit facilities, problems of produce collection, unfavourable mandis, lack of organization, intermediates, etc. Agriculture marketing contributes many operations and processes through which the food and raw material more from the cultivated farm to the consumers. The proper development of an infrastructure system will not only decrease the cost of distribution but also facilitate various sections of the population like farmers, traders, consumers, scientists, sociologists, administrators, etc. Indian agriculture has successfully moved towards commercialization. Hence, there is a need to create awareness about the marketing information among the farmers through the state development of agriculture and Krishi Vigyan Kendra (KVK). Marketing research, loan facilities, proper market information, development of means of transportation, training facilities, cold storage, regulation of mandis, standardization of products, market surveys, etc can help to improve the condition of the agriculture marketing system.

Keywords: Agriculture information system, Marketing, KVK, Infrastructure system, Farmers

Theme 8: 326
Challenges Faced by FPOs and Strategies to Overcome

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Small holder farmers are having to suffer market uncertainties as most policies and institutional supports favours large and progressive farmers and smaller farmers are devoid of them increasing wider gap between producers and consumers. In these circumstances, the Farmer Produces Organization is crucial to the advancement and fortification of the farmer membership organization. Ten or more producers may organize using this company type in accordance with their memorandum of association. If politics do not intervene, FPOs have the ability to effectively link smallholder farmers with regional, national, and worldwide markets. Members of Farmer Producer Organizations (FPOs), which are established as FPCs, have access to financial and other input services. FPCs have a great potential to take over future food retails in India and around the world, but in order to surpass this profitable and productive model, they must be competitive with other businesses and rivals in the market.

Keywords: Agriculture, FPCs, Market, Strengthen, Agriculture

Theme 8: 327
Marketing Practices and Problems Faced by Flower Growers of Punjab

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Flower cultivation is one of the fastest growing enterprises in agriculture and it is ceaseless to blossom in the Indian context. There is a continuous increase in demand for flower products. The area under flower crops in India during the year 2020-21 was 3.22 Lakh ha with a production of 21.52 Lakh MT Loose Flowers and 8.28 Lakh MT Cut Flowers. So the present study was planned to analyse marketing patterns and problems faced by flower growers in Punjab state. Being the prominent crops, Gladiolus and Marigold were purposively selected for the present study. From the list of flower growers of the Punjab state, 40 farmers cultivating each flower crop were selected through simple random sampling technique. Data were collected from 80 respondents with the help of structured interview schedule. The findings revealed that the majority of respondents belonged to the age group of 36–50 years, studied up to secondary, belonged to nuclear families, had an operational land holding of 2-4 hectares and had 12-19 years of farming experience. The study further revealed that flower growers adopted a three-tier marketing channel (Producer '! Wholesaler '! Retailer '! Consumer) before reaching to consumer. Most of them marketed their produce in other districts and only 23.75 per cent of respondents market the flowers outside the Punjab. It was also found that wholesalers were the major source of market information for the Marigold as well as Gladiolus flower growers. The majority of the flower growers faced problems of insects and pests, high input and labour costs, storage problems and lack of advanced flower cultivation techniques and post-harvest technology. Marketing problems with a mean score of 60.75 were the leading impediments in flower cultivation.

Keywords: Adoption, Marketing, Problems, Flower cultivation

Theme 8: 328
Agricultural Marketing in India: A Review on Challenges and Prospects

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Agricultural marketing is considered to be one of the important dimensions of agricultural development in India. Over the years, there has been a substantial shift in the institutional innovations and reforms of the market to address imperfection in the market and maintain the collective strength of farmers. Through research, practitioner opinions, and policy initiatives have produced dualistic perspectives on both the benefits and drawbacks for farmer collectives and the agricultural market. The government of India made historic decisions to support resource-poor farmers through vertical integration, to realize a better share in consumer price, and mitigate price risk in the market by passing laws enacting market reforms such as the Agricultural Produce and Marketing Committee Act (APMC), Agricultural Produce Livestock Marketing Act (Promotion and Regulation), contract farming, and the Electronic National Agricultural Market (E-NAM). The paper, which is primarily based on literature review, delves to review the situation of agricultural marketing in India with their challenges and prospects. It also identifies the literature gaps and suggests the important areas for further studies.

Keywords: Agricultural marketing, Contract farming, APMC, APLM, Farmer producers Company, E-NAM

Theme 8: 329
Market-Led Extension: Challenges and Strategies

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The extension system had played its role untiringly in the transfer of production technologies as a result country achieved self-sufficiency in food grain production. However, individual farmers are not receiving fair compensation for their produce. Today, around 138 million Indian farmers' main concern is about declining farm income on the one hand and the increasing cost of inputs on the other. After harvesting, the majority of farmers sell their produce through middlemen, and they receive a lower price for it. Also, farmers facing many challenges including poor access to quality market information, a labour shortage, high cost of inputs, inadequate infrastructure, abundance of market functionaries, poor marketing strategies, lack of processing and value addition by farmers, and lack of storage facilities. These issues have led to high production costs and low producers' share in consumers' rupee. To solve the aforesaid issues, extension agents must take a leading role in helping farmers beyond production-led extension and addressing new issues of farmers related to marketing of their produce. The extension system needs to be oriented with knowledge and skills related to the market and need for innovations in market-led extension. The strategy for market-led agricultural extension in India has to include establishment of Agribusiness Cooperative Centers at every village or for a group of villages, which may be maintained by trained village leader (volunteers). These Agribusiness centers will have to provide information on market intelligence, production technology and will also supply inputs including marketing and value addition to the producers. Extension agencies need to be focus on promoting smallholder farmers for diversification towards high value crops, secondary and specialty agriculture, and linking farmers to market to increase producers' shares in consumers' rupee.

Keywords: Agribusiness, Market intelligence

Theme 8: 330
Transforming Seed Spices Farming in India: An Automated Revolution

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Seed spices play a crucial role in the Indian spice economy, contributing significantly to both area and production shares of the nation's total spices. However, traditional methods of seed spice cultivation are often labour-intensive, time-consuming, and face challenges in terms of efficiency and productivity. This article explores the transformational approach towards enhancing seed spice crop productivity through advanced technologies. From seedbed preparation to harvesting, various stages of cultivation are examined, highlighting the challenges faced by conventional farming operations and the potential solutions offered by modern agricultural techniques. The adoption of driverless systems, robotics, precision agriculture, and sustainable practices are discussed as key components in revolutionizing seed spice cultivation. By leveraging these advanced technologies, there is a significant opportunity to increase efficiency, improve quality, and ensure the long-term sustainability of the seed spice sector in India.

Keywords: Seed spices crops, Mechanization level, Automation, Precession

Theme 8: 331

Outcomes of KVK's Kisan Mobile Sandesh in Seeking of Agricultural Information for Increasing the Income of Tribal Farmers

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ICT is an innovative technology that provides access to useful information through tele communication. This tele communication is a means of spreading information over large distance in a timely manner. It is similar to information technology or it can be considered equivalent to information technology but especially it is useful as a good medium of effective communication. Agriculture related advisory services is the innovative services of ICT which provides advisory services for specific crops and specific locations and facilitates the farmers for seeking new agricultural information on time. K.V.K. avail different types of farm support to the agricultural sector and Kisan Mobile Sandesh (KMS) is a special tool for providing the timely knowledge and information to the tribal farming community. This present research work was conducted in district Barwani of Madhya Pradesh. The total sample consisted of 120 tribal respondents for this study. A large portion of the respondents (72.48%) perceived high efficacy of agriculture related farm advisory category in seeking of agricultural related information. In this research, the zero order correlation coefficient between independent and dependent variables was determined. Education, social participation, land holding size, annual income of farmer, credit orientation, mass media exposure, innovativeness, participation in extension activities, information seeking behaviour of farmer, frame of mind towards farm broadcast were noted having significant relationship with efficacy of farm advisory. A large portion of the respondents (63%) tribal farmers reported that farm messages should be based on innovative technologies of agriculture and allied sectors.

Keywords: ICTs, Consequences, Farm related advisory, Agricultural Knowledge and Information, Mobile, Internet, KMS, Simple random sampling and Tribal farmers

Theme 8: 332

The Rise of e-NAM as a Contemporary Agricultural Marketing Model for Agricultural Sustainability and Agri-business Growth

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e-NAM is a powerful platform that empowers small farmers by providing them with direct access to a wider market and enabling them to engage with buyers. This inclusiveness creates opportunities for small-scale farmers to improve their incomes significantly. The study covers 60 traders registered on e-NAM, 48 farmers, 27 agri-business holders, and 15 mandi employees of Uttar Pradesh selected for data collection. The result revealed that 80 per cent of respondents believe that e-NAM is a sustainable model for agri-marketing. Digitalization of agriculture mandis has a significant impact on developing technical skills among farmers and other stakeholders. The study also reveals that 72 per cent of the respondents found that the portal offered lower prices than the MSP for commodities demanded by the portal's beneficiaries. Marketing with e-NAM significantly enhances the contacts of 90% of farmers with inter-state traders, leading to marked improvement in the supply chain for

commodity selling. Many SHG and small farmers agreed that trading through the e-NAM portal leads to high-income generation. This portal combines various marketing models, including direct marketing, e-commerce, and blockchain-enabled markets. In this study, registered farmers are also utilizing hybrid marketing models to increase their profits. The study concludes that the implementation of electronic-National Agriculture Market (e-NAM) is imperative not only in transforming the structure of agriculture markets but also in improves agriculture trading.

Keywords: e-NAM, Digitalization of agricultural markets, Digital agriculture, Mandi integration, Market facilitation

Theme 8: 333
From Field to Market: Exploring Dynamics of Agricultural Marketing in India

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In the vast agrarian landscape of India, agriculture serves as the backbone of the economy, providing sustenance and livelihood to a significant portion of the population. With over half of the country's workforce engaged in agriculture-related activities, the sector plays a crucial role in driving rural development and ensuring food security. Despite its immense importance, Indian agriculture faces numerous challenges, including fragmented land holdings, water scarcity and inefficient marketing. Amidst these challenges, the efficient marketing of agricultural produce emerges as a critical factor in maximizing returns for farmers and bolstering the overall agricultural economy. While the sector shows promise with technological advancements and government initiatives, it faces structural inefficiencies, lack of transparency and market volatility. Losses occur across the supply chain, including pre-harvest, harvest, post-harvest, transportation and marketing stages. Pre-harvest losses, which include factors like pests, diseases, and adverse weather conditions, can account for around 15-25% of total losses. Harvest losses due to improper harvesting techniques or timing can range from 5-15%. Post-harvest losses, attributed to inadequate storage facilities, handling, and processing, contribute significantly, comprising approximately 20-30% of total losses. Transportation losses, caused by poor infrastructure and handling practices, can vary but often range from 5-15%. Marketing losses, including spoilage, wastage, and market-related factors like price fluctuations, contribute around 10-20% to total losses. To reduce these losses, strategies such as improving access to technology and training for farmers to mitigate pre-harvest losses, promoting the adoption of proper harvesting and post-harvest handling techniques, investing in better storage infrastructure, implementing efficient transportation systems and enhancing market linkages to reduce marketing losses are crucial. Additionally, encouraging the adoption of value-added processing techniques, facilitating access to credit and insurance schemes for farmers, promoting the use of innovative packaging and preservation methods and leveraging digital platforms for real-time market information can also help minimize losses. Furthermore, strengthening farmer cooperatives and producer organizations can play a pivotal role in addressing the multifaceted challenges in agricultural marketing losses. Addressing these challenges requires concerted efforts from various stakeholders, including policymakers, market regulators, agricultural extension services, thereby enhancing food security, farmers income, and the overall sustainability of the sector. Moreover, promoting fair trade practices, strengthening farmer-producer organizations, and implementing supportive policies are essential for ensuring equitable returns and empowerment of farmers. By embracing innovation, fostering inclusive growth, and collaboration among stakeholders, India can unlock the full potential of its agricultural marketing sector, contributing to food security, rural development and economic prosperity.

Keywords: Agricultural marketing, Challenges, Advancements, Strategies, Food security

Theme 8: 334
Analysing the Facilitating and Hindering Factors in the Mango Value Chain in the FPOs Using Mixed Method Model

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India's agricultural value chains are extremely fragmented, which results in enormous losses in both the quantity and quality of the produced goods. The biggest challenges downstream of the agricultural value chain are the presence of several intermediaries, lack of transparency, processing facilities, and high price volatility. FPOs enable the development of market-oriented, systems-based Agri-food value chains that are inclusive and sustainable to assess, understand, and enhance the performance of Agri-food value chains and assure their sustainability in terms of the economic, social, and environmental aspects. FPOs help in mobilizing and organizing the farmers into groups to reap the benefits of economies of scale, collective post-harvest operations, and marketing and these collective actions for the agriculture value chain have resulted in a decrease in the transaction cost and an increase in the income of farmers. Therefore it is very important to analyse the constraints and success factors in the FPO value chains to further improve its efficiency. With a sample size of 200 members of FPO, the study analysed constraints and success factors using Mixed Method research which combines qualitative and quantitative research components to offer a solution to a problem under investigation. Compared to using either method independently, using quantitative and qualitative methods together results in more detailed outcomes. Quantitative and qualitative analysis of constraints using Garrett's ranking and Thematic analysis respectively revealed that lack of participation of members in decision-making, delayed payment, and lack of branding and sales promotion were the major constraints faced by the members of FPO. Collaborating with ATMA, KVK, and research institutes to provide training and knowledge on numerous issues as well as engaging the FPOs in secondary value addition activities helps to overcome the constraints. The major success factors identified using Friedman and Thematic analysis were better prices, a large number of shareholders, and adequate EAS. Focusing on these success factors, FPOs can streamline their operations, encourage improved stakeholder participation, and increase overall effectiveness in attaining organizational goals.

Keywords: FPO, Mixed method analysis, Constraints, Success factors, Thematic analysis

Theme 8: 335
Agricultural Marketing in India: Challenges, Policies and Politics

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This article aims to critically examine the current agricultural marketing system in India in the wake of the recent farmer unrest caused by the enactment of three contentious farm laws in September 2020 and the subsequent repeal of these laws in November 2021, which provided some relief to the nation's agrarian population. India's antiquated agriculture system has to be modified. The three farm laws that were passed aimed to boost competition and encourage investment in order to modernize the Indian agricultural sector. Farmers, however, protested across the nation, believing that these laws would ultimately weaken or eliminate the safety net that the states supplied, leaving them vulnerable. The present review takes a deeper dig into the present agricultural marketing situation of India in the context of the new farm laws and tries to critically evaluate the situation.

Keywords: Agricultural marketing, Agriculture in India, Agricultural reforms, APMC Act

Theme 8: 336
A Study of Professional Competencies of Agripreneurs in Madhya Pradesh

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Agri-entrepreneurship plays a vital role in India's agrarian economy for fostering innovation, economic independence, and entrepreneurial competence among rural communities. Keeping in above fact a study was undertaken during 2023 in the state of Madhya Pradesh with a total of 120 sample size. The professional competencies of agripreneurs was analyzed, focusing on managerial, executive, and collaborative competencies. The data indicates that managerial competencies are predominantly high (43.33%), with livestock and poultry entrepreneurs leading the way. Executive competencies vary, with the highest levels found in horticultural crop enterprises. Collaborative competencies are fairly evenly distributed, with fisheries enterprises demonstrating strong performance. After analyzing the data a strategies to promote professional competencies among agripreneurs was developed. Data-driven analysis identifies the most effective strategies, starting with Agripreneurs Conferences and Fairs, recognized as vital platforms for networking and knowledge exchange. Market Linkages and Value Chain Integration rank second, emphasizing the importance of connecting agripreneurs with markets and enhancing their competitiveness. Industry Expert Workshops secure the third position, providing tailored learning experiences. This data-driven prioritization offers practical guidance for policymakers and stakeholders in their efforts to support agripreneurship development in Madhya Pradesh. These findings serve as a valuable resource for policymakers, researchers, and stakeholders seeking to foster the growth and development of agripreneurship in the region.

Keywords: Professional Competencies, Agripreneurs, Madhya Pradesh

Theme 8: 337
Farmer Producer Organizations (FPOs) in India: A Contextual Analysis with emphasis on Jammu and Kashmir

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Agriculture in India, as a critical component of its economy, constantly grapples with challenges ranging from climatic variations to market fluctuations. In recent years, the emergence of Farmer Producer Organizations has become a significant force in reshaping the agricultural landscape by empowering farmers and promoting sustainable practices. The database of Ministry of Corporate Affairs, GoI shows the presence of 24183 FPCs as of 2023. The Formation and Promotion of 10000 FPOs Scheme, launched in 2019 aims to create 10000 FPOs by 2024 with a budgetary allocation of Rs 6865 crore. Farmer Producer Organizations in India have emerged as instrumental entities in transforming the agricultural landscape, particularly within the unique context of the Union Territory of Jammu and Kashmir. The region, characterized by diverse topography and climatic variations, presents distinct challenges to its agrarian communities. Recent data underscores the evolving role of FPOs in Jammu and Kashmir, revealing their formation and organizational structures tailored to address these challenges. There are more than 100 FPOs working under different implementing agencies in Jammu and

Kashmir. FPOs, functioning as collaborative platforms formed by farmers, have demonstrated a notable impact on agricultural practices. The data highlights their contributions to crop diversification, adoption of modern technologies, and the establishment of crucial market linkages. By fostering collective action, FPOs have played a pivotal role in enhancing the socio-economic fabric of farming communities. The analysis of recent trends sheds light on their effectiveness in navigating regional complexities, leading to improved productivity and income for farmers. Additionally, this academic examination critically evaluates the influence of government policies on the trajectory of FPOs in Jammu and Kashmir, offering insights into the regulatory framework and support mechanisms. The findings contribute valuable insights to the scholarly discourse on agricultural development in India, with a specific emphasis on the nuanced challenges and opportunities confronted by FPOs in Jammu and Kashmir.

Keywords: Agriculture, Farmer producer organization, Market linkages, Farmers, Productivity

Theme 8: 338
Institutional Innovation for Enhancing Farmers' Income: A Comparative Analysis of Assam and Odisha

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Institutional Convergence, defined as the strategic alignment of institutions across multiple sectors, plays a pivotal role in addressing the challenges posed by farmers due to climatic vagaries and inefficient agricultural marketing system in India. In the face of escalating climatic risks, the need for coordinated efforts among institutions becomes increasingly imperative. The study focuses on assessing the convergence landscape in the vulnerable regions of Assam and Odisha, identifying key factors influencing its effectiveness and exploring its tangible outcomes on agricultural productivity and farmers' well-being. The findings reveal a nuanced picture of convergence dynamics in Assam and Odisha. While both states demonstrate some degree of institutional convergence, Odisha emerges as a frontrunner in terms of perceived effectiveness. This superiority can be attributed to its robust infrastructure, proactive stakeholder engagement and efficient coordination mechanisms. Propensity score matching followed by t-test revealed that iinstitutional convergence programmes positively impact farmers' income and employment opportunities in both states, indicating enhanced livelihoods and agricultural productivity. Further analysis using the Analytical Hierarchical Process (AHP) sheds light on the underlying constraints hampering effective convergence efforts. Organizational constraints emerge as a primary bottleneck, emphasizing the urgent need for harmonizing administrative structures and streamlining communication channels among institutions. Additionally, infrastructure deficits and communication barriers pose significant challenges, highlighting the imperative of investing in physical and digital infrastructure to facilitate seamless collaboration. Addressing these constraints holds the key to unlocking the full potential of institutional convergence in Assam and Odisha. By prioritizing organizational reforms, enhancing infrastructure and fostering a culture of collaboration; policymakers and stakeholders can pave the way for more effective convergence initiatives.

Keywords: Innovations, Institutional Convergence, Impact, Farmers' Income

Theme 8: 339
Digital Marketing Systems in Horticulture Sector for Increasing Marketing Efficiency

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The horticulture sector is pivotal in global agriculture, contributing substantially to economic development and environmental sustainability as well as horticultural crops are rich in nutritional quality and reduce malnutrition problems. For increases the efficiency and reaching the horticultural crops and their processed products to the people, we need a transforming platform such as digital marketing. It empowers horticultural startups because of the increasing amount of literacy in rural areas and the development of agribusiness infrastructure; young farmers are ready to adopt digital marketing platforms. COVID-19 changes the mindset of farmers to adopt digital marketing. It is helpful for farmers to reach out to multiple buyers and get higher prices for their products. Digital marketing plays a crucial role in the horticulture sector as it facilitates the expansion of market access and enables businesses to engage with a worldwide audience. By implementing focused strategies such as search engine optimization (SEO), leveraging social media platforms, and utilizing online advertising, horticulture businesses have the potential to enhance their visibility and boost sales. The utilization of data analytics facilitates the process of making well-informed decisions, which in turn results in the effective allocation of resources and the enhancement of product quality. E-commerce platforms facilitate the optimization of distribution processes by minimizing the involvement of agents, enhancing the freshness of produce. In addition, digital marketing serves to advance sustainable practices by providing education to consumers and encouraging the adoption of environmentally sensitive decisions. The horticultural industry can flourish in a competitive environment because of this technological integration, which also promotes economic growth and environmental sustainability.

Keywords: Digital marketing, Sustainability, Horticulture industry, Horticulture business, E-commerce

Theme 8: 340
Performance Analysis of e-NAM and Its Impact on Price Realization in Rajasthan and Haryana

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The central government launched e-NAM on 14th April 2016. The present study on e-NAM used both primary as well as secondary data. Tabular and graphical analyses were conducted to assess the countrywide implementation status of e-NAM. The HHI index was used to analyze trade concentration across states and crops. Additionally, 42 Wilcoxon price difference tests were performed across 15 crops to understand the impact of e-NAM on price realization at the national level. A Panel Regression model was employed using a panel of 15 states to analyze the determinants of e-NAM trade. The primary study focused on Haryana and Rajasthan, which account for over 50% of the total e-NAM trade in the country in 2020-21. Bajra and paddy were chosen as the specific

crops for the primary study in Rajasthan and Haryana. In each state, two districts and two APMC mandis were selected in each district for the primary survey, involving 240 farmers, 32 traders, 40 commission agents, and mandi officials of the respective markets. Data collection encompassed crop details, cultivation costs, marketing channels for the chosen crops, and stakeholders' awareness, perceptions, and perceived constraints regarding e-NAM. The findings indicate a remarkable twenty-fold increase in e-NAM trade value over the five years from 2018-19 to 2022-23 at the national level. The HHI index reveals monopolies in dry fruits and spices, particularly in Odisha and Andhra Pradesh. In terms of the total trade value, Haryana (19.5%) has the highest percentage in 2022-23, followed by Punjab (18.1%), Rajasthan (17.5%), and Andhra Pradesh (14.7%). Notably, on a value basis, Haryana excels in the cereals trade, Punjab in the pulse trade, Rajasthan in the fruits and oilseeds trade, and Andhra Pradesh in the vegetable trade in the year 2022-23.

Keywords: e-NAM macro trends, Price realization, Constraint analysis, Determinants of trade, HHI

Theme 8: 341
Impact Assessment and Determinants of Farmers' Participation in Farmer Producer Organizations

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The establishment of Farmer Producer Organizations (FPOs) has emerged as a promising strategy to alleviate the myriad challenges faced by small and marginal farmers. To delve into the efficacy of these organizations, a comprehensive study was undertaken, encompassing 20 FPOs, 200 farmers, and 20 FPO officials from Andhra Pradesh and Telangana states of India. The objective was to analyze the path relationships among institutional features, rationalities, performance, and overall impact, drawing upon principles from new institutional economics and management science. Employing methodologies such as partial least squares path modeling, ordered probit regression analysis, the study unearthed valuable insights. Notably, it illuminated a robust linkage between performance and overall impact, highlighting the pivotal role FPOs play in catalyzing positive outcomes in the farming community. Key determinants underpinning the overall impact were identified, including scalability, technical rationality, economic benefits, and psychological benefits. These factors collectively contribute to enhancing the overall impact of FPOs, thereby enhancing farmers' income. Moreover, the success of FPOs is contingent upon a multitude of individual, social, and organizational factors, with farmers' active participation being paramount. Despite the growing number of FPOs across the country, little evidence exists regarding farmers' involvement in FPO activities and the underlying determinants. We have examined both member-related and organizational factors. Our findings, analyzed through ordinal logit regression underscore the significant positive relationship between individual factors such as education, access to formal credit, and attendance of relevant training sessions with farmers' participation in FPO activities. Moreover, farmers' participation is influenced by technical and organizational rationalities inherent within FPOs. Heterogeneity was observed across determinants of participation in various activities including meetings, financial matters, and decision-making processes. The study emphasizes the importance of considering both member and FPO characteristics to enhance farmers' active involvement in FPO initiatives.

Keywords: Assessment, Determinants, Farmer, Farmers, Impact, Participation, Producer

Theme 8: 342
Prospects and Challenges of Agricultural Marketing in India

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There has been huge concern in recent years regarding the efficiency of agriculture produce in India. The main reason for this concern is poor linkage in marketing channels and poor marketing infrastructure. Indian agriculture has successfully moved towards commercialization. In mean time, agriculture has continued to be the source of livelihood to majority of the population in India. The proper development of infrastructure system will not only decrease the cost of distribution but also facilitate to various section of the population like farmers, traders, consumers, scientists etc. so there is a need to create awareness to incorporate marketing information among the farmers through the state development of agriculture, Krishi Vigyan Kendra (KVK) etc as there is a limited access to the market information, literacy level among the farmers is low, multiple channels of distribution that eats away the pockets of both farmers and consumers. There's no doubt that in any marketing there is a motive towards profit involved and at the same time the marketing is to be based on certain values, principles and philosophies such as offering just and fair prices to the farmers who toil hard to till. Bringing necessary reforms coupled with proper price discovery mechanism through regulated market system will help streamline and strengthen agricultural marketing. Marketing can be made effective if it is looked from the collective and integrative efforts from various quarters by addressing to farmers, middlemen, researchers etc. So, strategies in agricultural marketing with innovative and creative approaches needed to bring fruits of labour to farmers. It can be done by reducing the number of intermediaries between farmers and consumers, having proper storing facilities so that farmer will not be compelled to indulge in distress sales, efficient transport facilities should be available, malpractices of middlemen should be regulated, farmers should be freed from the clutches of village moneylenders and regular market information should be provided to the farmer.

Keywords: Agriculture, Marketing, Regulated Market, Infrastructure, Farmers

Theme 8: 343
Knowledge of Rural Women Regarding Pratapdhan Poultry Production Technology Promoted by KVK Bhilwara

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The study was conducted in Bhilwara district of Rajasthan. Bhilwara was selected purposively for the study as Pratapdhan Poultry Production Technology has been widely promoted through KVK Bhilwara. Random sample of 20 rural women was selected from each village to form a total sample of 100 respondents from five selected villages. Personal interview method was used for data collection. Frequency, percentage, mean percent score and adoption index were used for analysis of the data. Results clearly depicts that majority of the respondents 89 per cent had good knowledge about Pratapdhan poultry production technology and very few 11 per cent were in average category. It was very interesting to know that there was not a single respondent in poor knowledge category.

Keywords: Pratapdhan, Poultry, Production, Knowledge, Rural women

Theme 8: 344
Assessment of Knowledge Level of Tribal Farmers Towards Scientific Backyard Poultry Farming

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India is one of the most vulnerable countries to climate change and is also considered as one of the most drought-prone countries in the world. The changing climate scenario increases the chances of crop failure; in such situation, backyard poultry farming is a viable option for resource-poor farmers in securing and sustaining their livelihood. Backyard poultry farming requires a very small amount of initial capital and a quicker return on investment is ensured. Backyard poultry farming is becoming more popular to eradicate malnutrition, especially in children and pregnant women in the tribal and rural areas across the country. The present study was conducted under the tribal sub-plan project of ICAR-IVRI, Izatnagar in *Khatima* block of Udham Singh Nagar district, Uttarakhand. Initially, 20 resource-poor tribal farm families were selected as the beneficiaries of the programme including 18 women of the *tharu* tribe for their livelihood security through backyard poultry farming. Under the project, several awareness and training programmes were conducted regarding backyard poultry farming. Thus, in this context, a knowledge test regarding scientific poultry farming was developed with a total score of 24. The reliability of the test was measured by using the Spearman-Brown formula (0.885) as well as Cronbach's alpha (0. 0.846). The overall test content validity index was 0.91. A significant difference in the knowledge level of tribal farmers was found due to the intervention of a training programme on scientific backyard poultry.

Keywords: Backyard poultry farming, Knowledge test, Reliability, Validity, Tribal farmers

Theme 8: 345
Enhancing Food Safety through Personal Hygiene: A Review

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Every individual has the fundamental right to trust that the food they consume is safe and appropriate for consumption. Foodborne illnesses pose a grave health risk, potentially leading to severe ailments and even fatalities. Furthermore, outbreaks of such illnesses can harm trade and tourism, resulting in financial losses, unemployment, and legal disputes. Food spoilage not only incurs wastage and costs but also detrimentally impacts trade and consumer trust. The rise in international food trade and travel has brought significant societal and economic advantages. However, it has also rendered the global population susceptible to rapid disease spread if proper hygiene measures are not upheld. Thus, ensuring effective hygiene control is essential to prevent adverse impacts on human health and the economy stemming from foodborne illnesses and spoilage. Personnel involved in handling milk and its derivatives represent a critical source of microbial contamination, including potential pathogens. Therefore, maintaining personnel hygiene plays a pivotal role in influencing the microbiological quality of milk and milk products, which directly affects consumer health. Inadequate adherence to hygiene standards by personnel can inadvertently introduce numerous undesirable microorganisms through contact alone. To address these challenges, implementing food hygiene principles throughout the food supply chain and adopting an HACCP-based approach are imperative. All stakeholders, including producers, manufacturers, food handlers, and consumers, bear the responsibility of ensuring the safety and suitability of food for consumption. Both governmental bodies and industry players are tasked with providing safe and suitable milk and milk products to consumers by adhering to food hygiene principles.

Keywords: Enhancing, Food safety, Hygiene, Personal

Theme 8: 346
Parenting Style: A Deciding Factor for Wellbeing of Child

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Parenting or child rearing is the process of promoting and supporting the physical, emotional, social, financial, and intellectual development of a child from infancy to adulthood. Thus, a parent-child relationship lays the foundation of the 'building of her life'. A parenting style is a psychological construct representing standard strategies that parents use in their child rearing. The quality of parenting can be more essential than the quantity of time spent with the child. To reflect the variations in typical parenting behaviours, created a typology comprising three parenting styles: the authoritarian, authoritative, and permissive parenting styles. A Descriptive research design was used for present study to attain the following objectives to find out the existing parenting style in rural families (Birth-6 years) and to compare the parenting style amongst father and mother. Sample comprised of 6428 couples (both father and mother) by selecting 185-325 couples from each centre, residing in the operational villages of AICRP on Home Science. Parenting style questionnaire (was used after incorporating the required modifications. which consists of 30 questions related to three main styles of parenting namely authoritative, authoritarian and permissive. The scores of checklist were categorized as higher, average and lower levels. Data was analyzed by computing frequency and percentage. Results stated that the entire center parents like Jorhat (83.33%), Hyderabad (44.00%), Hisar (86.66%), Palampur (94.04%), Udaipur (80.00%), Parbhani (96.33%), Dharwad (73.18%), Madurai (43.5%) and Tura (85.00%) parents were following authoritative parenting style which means parents use reasoning and allow give and take discussion. It can be concluded that looking into the percentage of parents in the remaining two groups namely authoritarian and permissive reflects the unawareness, ignorance or incapability of the parents in parenting. It's high time to sensitize the community for productive and positive parenting for the betterment of society and humanity by and large.

Keywords: Parenting, Parenting styles, Authoritative, Authoritarian, Permissive

Theme 8: 347
Assessment of Weed Management Strategy for Enhancing Productivity and Profitability of Pigeonpea Under Eastern Plain Zone of U.P.

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The on farm trial (OFT) was conducted to find out the cost-effective weed management practices for pigeonpea during *kharif* season of 2022-23 with four replication one at in crop cafeteria (Technical Park) of Krishi Vigyan Kendra and remaining three conducted on farmer field of village Bharauli block Sohaon, district Ballia Uttar Pradesh. Among all the treatments, pre-emergence application of Pendimethalin followed by Imazethapyr at 30 DAS (days after sowing) was significantly recorded lowest weed growth and weed dry weight with WCE of 82.64 per cent at 60 DAS and 76.80 percent at 90 DAS, respectively. The treatment Pendimethalin followed by Imazethapyr was significantly obtained highest grain yield (1478 kg ha^{-1}) and 70.66 % of yield reduction was recorded over unweeded check.

Keywords: Pigeonpea, Weeds, Weed control efficiency, Yield

Theme 8: 348

Enhancing Agricultural Resilience: Economic Analysis of Isabgol Production under TDC-NICRA Project in Barmer District, Rajasthan

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The study conducted in Barmer district, Rajasthan, under the National Innovations in Climate Resilient Agriculture (TDC-NICRA) Project, addresses the critical concern of climate change's impact on India's food and nutritional security. Spanning from 2016-17 to 2019-20, the research aimed to analyze the economics of Isabgol (Plantago ovate Forsk) production and the constraints faced by farmers in the region. Implemented in villages such as Sujan Singh Sutharo Ka Talla, Rampura, Bakana, and Jogesar Kua, the TDC-NICRA Project selected 75 beneficiaries purposively from these areas. The primary data were collected from a total sample of 80 farmer respondents, providing insights into the economic dynamics and challenges associated with Isabgol cultivation. Findings revealed that Isabgol production, particularly through Farmer's Field Demonstrations (FLDs), yielded higher Gross Costs, Gross Returns, and Net Returns per hectare compared to check plots. Specifically, FLDs demonstrated Gross Costs, Gross Returns, and Net Returns of Rs. 21,262.50, Rs. 69,030, and Rs. 47,517.50 per hectare, respectively, whereas check plots yielded Rs. 19,600.50, Rs. 54,337.50, and Rs. 54,337.50, respectively. The benefit-cost ratio for FLDs was 3.25, indicating the economic viability of Isabgol production under improved practices. Encouraged by the positive outcomes of FLDs, Isabgol cultivation was further expanded in adjoining villages, resulting in a significant increase in its cultivation area across Barmer district. This underscores the potential of climate-resilient agricultural practices in mitigating the adverse effects of climate variability and change in arid regions like Western Rajasthan. In conclusion, the study provides valuable insights into the economic aspects of Isabgol production and highlights the importance of adopting climate-resilient agricultural practices to ensure food and nutritional security in the face of climate variability and change.

Keywords: Isabgol, Production, Climate resilient agriculture, Gross cost, Gross net return, B:C ratio

Theme 8: 349

Studies on Anestrous Problem of Buffaloes in Dholpur (Rajasthan)

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The present investigation was carried out by Krishi Vigyan Kendra, Dholpur during two consecutive year 2014-15 and 2015-16 at village Devi Singh ka Pura (Block-Bari) and Ghanedi (Block-Rajakhera) in District Dholpur (Rajasthan). The main objective of this study was to overcome the problem of anoestrus in buffalo. The 18 anestrus buffaloes were randomly divided into Three groups; the first group (T1) buffaloes was treated with Feeding Concentration + Green Fodder + Mineral Mixture, Second Group (T2) was treated with feeding concentration + Green Fodder + Mineral Mixture + Coco Tablets + Prajna Capsule and Third group of buffaloes was treated with T3 farmers practices. Comparative study of three treatments was carried out by comparing their efficacy for oestrus induction and successful conception. The results showed that higher oestrus induction was found in (T2) treated with (feeding concentration + Green Fodder + Mineral Mixture + Coco Tablets + Prajna Capsule), which showed 66.66% and 83.33% of buffalo's oestrus during the year of 2014-15 and 2015-16 respectively.

Keywords: Anestrous, Buffalo, Feeding concentration, Calving interval, Treatment, Incidence

Theme 8: 350
Vulnerability to Climate Change in Himalayan Region of Uttarakhand

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Climate change has emerged as a critical component in global development dialogue. It is of concern to the governments of developed countries as well as that of developing/ under-developed countries as it presents a major threat to sustainable development. Changes in climatic parameters will also have adverse impact on global food security. As we know India is an agriculture dependent country, climate change directly affects agriculture productivity. However, agriculture sector is inherently sensitive to climatic conditions and is one of the most vulnerable sectors to the risk and impact of global climate change. Agriculture is dependent on a proper combination of weather and associated factors, and is thus highly vulnerable to climate change. Thus, to have an insight into these issues a study was undertaken to assess the Vulnerability of farmers in Himalayan region of Uttarakhand. The analytical and descriptive research deign was used. It was found that majority of the respondents (52.5%) had medium level of risk perception about climate change. Further it was found that majority of the respondents (71.5%) had medium level of awareness about climate change, favorable attitude towards climate change (50%), adopt drought/frost tolerant variety (92.5%), had medium level of fatalism (66%), social cohesiveness (80%) and level of dependence of natural and social capital (63%). It was also found that farming experience, size of landholding, socio-economic status, information seeking behavior, attitude towards improved farm practices and attitude towards research station had significant positive relationship with the vulnerability of farmers to climate change. This study help the scientist, planners and extension policy makers to frame the policies, location specific strategies according to the vulnerability level of farmers and promotes successful adaptation of agricultural practices at local level.

Keywords: Climate Change, Farmers, Awareness, Vulnerability Assessment, Himalaya

Theme 8: 351
Attitude and Acceptance of Agroforestry Practices by the Farmers of Jaunpur District of Uttar Pradesh

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Agroforestry is practiced by the farmers for obtaining useful products and by products such as fruits, fuel, timber, fodder, etc. This study was conducted in during 2022-2023 in Kerakat, Dobhi, Dharmapur, Jalalpur, Muftiganj, Sirkoni and Shahganj blocks of Jaunpur district (Uttar Pradesh) to understand the attitude and acceptance of Agroforestry practices by the farmers of Jaunpur district. It was observed that majority of the farmers considered trees as competitor of cultivated crops for the land and degrades nutrient quality of the soil. It was observed that most of the farmers who practiced Agroforestry had below secondary education level. Thus, they may be educated and trained about the proper Agroforestry practices and its usage for increasing their income. However, majority of the farmers agreed that Agroforestry products and by products may be useful in obtaining fruits, fuel, timber, fodder. In addition to that, the education and awareness regarding the necessity of Agroforestry for balance of agriculture and climate may further enhance the acceptance of Agroforestry by the farmers.

Keywords: Agroforestry, Farmers, Adoption, Knowledge, Agriculture, Climate

Theme 8: 352
Unlocking Higher Potato Yields and Stronger Farm Profits: A Varietal Demonstration

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Potato is a crucial Rabi crop in the Ghazipur district, serving as a significant source of energy due to its rich carbohydrate content. It ranks as the fourth most important food crop globally, following rice, wheat, and maize. India stands as the second-largest producer of potatoes worldwide, with both India and China contributing 38 percent to the global potato production. In India, potato cultivation is immensely popular and serves as a lucrative cash crop. Over the past decade, India has witnessed a 51 percent increase in potato production, reaching 52.5 million tonnes (MT) in 2022 from 34.7 MT in 2008. Projections suggest a continuous annual growth of around 3 percent until 2050. The cultivated area has expanded from 2.2 lakh hectares in 1949 to 21.8 lakh hectares currently, while production has surged from 1.54 MT to 52.5 MT during the same period. Uttar Pradesh leads the chart as the largest potato-producing state in India, contributing 35 percent to the total production. However, despite its significant contribution, productivity remains below the state's average due to limited awareness about high-yielding potato varieties and imbalanced fertilizer application. To address this gap and enhance potato productivity in Ghazipur district, KVK Ghazipur conducted 23 demonstrations between 2020 and 2022 across seven different villages in Birno, Saidpur and Sadar. These demonstrations utilized high-yielding potato varieties, namely Kufari Anand, Kufri Chipsona-3, and Kufri Khyati, along with recommended fertilizer doses. The highest recorded yield was 396.00 q/ha in 2022-23, marking a 44 percent increase over traditional farming practices.

Keywords: Front line demonstration, Potato, High-yielding Variety, Recommended practices, Farmers' practice

Theme 8: 353
Multidimensional Impact Assessment of Interventions of KVK Jodhpur-II on Socio-Economic Status of Farmers of Lohawat Block

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A study was undertaken in five specifically chosen villages within the Lohawat Block of Phalodi District, Rajasthan, to evaluate the comprehensive impact of the KVK Jodhpur II intervention on the socio-economic status of farmers benefiting from it. Employing a quasi-experimental research design (before and after), the study aimed to gauge this impact. A sample of 120 beneficiary farmers and 120 non-beneficiaries from three selected villages under the purview of KVK Jodhpur-II in the Lohawat Block was selected for the assessment. A comprehensive interview schedule was devised to collect primary data from both beneficiary and non-beneficiary farmers. The findings revealed that beneficiary farmers exhibited higher levels of knowledge and adoption of good agricultural practices compared to non-beneficiaries. Moreover, beneficiary farmers demonstrated more favorable attitudes towards KVK activities. Additionally, the productivity of various crops was notably higher among beneficiaries. The study also identified significant disparities in the socio-economic status between beneficiary and non-beneficiary farmers, underscoring the pivotal role of KVK in the socio-economic advancement of farmers and its significance as a key institution for grassroots-level development.

Keywords: Impact Assessment, KVK, Socio-economic status

Theme 8: 354

Impact of Plant Growth Promoting Microorganisms on the Nitrogen Use Efficiency and Yield of Field Corn-Inbred Lines

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Maize (*Zea mays* L.) is one of the most important cereal crop and it is a preferred staple for a majority of the population in India, hence increasing its yield has been the major target of concern. Increase in yield has been attributed to the use of synthetic fertilizer which causes environmental damage in the form of eutrophication and atmospheric pollution. Plant Growth Promoting Microorganism (PGPM) can be used to increase nutrient uptake, therefore, looking into the aspect of maize inbred lines use with PGPM application will aid in the reduction of synthetic fertilizer loss into the environment. In this study, 14 maize inbred lines inoculated with PGPM, maintaining a separate control for each line, were grown in the field to assess based on their nitrogen use efficiency, yield attributes and yield. Results indicated that there were significant differences among the inbred lines revealing the variability existing between them. An increase of 20% was observed in cobs/plant in PML 36 and PML 11 was observed to have maximum increase in cob weight and in 1000 grain weight. PML 46 was observed to have the highest grain yield and high N uptake in grain. PML 36 was observed to have the highest increase in grain N uptake, nitrogen use efficiency in grain, nitrogen harvest index, partial factor productivity of fertilizer N and nitrogen uptake efficiency. Cob weight was found to be positively correlated with nitrogen harvest index, partial factor productivity of fertilizer nitrogen and nitrogen uptake efficiency. Grain yield was positively correlated with partial factor productivity of fertilizer nitrogen and nitrogen uptake efficiency.

Keywords: Microorganisms, Nitrogen use efficiency, Yield, Corn-inbred lines

Theme 8: 355

A Scale to Measure the Attitude of Extension Personnel Towards ICT

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Information and communication technology plays a critical role in assisting extension workers to address various obstacles of agricultural extension system. The main responsibility of extension is to disseminate information, skills, and attitudes that are not readily acquired through formal education. In light of this, a standardized scale was developed using Likert's technique of scale construction also known as summated rating scale. The procedure began with dimension identification, item collecting, relevancy and item analysis, and reliability and validity checks to ensure accuracy and consistency of the results. An individual's established feelings or emotions towards a psychological item aid in their ability to form an opinion about it which is known as attitude. Possible items concerning the psychological object i.e. attitude towards ICT were collected. For the relevancy test, an item collection of eighty statements was done. One hundred judges responded about relevancy of statements. Finally, 19 statements made up the scale based on the relevancy test and "t" value. For the final state statement, items with high "t" values more than 1.75 were chosen. Cronbach's alpha was used to assess the scale's reliability, which was found to be 0.69 when it was used in a non-sampled setting. Furthermore, the Spearman-Brown Prophecy formula was used to calculate the overall test reliability, which was found to be a dependable 0.55. Judges' opinions were obtained for each of the 19 items in order to validate the content.

Keywords: Summated rating scale, Extension personnel, Attitude, ICT

Theme 8: 356
Natural Farming : A Sustainable Livelihood for Farming Community

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The district of Ambala is located in Haryana, bordering Uttar Pradesh, Himachal Pradesh, and Punjab, and is near to the Union Territory of Chandigarh and geographical limits. The main agricultural systems are rice, wheat, sugarcane (64%, 66%, 8%), and horticulture crops (10-12%). In Ambala, 75% of farm families have marginal or tiny land holdings, and youth are migrating from rural regions due to low agricultural income and a lack of sustainable living. Mr. Lalchand Sharma is a farmer who uses natural farming methods to cultivate crops, including the timely application of Beejamrit, Jivamrit, Aachhadan, and Whapasa. He wants to raise wheat (Banshi & C-306), paddy, lentils, chickpeas, pulses, sugarcane, and other crops on 12 acre of land using a natural farming approach. He approached the KVK to increase his revenue and fall prospective market chances in 2016. After receiving technical guidance from the KVK Ambala, he began producing millets (Kodo millet and Brown top millet) on his land during kharif 2023 and selling the product in local markets and directly to consumers. The product was accepted by the market and granted the brand name "The Raghuram" with the FSSAI licensing mark. He planted guava, papaya, lemon, and banana trees on a 4-acre plot of land, and production will begin next year. He made jaggery, Khand and Shakkar from sugarcane without the use of any additions or synthetic chemicals. He is now known as "Gud wale Master Ji" and a master trainer in KVK programs. As a result of becoming an inspiration and role model for farmers, more than 2500 farmers have connected as farmers and consumers. The local farmer received net income from sold of 300 qtl. Sugarcane Rs. 62,632/- but he sold natural value added products of 300 qtl. Sugarcane (Gur, Khand & Shakkar) and received net income Rs. 2,70,000/- whereas during 2022-23 crop season his gross income was 8,44,000.00 and net income 6,28,200.00 from 8 Acre land.

Keywords: Natural farming, Sustainable Livelihood

Theme 8: 357
Studies on Medicinal Diversity and Ethno Medicinal Weeds used by Tribal of Balrampur, Uttar Pradesh

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These people have enormous knowledge about the medicinal uses of plants since long. India, as a subcontinent harbour greater number of weeds as compared to any other Country. This due to vast array of ecological habitats, climatic, edaphic and topographical factors. Stated that weed grow in places, where they are not desired. No plant is useless in nature. In fact, weeds are important from the stand point of medicinal, allelopathic and food values. Most of traditional medicinal herbs usually grow as weed. The world health organization estimated that 80% of the world population still believes in traditional medicine along with falklore system which is based on phytotharapy. The present study revealed that the studied area rich in invasive weeds and ruderals has been variously utilized medicinally by the tharu tribal for their health related problems, particularly for wounds, ulcers, dysentery etc. *Dotura stramonium, Eclipta alba* and *Argimona maxicana* were most popularly utilized wild plants.

Keywords: Etheno medicinal, Latitude, Weeds, Phytotharapy and Tharu Tribal

Theme 8: 358
Textile Waste Management for Income Generation

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There is a massive production of textiles due to technical advancement, industrialization, and the quick evolution of fashion, and production is still linked to some level of pollution and trash. Although our current way of living makes it impossible to set production limits, but we can discover new methods to recycle and lessen our impact on the environment. Reusing abandoned textiles can make goods with additional value that are both decorative and functional. There is a significant opportunity to turn textile waste into a valuable resource while simultaneously addressing environmental concerns and creating new job opportunities for rural women. The value of recycling trash is not only in the fact that it can be used again, but also in its ability to lessen human misery. Efforts were made to solve the problem of scrap generated in large quantities in stitching units and to impart skill training to self-help groups to apply their skills and creativeness to design eco-fashion handbags. Therefore, this study explores the viability of sustainable development in the fashion industry by creating up-cycled and handmade products that fuse classic designs with new technologies to boost demand while promoting sustainable development. In this research, up-cycling techniques were investigated and used to develop utility bags out of fabric scraps. It has also discussed critical findings about the assessment and acceptability of sustainable products made from leftover fabric using up-cycling techniques that adhere to sustainability principles. After working on fabric waste management it was realized that fabric waste management has potential of becoming an organized sector creating income opportunities and impact the local community positively.

Keywords: Sustainable development, Up-cycling techniques, Textile waste, Reusing, Eco fashion

Theme 8: 359
Challenges to Promote Organic Farming in India

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Organic farming offers a sustainable and environmentally conscious approach to agriculture, promoting soil health, biodiversity and potentially food options. However, it also has challenges such as lower yield, nutrient, shorter shelf life, weed management, pest and diseases management. India is now in the early stages of organic farming, however there is not enough food produced to satisfy the country's sizable population. Under this situation, concentrating on the export aspect of organic farming is more suitable opportunity for India. Non-availability of organic inputs is the main hurdle for adopting inorganic farming, while chemical inputs are easily available in the markets. The development of a marketing network dedicated to organic products is still lacking in both the domestic and foreign markets. The certification process for organic farming is very lengthy and complex, the cost of certification is also unaffordable for small farmers. Major part of the entire organic food market is covered by pulses and food grains. Concentrate efforts are required for growth in the future, branding and promotion for higher realization. Intensive research and developmental activities are of prime importance for maintaining the level of food grain production as per demand of the country.

Keywords: Organic farming, Population, Certification and Marketing

Theme 8: 360
Impact Assessment of Whats app Messages on Dissemination of Pulse production Technologies

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Whatsapp became basic need of human being. Its being employed as information dissemination and communication tool in day to day life. Agriculture is the primary source of livelihood for about 58 per cent of India's population. Inspite of this importance of agriculture in our nation, majority of the Indian farmers still practice agriculture using conventional methods. Farmers are following the traditional practices for production of food grains resulting in low productivity and less income per unit area of land. In this regard the effective pulse production technologies may be communicated to farmers as and when required through ICT tools i.e. mobile in whatsapp. With the adoption of these massages may help to the farmer for enhancing the productivity and losses cured due to a biotic and biotic stress. Keeping the above facts in view the study regarding to sending of massages and its effect on the adoption and its impacts were carried out in eight villages belonging to Shahpura, Patan, Majholi and Sihora blocks of Jabalpur district. For this purpose two villages from each block and 10 whatsapp user from each villages were selected. Hence a total of 80 farmers were used for sending the massages regarding pulse production technologies as and when required. Results of study indicated that out of 80 farmers 28 (35.00%) adopted the as such disseminated technology and 48 farmers (60.00%) were adopted partially. However, 14 (17.50%) farmers were not considered the massages for their purposes. The productivity of kharif and rabi pulses particularly Black gram and chickpea were increase by 38.51 and 21.50 percent respectively with the use of whatsapp massages timely. In this way the income of farmers increases by Rs. 12455 and Rs.16366 per hectare from Black gram and Chickpea crop respectively. thus it could be concluded that whatsapp may be used as a tool for dissemination of technologies to the farming community. It will not only save the time but also enhanced the income per unit area which will enhanced the social status of farmers.

Keywords: Whats app messages, Pulse production technologies

Theme 8: 361
Impact of Training on Home Science Technology Adoption

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The present study was conducted to find out the effectiveness of training programmes on adoption of home science technologies imparted by KVK Basti. The study was conducted in five selected villages of the Basti districts of Uttar Pradesh purposely namely; Charthibhatt, Chittargarhiya, Majha, Chando and Majhgawa. A sample comprising of 250 rural/farm women (125 beneficiaries and 125 non beneficiaries) were selected for the study purpose. The data indicated that 50.55 per cent beneficiaries and 14.83 percent non-beneficiaries had high extent of adoption about home science technologies. On the other hand, 03.66 per cent beneficiaries and 46.35 per cent non-beneficiaries were categorized in low extent of adoption category and respondents were had poor adoption of home science technologies. It was found that both beneficiary and non-beneficiary respondents had adopted "Women's involvement in animal husbandry and agriculture" to the higher extent with 79.21 and 48.45 per cent, respectively followed by "Value addition" like processing and product development of fruits, vegetables, sugarcane and millets etc. (65.42 and 458.56%), respectively. "Income generating activities" technology was found to be least adopted by both type of respondents. Research findings noticeably indicated

that there was a significant difference between beneficiary and non-beneficiary respondents regarding extent of adoption of home science technologies. The beneficiaries had more adoption than non-beneficiary respondents about home science technologies Thus; it was concluded that KVK's trainings played a significant role in enhancement of adoption of new technologies among beneficiary respondents. On the other side the study also showed that women encountered major barriers which included financial assistance, lack of available raw materials and lack of family encouragement while attempting to adopt new technology, regardless of whether they were beneficiaries or not.

Keywords: Impact, Training, Home science technology

Theme 8: 362
Effect of Flaxseed and Azolla Feeding on Milk Yield of Dairy Goat

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Goat is called poor's man cows mostly reared by resource-poor and landless farmers for meat purposes. Thus, plays a significant role in providing food, nutritional and livelihood security to the millions of marginal and small farmers and landless agricultural labourers. Goat milk is denoted as nutraceutical milk because it has health promoting constituents, therefore, demand of goat milk increasing in urban and peri urban area due to due to spread of knowledge about therapeutic, nutraceutical and medicinal benefits of goat milk and its product. Availability of open grazing land and community pasture is a limiting factor especially in urban and suburban areas therefore, despite considerable interest in landless farmers and young youth in goat dairy not developing as desired. Hence, providing a cost-effective and galactopoietic feed supplement to dairy goats is considered a tool to boost milk production reduce the feeding cost and increase the profitability of dairy goat farms. Flaxseed has been reported as a galactagogue rich in vitamins and minerals and has a beneficial effect on the digestibility and quality of milk. Azolla is a floating fern that has been reported to a very nutritive, rich in crude protein and a cheap organic feed substitute for dairy animals. Feeding azolla has been found to improve the milk yield and reduces cost of milk production. The trial was conducted at a farmers' field in Karnal, Haryana during 2022-23 to 2023-24. Lactating Beetal Goats (n=21) having similar per day milk yield, parity, body weight and days after kidding were divided into three groups namely Control, Flaxseed and Azolla groups. All the goats were provided similar type & amount of feed under a stall-feeding regime. The goats in the Control group were not given any supplement. In addition to normal routine feeds and fodders, lactating goats under the Flaxseed group were supplemented with roasted flaxseed @100g/day. In the Azolla group, 25% concentrate was replaced with fresh Azolla on a dry matter basis. The duration of the trial was 90 days after kidding. Milk yield per day and economic viability were recorded. Supplementation of roasted flaxseed and Azolla increased the daily milk yield by 22.8% & 18.64% over the Control group (1.45vs1.32vs1.18 kg/day). The highest increase in milk yield was reported in the roasted Flaxseed group. At the same time, the highest cost of milk production per kg was also found in the flaxseed group and it was higher by 13.04% and 40.04% over the Control and Azolla groups respectively. Supplementation of Azolla increased milk yield and reduced the cost of milk production by 19.6 % over the Control group. The average cost of milk production per kg was reported at Rs 34.48, 24.62 & 30.50 in Flaxseed, Azolla and Control group goats respectively. The B: C ratio among the groups was reported highest in the Azoll group (4.06:1) followed by Control (3.27:1) and Flaxseed group (2.9:1). Thus, it is concluded that the flaxseed supplementation has a beneficial effect on milk yield. Replacement of concentrate up to 25% on a dry matter basis has a beneficial effect on goat's milk yield and is economically viable for the farmers rearing Beetal goats for dairy purposes under field conditions.

Keywords: Flaxseed, Azolla, Dairy Goat, Milk Yield, Economics

Theme 8: 363
Performance of Super Seeder for Wheat Sowing in Cotton-Wheat Cropping Rotation

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Field experiments were conducted by Krishi Vigyan Kendra, Rewari (Haryana) using Supper seeder (SS) at three villages (Bharangi, Khurshid Nagar and Jhollery) and selected fifteen innovative farmers during Rabi 2022-23 crop season and also to compare the economics of wheat yield to conventional tillage (CT). Super Seeder (SS) is an advanced ZT drill machine with a heavy-duty rotavator fitted with stainless steel blades for mixing standing cotton crop residue in the single pass drilling of fertilizer and sows wheat seed. Five field experiments (each village) were conducted after the completed field survey and to evaluate supper seeder with conventional tillage practices adopted by farmers (CT) using Randomized Complete Block Design. As compared to (CT) the SS has been estimated as a resource conservation technique regarding sowing time (60.45%), irrigation time (7.21%), seed cost (15%), fertilizer cost (11.23%), and fuel cost (59.34%) reduced with the use of 55HP tractor for all farming operations. An increased wheat yield (12.44%) was recorded of SS (54.99 qt./ha.) as compared to CT (48.91 qt./ha.) in cotton-wheat cropping rotation. The higher net return and B:C ratio were observed Rs. 107517.50/- per hectare and 3.02 by SS as compared to CT Rs. 88337.50/- per hectare and 2.55. Similarly, based on the experimental data the SS resulted in significantly higher values of plnat height (94.11cm), number of tillers meter^{-2} (95.00), test weight (46.23 g) and number of grains per spike (85.12) over the CT. Thus, SS has increased soil organic matter and soil moisture as well as better soil tilth along with increased wheat yield as compared to other sowing practices.

Keywords: SS, Wheat sowing, KVK Rewari, ZT, Cotton, RCT

Theme 8: 364
Assessment and Use of Pheromone Traps for Eco Friendly Management of Fruit Fly under FLD in Bitter Gourd – A Success Story

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Fruit fly (*Bactrocera cucurbitae* Coquillett) has been the most prominent pest over the last several decades in India, especially bitter gourd. It is also a serious pest not only of cucurbits but also vegetable and fruit crops causing huge losses to farmers in Udaipur district. Despite using hazardous pesticides, farmers are bound to bear about 30 – 70 % yield loss every year due to the attack of fruit fly. Various front-line demonstrations (FLD) of cue lure containing pheromone traps followed by foliar spray of neem oil @ 3ml/litre before flowering were laid out by KVK Badgaon, Udaipur at the fields of bitter gourd growers of the tribal dominated area during two consecutive years to introduce and promote the ecofriendly management technology of fruit flies by installation of 20 traps/ha. The technology was found feasible, cheaper as well as easy to adopt at farmer's field. An average of 27.05 per cent increased yield was observed resulting Rs. 61213 average increased income per hectare comparing with plots under farmer's practice where traps were not installed. It's very economic and ecofriendly method for the management of fruit flies.

Keywords: Bitter gourd, Fruit fly, Pheromone

Theme 8: 365
Impact on Socio-economic Status of Farmers after Linkage with FPO's

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FPOs are farmers' collectives, with membership mainly comprising small/marginal farmers (around 70 to 80%). Presently, around 5000 FPOs (including FPCs) are in existence in the country, which were formed under various initiatives of the Govt. of India (including SFAC), State Governments, NABARD and other organizations over the last 8-10 years. Of these, around 3200 FPOs are registered as Producer Companies and the remaining as Cooperatives/ Societies, etc. Majority of these FPOs are in the nascent stage of their operations with shareholder membership ranging from 100 to over 1000 farmers and require not only technical handholding support but also adequate capital and infrastructure facilities including market linkages for sustaining. Promotion and strengthening of FPOs have been one of the key strategies of Government of India to achieve inclusive agriculture growth. Given this rapid growth in the number of FPOs, the issue of access to credit, linking the FPOs to reliable and affordable sources of financing to meet their working capital, infrastructure development and other needs has assumed center stage. The paired-t test distribution was applied to assess the socio-economic impact before and after the linkage of farmers with farmer producer organisations. The data results in that 71.746 t-value significant at 1% level of significance. Therefore, there is significant impact before and after linkage of farmers with FPOs. It indicates that after linkage of farmers with FPOs they were able to overcome constraints related to marketing and purchasing of equipment's to some extent which leads to significant and positive impact on their socio-economic profile.

Keywords: Capacity building, Farmer producer organisations, Impact, Linkage and Promotion

Theme 8: 366
Integrated Nutrient Management (INM) for Sustaining Crop Productivity

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The increasing food demands of a growing human population and the need for an environmentally friendly strategy for sustainable agricultural development require significant attention when addressing the issue of enhancing crop productivity. Here we discuss the role of integrated nutrient management (INM) in resolving these concerns, which has been proposed as a promising strategy for addressing such challenges. INM has multifaceted potential for the improvement of plant performance and resource efficiency while also enabling the protection of the environment and resource quality. After a thorough review of the literature, it was discovered that integrated natural farming (INM) improves grain quality, soil health, and sustainability while increasing crop yields by 8–15 Various approaches and perspectives for further development of INM in the near future are also proposed and discussed. when compared to conventional practices. It also increases water-use efficiency and the financial returns to farmers. Advanced INM practices result in significant reductions in reactive nitrogen (N) losses and greenhouse gas emissions, as demonstrated by model simulation and fate assessment. Under advanced INM practices, lower chemical fertiliser inputs were achieved without compromising crop yields, and consequently lower human and environmental costs (such as intensity of land use, N use, reactive N losses & GHG emissions).

Keywords: Integrated nutrient management, Soil health, Water-use efficiency

Theme 8: 367
Interactive Effect of Elevated Carbon Dioxide, Temperature and Salt Stress on Growth and Physiological Characteristics of Chickpea

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Climate change poses a significant challenge to agriculture globally due to alterations in temperature, precipitation and the frequency of extreme weather events which may lead to a significant reduction in crop yield and quality in following years. Further, an increase in CO_2 and temperature also indirectly causes varied abiotic stresses such as drought, salt and nutrient stress. Chickpea, second major pulse crop worldwide, is generally sensitive to salinity, mainly at the reproductive and at the vegetative stage resulting in major yield losses. However, the interactive effect of salt stress under the climate change scenario on crops in general and chickpea in particular are not investigated. An experiment was thus, conducted in temperature gradient tunnels to evaluate the physiological response of a salt tolerant (cv. Pusa-1103) and a salt susceptible variety (cv. Pusa-256) of chickpea under 100 mM and 200 mM salt (NaCl) stress, maintained at elevated (~550 ppm, tunnel 1) and ambient CO_2 level (~415 ppm, tunnel 2), at two elevated temperature (+1.5 and +2.5°C over ambient in each tunnel) conditions. In general, there was a dose dependent decline in germination ability, plant vigour, membrane stability index and relative water content in the sensitive than tolerant chickpea variety under the salt stress. A significant positive effect of elevated carbon dioxide in mitigating the adverse effect of salt stress in comparison to the ambient control were evident across the chickpea genotypes measured in terms of the shoot and the root growth. Under an exclusive elevated temperature condition, there was a decline in plant growth, however the effect was alleviated significantly under the elevated CO_2 condition. The underlying mechanism regulating the interactive effect of elevated CO_2, temperature and salt stress response shall be discussed.

Keywords: Carbon dioxide, Temperature, Salt stress, Growth and Physiological Characteristics, Chickpea

Theme 8: 368
Impacts of Fishing on Rural Household Income

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Fish farming is the vital resource to fight poverty and food insecurity through the diversification of income sources. However, little has been investigated on its actual contributions to increase household income. This study investigates the impacts of fishing on the house hold income in rural areas in Uttar Pradesh. Fish is an aquatic animal that serves as the source of food and nutrition and liveli hood for millions of people in the world. Fishing is animal based food production that has quickly grown sector since the ancient civilization of Egypt and China. Now a days it is practice both in developed and developing countries with different production statues through both capture and aquaculture fisheries. From global fish production of 171 million tones, capture fisheries represented about 90.63 million tones which cover 53% of the total fish production.

Keywords: Fish, Liveli hood, Farmers

Theme 8: 369
Assessing Farm Households' Exposure to Different Production Risks in Agriculture of Maharashtra

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Risk in agriculture refers to the probability of an event occurring, which can be estimated based on prior information and data. Agriculture is vulnerable to risks and uncertainties caused by climate-related natural disasters (droughts, floods, and cyclones), pest and disease outbreaks, and other unforeseen circumstances that negatively affect agricultural production and economic returns. Over the years, with liberalization and globalization, farming activity has become riskier, and farmers face different risks in daily activities. Throughout history, wide fluctuations in agricultural output highlight the dependence of agriculture on weather conditions. In developing countries like India, where agriculture is a primary source of livelihood, confronted with limited access to technology, financial resources, and institutions, farmers often face frequent risks associated with production. Hence, the study has undertaken to assess the exposure of farm households to different production risks by using the data of NSS 77th round "Situation Assessment of Agricultural Households and Land and Livestock Holdings of Households" (SAS-LLH, 2018-19). Farm households' exposure is estimated in terms of the percentage of farm households reported losses due to various production risks, such as droughts, floods, pests, etc. Farm households of Maharashtra were more exposed to the drought risk (41.64%) followed by insect-pest damage (10.64%), other causes of loss (3.13%), and flood (1.74%). Looking at the regional exposure, the Marathwada region was found to be more exposed to drought (58.10% of total farm households) followed by the Vidarbha region. In the case of insect pest infestation risk, farm households from the Vidarbha region (16.47%) were more exposed compared to other regions. Whereas Western Maharashtra reported relatively higher exposure to flood (2.84%) and other causes of loss (4.81%) risk. Season and household fixed effects improved the adjusted R^2 and revealed the role of household characteristics in explaining the variation in exposure of crops to overall risk. Therefore, it is important to prioritize the implementation of adaptation and mitigating measures by educating the farmers and honing their skills through training, exposure visits, and awareness programs. However, the exposure of crops remains the same irrespective of the growing season.

Keywords: Production Risks, Agriculture, Maharashtra

Theme 8: 370
Energy Conservation Agriculture : Role of Renewable Energy

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Agricultural practices in the less developed and some developing countries is still being carried out manually with crude tools while the usage of fossil fuel in developed countries has contributed immensely to global warming and environmental degradations. Energy is one of the major parameters for establishing growth and progress. Renewable energy has shown promising potential for integration into a wide range of agricultural activities and offers an alternative sustainable solution to current practices. Most of energy on the earth is received from the sun. Solar energy creates circulation of wind and ocean water, causes water evaporation and consequent precipitation. Renewable sources studied include biomass, geothermal, wind, solar, hydropower and fuelwood.

Harnessing these energy sources in agriculture is termed clean energy farming. These renewable resources have a huge potential for the agriculture industry. The concept of sustainable agriculture lies on a delicate balance of maximising crop productivity and maintaining economic stability, while minimising the utilisation of finite natural resources and detrimental environmental impacts. Hence, there is a need for promoting use of renewable energy systems for sustainable agriculture, e.g. solar photovoltaic water pumps and electricity, greenhouse technologies, solar dryers for post-harvest processing, and solar hot water heaters. Also Crops and biomass wastes can be converted to energy on the farm or sold to energy companies that produce fuel for cars and tractors and heat and power for homes and businesses.

Keywords: Renewable, Biomass, Geothermal, Hydropower

Theme 8: 371
A Face Towards Agriculture: ICT

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e-Agriculture is relatively a new term and its scope to change and evolve as our understanding of the area is growing. e-Agriculture is an emerging field focusing on the enhancement of agriculture through improved information and communication processes. But what exactly are ICTs and can they really be useful and cost-effective for poor farmers with restricted access to capital, electricity, and infrastructure. An ICT is any device, tool, or application that permits the exchange or collection of data through interaction or transmission. More specifically, e-Agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communication technologies (ICT) in the rural domain, with a primary focus on agriculture. Mobile, personal computers, laptops, Internet, television, radio, and newspapers are all used to promote agriculture. It is important to begin any ICT in agriculture intervention by focusing on the need that the intervention is purposed to better and more timely market information, better access to financial services, timely and appropriate crop and disease management advice, stronger links to agricultural value chains etc. ICTs allow users to overcome limits of time and space. Vast quantities of information held by institutions and individuals are becoming visible, publicly accessible, and re-usable through the open access movement. Many times, mobile phones and other devices function strictly as a tool for basic communication or entertainment. This is often a result of participants' low exposure to ideas or methods on how the ICTs were used to achieve agriculture or other economic goals. Key Constraints restricting farmers' access to ICTs i.e., lacks of financial resources to secure the use of ICTs, higher levels of technological and language, illiteracy among farmers, continuous changing of software. ICT to achieve agricultural development goals requires supplementary investments, resources, and strategies. Agriculture is facing new and severe challenges in its own right with rising food prices that have pushed. The point to develop competency i.e., assessing the human capital available for developing and disseminating the ICT device or application is critical, the more complex the technology, the more training and extension support it will require, use ICTs to complement existing information channels, develop direct relationships with men and women farmers, identify employment opportunities for farmers with agricultural related ICTs service providers, design two-way ICT programs to collect and disseminate information. Develop gender-equitable national or regional ICT policy, improving co-ordination between men and women farmers in designing ICT interventions. It is necessary to research and understand local information and communication practices, barriers to ICT enabled empowerment, and priority information and communication needs of end users.

Keywords: ICT, e-Agriculture, Agriculture, Empowerment, Information

Theme 8: 372
Enhancing Nutrition through Processing and Value Addition of Millets

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In the 21st century, climate change, water scarcity, increasing global population, rising food prices and other socio-economic impacts are expected to pose a great threat to agriculture and food security particularly for the people living in marginal areas. These impacts present a challenge for scientists search the possibilities of producing, processing and using other potential food sources to end hunger and poverty. This is why millet is attracting more and more interest from food scientists, technologists and nutritionists around the world. Millet is one of the oldest agronomic groups of grasses cultivated for its small grains which are the product of small herbaceous plants belonging to the Poaceae family. Millets have been important staple foods throughout human history, particularly in Asia and Africa, due to their important contribution to national food security and their potential health benefits. But recent studies confirmed a decline in cultivated area and millet production in India. The UNGA resolution declared year 2023 the International Year of Millets aiming to highlight the importance of millets as environmentally sustainable and sustainable crop with significant nutritional, health and economic benefits. Furthermore, value addition through product diversification and innovation provides opportunities to expand the market reach of millet and create value-added products that meet diverse consumer preferences, which in turn helps reduce post-harvest losses, optimize the use of resources and promote the principles of the circular economy. In addition to this, policy actions that galvanize research and development, define the market framework and facilitate value chain integration can stimulate challenges and innovation in the millet sector towards greater security. sustainable food and nutrition.

Keywords: Climate change, Millets, Food security, Sustainable agriculture, Value addition

Theme 8: 373
Role of Livestock and Dairy Innovations for Sustainable Development of Rural Economies

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Livestock and dairy innovations play a pivotal role in promoting sustainable development within the livestock sector, significantly impacting the rural economy. These innovations contribute to economic growth, poverty reduction and environmental sustainability, fostering a more resilient and prosperous rural community. Innovations in livestock and dairy farming, such as improved breeds, advanced veterinary care and better nutrition management, enhance productivity. These result in increased income for rural households engaged in livestock-related activities, providing a sustainable livelihood source. The introduction of innovative practices, such as value-added dairy processing or the integration of technology in livestock management, enables rural communities to diversify their income sources. This diversification reduces dependency on a single economic activity, contributing to economic stability. Integrating technology, like precision farming, artificial insemination and digital health monitoring, enhances overall efficiency in livestock management. These advancements lead to increased

productivity, reduced resource use and improved disease management, ultimately contributing to sustainable development. Livestock and dairy products are valuable sources of high-quality protein and essential nutrients. Innovations in animal husbandry practices contribute to improved animal health and production, ensuring a more reliable supply of nutritious food for rural populations. Sustainable practices, including efficient waste management and utilization of by-products, help mitigate the environmental impact of livestock farming. Innovations in sustainable farming methods contribute to reduced greenhouse gas emissions, improved soil health and overall environmental conservation. Investments in education and training programs related to modern livestock and dairy farming practices empower rural communities. Knowledge transfer enables farmers to adopt innovative techniques, enhancing their ability to adapt to changing market demands and environmental conditions. In conclusion, the adoption of livestock and dairy innovations in the rural economy is essential for sustainable development. These innovations contribute to economic growth, income diversification, nutritional security and environmental sustainability. Fostering a supportive environment for the widespread adoption of these innovations is crucial for ensuring the long-term resilience and prosperity of rural communities engaged in the livestock sector.

Keywords: Dairy innovations, Development, Role of livestock, Rural economies, Sustainable

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2. पर्यावरण सुधार हेतु पंचायती चारागाह पर वृक्षारोपण कार्यक्रम।
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