Viksit Krishi Sankalp Abhiyan

Insights and Outcomes

Indian Council of Agricultural Research
New Delhi

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Insights and Outcomes

Division of Agricultural Extension
Indian Council of Agricultural Research
New Delhi

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शिवराज चौहान
SHIVRAJ SINGH CHOUHAN

सत्यमेव जयते

कृषि एवं किसान कल्याण और
ग्रामीण विकास मंत्री
भारत सरकार
कृषि भवन, नई दिल्ली
Minister of Agriculture & Farmers Welfare
and Rural Development
Government of India
Krishi Bhawan, New Delhi

Message

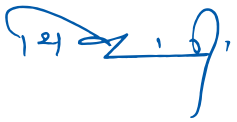
THE *Viksit Krishi Sankalp Abhiyan* (VKSA) stands as a landmark initiative in our collective journey toward building a robust, resilient, and forward-looking agricultural sector in India. It aligns seamlessly with the national vision of *Viksit Bharat @2047*, which envisions a self-reliant, inclusive, and prosperous India. The campaign has been guided by science, supported by institutions, and above all, anchored in the lived experiences and voices of our farmers. I had the opportunity of personally participating in several VKSA programmes and interacting with farmers in diverse regions. These interactions were profoundly moving and illuminating. The farmers' innovative spirit, their ability to articulate real challenges, and their desire to adopt modern solutions reaffirmed our belief in their central role in shaping India's agricultural future.

The campaign was executed through a convergence-based approach called *'One Nation- One Agriculture-One Team'*, ensuring coordinated action across institutions. The Indian Council of Agricultural Research (ICAR) and the Department of Agriculture & Farmers Welfare (DA&FW) under Ministry of Agriculture & Farmers Welfare (MoA&FW), GOI, New Delhi jointly led the planning and coordination efforts, with active involvement from State Governments, Agricultural Universities, and local administrations. Through coordinated efforts, VKSA successfully organized more than 60,000 programs and established direct interaction with more than 1.35 crore farmers.

The publication '*Viksit Krishi Sankalp Abhiyan: Insights and Outcomes'* captures the valuable insights generated through this massive exercise. It clearly brings out the researchable issues, extension-related gaps, numerous policy concerns, and farmer-led innovations. These issues and innovations will not only guide future strategies in research, extension, and governance, but also lay a strong foundation for ***demand-driven research***, ensuring that future research and development efforts are closely aligned with the actual needs and priorities of farmers.

I place on record my appreciation for the outstanding efforts of ICAR, DA&FW, KVKs, Agricultural Universities, and numerous other institutions whose dedication and teamwork made VKSA a resounding success. I also acknowledge the active participation of state governments, agri-preneures, progressive farmers, and field functionaries whose commitment enabled this nationwide campaign to achieve its goals.

Let us continue to move forward with renewed resolve to ensure prosperity for every farmer and sustainable growth for Indian agriculture.



(Shivraj Singh Chouhan)

20th August, 2025

New Delhi

भागीरथ चौधरी
BHAGIRATH CHOUDHARY

सत्यमेव जयते

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

Message

THE *Viksit Krishi Sankalp Abhiyan* (VKSA) stands as a path-breaking initiative that exemplifies how scientific approaches, institutional synergy, and active grassroots participation can come together to forge a brighter future for Indian agriculture. I had the privilege of actively participating in several VKSA programmes, which enabled me to directly engage with farmers from different agro-climatic zones and social contexts. These firsthand interactions left a lasting impression on me and further strengthened my belief that farmers must remain at the core of our policy planning and decision-making processes.

VKSA was not just an awareness drive; it was a structured, nationwide campaign specifically designed to systematically identify the most pressing issues faced by our farmers. It provided a platform for their voices to be heard, documented, and translated into actionable insights. The problems identified ranging from poor access to quality seeds, inadequate mechanization, gaps in plant protection and nutrient management as well as climate induced stresses. This reflects the multidimensional and interconnected nature of the challenges confronting Indian agriculture.

What truly sets VKSA apart is its ability to convert farmer feedback into structured knowledge. By classifying the identified problems into researchable issues, extension related knowledge and skill gaps, and broader policy level concerns, the campaign has established a strong foundation for evidence-based decision making. In addition, the documentation of farmer led innovations, many of which provide locally adapted and cost-effective solutions reflects the immense potential of grassroots creativity in addressing current agricultural challenges.

The publication on '*Viksit Krishi Sankalp Abhiyan: Insights and Outcomes*' offers valuable learnings and practical directions for researchers, policy planners, extension professionals, and development agencies. I congratulate ICAR, KVKs, AUs, and other stakeholders for this collaborative effort. Moving forward, we must ensure that the momentum generated by VKSA is sustained and translated into concrete interventions that deliver tangible improvements in the lives of our farmers. Let us continue our journey with renewed commitment to building a self-reliant and prosperous farming community.

20th August, 2025
New Delhi

(**Bhagirath Choudhary**)

राम नाथ ठाकुर
RAM NATH THAKUR

सत्यमेव जयते

कृषि एवं किसान कल्याण
राज्य मंत्री
भारत सरकार

**Minister of State For
Agriculture & Farmers Welfare
Government of India**

Message

THE transformation of Indian agriculture is fundamental to realizing the vision of *Viksit Bharat @2047*. In this context, the *Viksit Krishi Sankalp Abhiyan* (VKSA) has emerged as a pioneering initiative that successfully mobilized institutions, scientists, extension systems, and farmers to work towards a common goal; identifying and addressing the most critical challenges in Indian agriculture at the grassroots level.

Having participated in multiple VKSA programs across states, I had the opportunity of listening to our farmers and understanding their lived realities. Their stories revealed not only the hardships they endure from erratic weather and declining soil fertility to market unpredictability and technological gaps but also their deep commitment to improving their practices and livelihoods. VKSA created a unique, structured platform where such insights could be captured and translated into research, extension, and policy priorities.

This campaign is particularly impactful because of its nationwide scale and scientific rigour. VKSA has generated a comprehensive dataset that captures both the problems and opportunities encountered in the field. It has helped identify priority areas for targeted research, highlighted knowledge and extension gaps, and brought to light several policy concerns that require immediate attention. Importantly, the documentation of grassroots innovations has created a valuable repository of field-tested solutions that can be replicated or adapted in other contexts to benefit farming communities across the country.

The publication on '*Viksit Krishi Sankalp Abhiyan: Insights and Outcomes'* presents this vast body of work in a well-structured and insightful manner. It is a testimony to the strength of participatory approaches in agricultural development. I appreciate the tireless efforts of ICAR, KVKs, Agricultural Universities, and all partners who contributed to this mission. As we move ahead, it is critical that we use these insights to shape policies, design programmes, and invest in innovations that respond to farmers' real needs. Together, let us ensure that the spirit of VKSA becomes a common feature of our national agricultural development efforts.

Ram Nath Thakur

(Ram Nath Thakur)

21st August, 2025
New Delhi

डा. देवेश चतुर्वेदी
सचिव
Dr Devesh Chaturvedi
Secretary

भारत सरकार
कृषि एवं किसान कल्याण मंत्रालय
कृषि एवं किसान कल्याण विभाग
Government of India
Ministry of Agriculture & Farmers Welfare
Department of Agriculture & Farmers Welfare

Message

It gives me immense pleasure to congratulate ICAR for bringing out the publication on *Viksit Krishi Sankalp Abhiyan: Insights and Outcomes*, which captures the scale, depth, and spirit of one of the most extensive and participatory agricultural campaigns undertaken in India in recent times. The *Abhiyan* reflects our shared commitment to achieving the vision of *Viksit Bharat @2047* by empowering farmers through science, technology, and policy convergence.

The VKSA was not just a campaign, it was a movement. Spanning across 728 districts, engaging over 1.35 crore farmers, and facilitated by thousands of scientists and extension personnel, it became a unique platform to understand grassroots realities, disseminate information, and co-create solutions. The *Abhiyan* encouraging direct interaction among farmers, scientists, and development agencies.

As I was actively involved in planning, monitoring and implementation of the VKSA, I had the opportunity to witness first-hand the enthusiasm, expectations and innovative ideas emerging from rural India. These experiences reaffirmed my conviction that farmers' voices must remain central to the national discourse on agricultural development.

The insights presented in this document reflect a rigorous analysis of the issues raised by farmers, as well as observations made by field teams. It identifies policy gaps, researchable problems, and extension needs that call for targeted interventions. I particularly commend the KVKs for their proactive role in leading the campaign, delivering agro-advisories, and documenting feedback from the grassroots.

VKSA also brought to light several farmers' innovations. These local solutions, borne out of necessity and experience, offer valuable lessons and opportunities for upscaling through appropriate scientific and policy support.

I am confident that the findings and suggestions emerging from this publication will guide the design of region-specific research, farmer-centric extension strategies, and responsive policy measures. I extend my sincere appreciation to the Indian Council of Agricultural Research (ICAR), the KVKs, state departments of agriculture, and all others involved in making this campaign a success.

(Devesh Chaturvedi)

21st August, 2025
New Delhi

सत्यमेव जयते

डॉ. एम. एल. जाट
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Dr M. L. Jat
SECRETARY (DARE) & DIRECTOR GENERAL (ICAR)

भारत सरकार
कृषि अनुसंधान और शिक्षा विभाग एवं
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Foreword

It gives me immense pleasure that the Indian Council of Agricultural Research (ICAR) has brought out the publication *Viksit Kishi Sankalp Abhiyan: Insights and Outcomes.* The publication provides a comprehensive account of the conception, implementation and outcomes of the landmark 15-days nationwide campaign of *Viksit Kishi Sankalp Abhiyan* (VKSA), jointly organized by ICAR, DA&FW and State Governments. This initiative stands as a testament to the strength of coordinated action and scientific partnership, bringing together scientists, extension personnel, farmers and a broad range of stakeholders in a collective endeavour. Their dedicated and enthusiastic participation facilitated the dissemination of context-specific agricultural technologies and enabled the identification of real-time field level challenges across diverse agro-ecological regions. The evidences and insights generated through this nationwide exercise hold considerable significance for policy and programme planning and are firmly aligned with the national vision of *Viksit Bharat @2047.*

I had the privilege of not only overseeing the implementation and monitoring of this campaign but also participating in its programs across several states. These field-level interactions offered valuable insights into the evolving aspirations of our farmers and the transformative role that agricultural scientists must play in meeting those expectations.

The findings and suggestions presented in this publication will serve as a guiding framework for shaping demand-driven research, need-based capacity building programmes, and evidence-based policy formulation. The VKSA has led to the identification of critical researchable issues for ICAR institutes, extension gaps requiring targeted capacity building by KVKs, and policy-level concerns needing coordinated action.

I commend the entire NARS, especially our KVK teams, for their outstanding efforts in organizing more than 60,000 programs across 728 districts and interacting with more than 1.35 crore farmers. Their dedication to knowledge sharing, technology dissemination, agro-advisory services, and farmer feedback collection ensured that the campaign was grounded, inclusive, and outcome-oriented.

I sincerely hope that this document not only informs but also inspires further efforts toward farmer-centric research innovation and inclusive development in agriculture. The VKSA has laid a strong foundation. Now, it is upon us to carry the momentum forward through collaborative, regionally relevant, and impact-driven actions.

(M.L. Jat)

20th August, 2025
New Delhi

Preface

The *Viksit Krishi Sankalp Abhiyan (VKSA)* was conceptualized as a national initiative to raise awareness among farmers about the latest improved technologies ahead of the *Kharif* season. It promoted direct farmer–scientist interactions focused on improved technologies for the *Kharif* season. VKSA was executed through a convergence-based strategy *'One Nation–One Agriculture–One Team'* ensuring unified action across the country. Indian Council of Agricultural Research (ICAR) and the Department of Agriculture & Farmers Welfare (DA&FW) under Ministry of Agriculture & Farmers Welfare (DA&FW), Government of India, constituted a national-level core group to plan the *Abhiyan* and coordinate its activities. Support from State Governments, Agricultural Universities, and local administration was mobilized through formal communications from central leadership. The campaign brought together policymakers, scientific institutions, extension agencies, and grassroots organisations to work in a coordinated manner towards achieving its objectives.

This publication, '*Viksit Krishi Sankalp Abhiyan: Insights and Outcomes'*, presents a comprehensive account of the objectives, strategies, activities, and achievements of the *Abhiyan*. It also documented the key insights gained from the extensive field engagements and the diverse perspectives contributed by stakeholders at various levels.

The authors express their sincere gratitude to the Hon'ble Minister of Agriculture and Farmers Welfare for his guidance, encouragement, and active involvement in the implementation of the *Abhiyan*. Appreciation is also extended to the Chief Ministers of States for their support in facilitating the successful execution of activities at the state and district levels. We gratefully acknowledge the valuable contributions of the Secretary, Department of Agricultural Research and Education & Director General, ICAR; Secretary, Department of Agriculture & Farmers Welfare; Principal Secretaries/ Directors of State Departments of Agriculture, Horticulture, and allied sectors; Vice Chancellors of Agricultural Universities (AUs) and the Nodal Officers for their dedicated coordination and monitoring the activities carried under VKSA. Sincere thanks are also extended to all the Directors of ICAR Institutes for proactively participating and mobilising their scientific teams to support and execute VKSA activities at the field level. Special appreciation is extended to the ADG (ICT), the Director of ICAR-IASRI, New Delhi, and the ICT Team for their pivotal role in developing the dashboard used for daily reporting of VKSA activities. Their contribution has greatly enhanced the efficiency and transparency of activity monitoring and reporting under the campaign. The contribution of the Project

Director, ICAR-DKMA, and her team for efficient management of the Media Cell of DKMA, is gratefully acknowledged.

It is imperative to duly recognise the invaluable contribution of the Directors of the all ICAR-ATARIs and their dedicated teams, who played a pivotal role in the overall coordination and meticulous execution of VKSA and consistently guided all the KVKs across their respective zones. Special appreciation is extended to the 448 KVKs whose sustained efforts under the guidance of team ATARI in organising Focused Group Discussions (FGDs) enabled a systematic identification, categorisation, and prioritisation of farmers' problems and sub-problems across different agro-ecological zones. We gratefully acknowledge the active participation in FGDs of more than 1.6 lakh farmers, whose experiential knowledge and insights were instrumental in capturing the ground-level challenges and contextual nuances of Indian agriculture. We also express our gratitude to Dr. Sanjit Maiti, Senior Scientist, ICAR, NDRI, Karnal and Dr. S.K. Roy, Scientist, ICAR-ATARI, Kolkata for their valuable support in the analytical work, which significantly contributed towards generating meaningful inferences and strengthening evidence-based recommendations.

We place on record our appreciation for the efforts of all Heads and SMSs of KVKs, Scientists of ICAR Institutes, Faculty of AUs, Officials of District Department of Agriculture & allied department, Farmer Producer Organisations (FPOs), Self-Help Groups (SHGs), progressive farmers, innovators, agri-preneurs, and other partner institutions, whose active engagement ensured wide outreach and meaningful outcomes. Special acknowledgment is due to the farmers including farm-women whose whole hearted participation, interaction were central to the success of VKSA.

It is our belief that the experiences, learnings and outcomes documented in this publication will serve as a valuable reference for policymakers, researchers, extension professionals, and development practitioners in designing and implementing future programmes for agricultural transformation.

Authors

Executive Summary

DESPITE notable progress in Indian agriculture, substantial gaps in technology adoption and extension services continue to persist, underscoring the urgent need to strengthen efforts to bridge the 'Lab-to-Land' gap. In this context, a nation-wide 15 days long campaign, the *Viksit Krishi Sankalp Abhiyan* (VKSA) was launched on 29th May 2025, aimed at sensitizing farmers about the latest agricultural technologies before the start of *Kharif* season. The initiative drew inspiration from the Hon'ble Prime Minister's launch of 109 high-yielding, climate-resilient, and biofortified crop varieties on 11th August 2024 at ICAR-IARI, New Delhi. The key thrust of VKSA was to create awareness about improved agricultural practices, inform farmers about government schemes and policies, foster reciprocal learning between farmers and scientists, and gather local insights and feedback on technologies and farmer-led innovations.

VKSA was grounded in behavioural change theories, adult learning principles, and systems thinking, and it adopted a multi-level strategy extending from national level planning to village-level implementation. The campaign was executed through a convergence-based approach called ***'One Nation-One Agriculture-One Team'***, ensuring coordinated action across institutions. The Indian Council of Agricultural Research (ICAR) and the Department of Agriculture & Farmers Welfare (DA&FW), under Ministry of Agriculture & Farmers Welfare, Government of India, jointly led the national planning and coordination efforts, with active involvement from State Governments, Agricultural Universities, and local administrations.

To implement the campaign on the ground 2,170 multidisciplinary teams were constituted nationwide. These teams, led by KVKs, visited clusters of villages and conducted direct farmer-scientist interactions. In total, 60,917 awareness programs were organized, reaching more than 1.35 crore farmers, including 95.7 lakh men and 39.7 lakh women, from 1.40 lakh villages covering 728 districts in 34 States and Union Territories. A comprehensive monitoring system was established through a hierarchy of nodal officers and a customized digital platform (https://vikalp.kisansarathi.in), enabling real-time reporting and coordination at national and state levels.

A special emphasis was placed on inclusivity, with women accounting for 29.3 percent of all farmer participants. Meghalaya reported the highest proportion of women farmers at 64.6%, followed by Arunachal Pradesh, Ladakh, Himachal Pradesh, and Assam. VKSA also made significant outreach in tribal and aspirational districts. It reached 176 tribal districts and organised 15,445 programs, covering over 25.5 lakh farmers from more than

31,000 villages. Similarly, in 112 aspirational districts, 9,864 programs covered 23,483 villages and reached nearly 19.89 lakh farmers.

The campaign received substantial political and institutional support, with participation from 9 Chief Ministers and 17 Union Ministers across various programs. In addition, 47 State Ministers, 87 Members of Parliament, and 158 Members of Legislative Assemblies attended over 400 events nationwide. VKSA's public outreach was further amplified through mass media and social media platforms, reaching over 5.50 crore people. More than 1,000 articles appeared in around 200 national newspaper editions, while 31 programs were broadcast on DD Kisan and over 850 programs on All India Radio, supplemented by regional and local media coverage.

An analysis of key agricultural problems across Indian states, categorized as large, medium, small, and North-Eastern States, revealed both common and region-specific challenges. Among large states, top concerns include issues with seeds and improved varieties, climate change impacts, and water management. Medium-sized states showed similar patterns, with additional emphasis on soil health and fertilizer management. In small states and UTs, geographic and ecological constraints elevated concerns related to climate change, seed access, water scarcity, and horticultural development. The North-Eastern region highlighted seed systems, climate change, and water management as pressing issues, despite high rainfall, due to infrastructure gaps. Terrain-related challenges also impacted machinery use and livestock management. Across all regions, seed quality, climate resilience, and water availability consistently emerged as critical themes. These findings underscored the need for a dual strategy: national policies targeting shared concerns, and localized interventions aligned with specific agro-ecological and socio-economic conditions. Strengthening KVKs and capacity building will be essential for effective and inclusive, farmer-centric solutions.

To offer a more comprehensive and intuitive understanding of the data generated on problems, a hybrid visualization combining elements of both violin and box plots was used. This integrated approach not only displayed the distribution and density of responses but also highlights key statistical summaries, providing deeper insights than either plot could offer individually. To derive focused insights, 20-key agricultural problems were grouped into four thematic clusters: Crop Production and Protection; Animal Husbandry and Allied Sectors; Natural Resource and Environmental Management; and Agricultural Diversification and Value Addition. To provide a rich and intuitive understanding of the data, the results were visualized using a hybrid plot that combines the features of both a violin plot and a box plot. This combined visualization offers a more complete picture than either plot could alone.

ANOVA analysis across all clusters revealed statistically significant variations in the severity of perceived problems.

In the Crop Production and Protection cluster, *'Seed & Improved Varieties'* emerged as the most critical challenge, followed closely by issues in farm machinery, plant protection, and nutrient management, indicating foundational input and operational bottlenecks. In the Animal Husbandry and Allied Sectors cluster, mainstream concerns such as *'Livestock Production & Dairy'* and *'Fodder Production'* were rated significantly higher than niche areas like poultry, pig, and fish farming, suggesting urgent attention needed for core livestock systems.

The Natural Resource and Environmental Management cluster highlighted severe concerns regarding *'Water Management'*, *'Climate Change'*, and *'Soil Health'*, underscoring environmental threats to farming. Meanwhile, biodiversity erosion and energy in agriculture were rated significantly lower, revealing a perception gap regarding long-term sustainability.

In Agricultural Diversification, *'Horticulture'* and *'Processing & Value Addition'* were perceived as high-severity challenges, while socio-economic and policy issues were seen as moderate barriers. Overall, the findings emphasize the need for targeted, cluster-specific interventions aligned with farmer perceptions.

Through rigorous statistical analysis of the problems identified under VKSA, more than 500 researchable, extension-related (reflecting knowledge and skill gaps), and development & policy-related issues were systematically identified. In addition, state-wise researchable priorities were mapped to address region-specific challenges. Furthermore, over 300 farmer-led innovations were documented, which hold potential for wider replication following validation by relevant research institutions.

The biggest takeaway from this campaign is that stronger and more coordinated collaboration between the Centre and the States is essential for the successful implementation of future agriculture-related technological programs and schemes. Such coordination will play a vital role in ensuring farmer prosperity and sustainable agricultural development.

Contents

"*Viksit Krishi Sankalp Abhiyan* resolves to make Indian agriculture the mainstay of Viksit Bharat."

Shri Narendra Modi
Prime Minister of India
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1

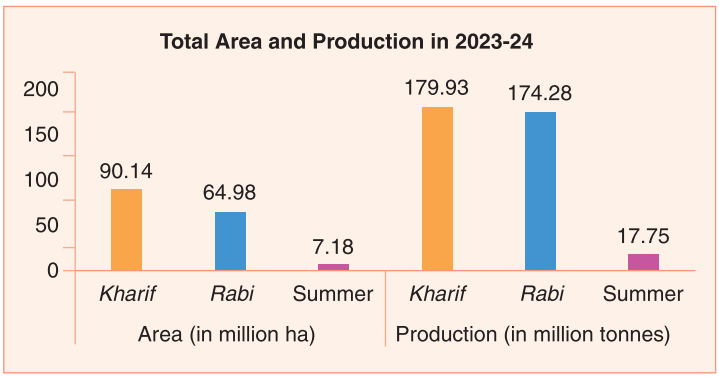
Introduction

INDIA, home to over 1.4 billion people, is the world's most populous country and largest democracy. While the economy is rapidly growing and diversified, agriculture remains the backbone of the economy, supporting nearly half the population and contributing to food security and rural development. The country's diverse agro-climatic zones allow cultivation of a wide variety of crops. Despite technological and policy advancements, challenges such as climate change, land fragmentation, soil and environment degradation persist. Foodgrain production has increased steadily from 50 million tonnes in the 1950s to over 350 million tonnes by 2024-25. Since 2012, annual growth has averaged 8.1 million tonnes, double the post-Green Revolution average, signalling rapid progress. Crop resilience has improved notably, with even 'abnormal' years (droughts, floods) yielding higher outputs than earlier 'normal' years, reflecting widespread adoption of climate-resilient technologies.

1.1 Agriculture Scenario with Reference to *Kharif* Season

Kharif crops are central to India's agriculture, closely tied to the Monsoon. Sown during June–July and harvested by September–October, these crops are critical for food security and raw materials for industry. Their success largely depends on the southwest monsoon. Major crops include paddy, cotton, maize, pulses, oilseeds, millets, etc. cultivated across varied regions according to agro-climatic suitability.

The *Kharif* season dominates in terms of land use, covering 64.06% of the net cultivated area and producing the highest total output of 179.93 million tonnes. On the other hand, *Rabi* crops utilizing 46.18% of the net cultivated area and contributing 174.28 million tonnes to the total output. However, summer season, occupies only 5.10% of the net cultivated area and contributing 17.75 million tonnes to the country's total agricultural production (India Stats, 2024). Paddy dominates *Kharif* cultivation, followed by maize, bajra, pulses,



India must not only fulfil its own needs but also emerge as a global food supplier.

Shri Narendra Modi
Prime Minister of India
Inaugural Address of *Viksit Krishi Sankalp Abhiyan*

oilseeds, and cotton, varying by region, from coastal coconut farming in Kerala and the islands to pulse and millet cultivation in Rajasthan and North-Eastern states.

India has become a global leader in food production, particularly in rice. In 2024-25, rice output is estimated at 149.1 million tonnes, up 26.4% compared to 2019-20.

Kharif farming not only sustains livelihoods but also drives India's food economy, with its success tied to monsoon behaviour, regional crop diversity, and technological support.

1.2 Yield Gap in *Kharif* Crops

A yield gap analysis of major *Kharif* crops shows significant variation, largely due to gaps in farmers' knowledge and capacity. Even under frontline demonstrations with guided extension support, the difference between attainable yield and demonstration yield remains substantial. This indicates that available technologies are not being fully adopted or adapted at the field level. This needs for localized refinement of technologies and stronger support mechanisms to help farmers realise the benefits of existing innovations. Bridging this gap will require a strengthened extension system, systematic capacity building of farmers, and regular, context-specific agro-advisory services. Improved delivery of technologies must be ensured to translate potential yields into attainable yields under farmers' conditions. Effective "Lab-to-Land" interventions will be essential in bridging the existing knowledge and capacity gaps.

2

Viksit Krishi Sankalp Abhiyan (VKSA)

Despite several achievements in agriculture, significant knowledge and capacity gaps still persist. This highlights the urgent need to strengthen extension efforts to bridge the 'Lab-to-Land' gap. In response, the *Viksit Krishi Sankalp Abhiyan* (VKSA) was conceptualized as a national initiative to raise awareness among farmers about the latest improved technologies ahead of the *Kharif* season. It promotes direct farmer–scientist interactions focused on improved technologies for the upcoming *Kharif* season.

> Under *Viksit Krishi Sankalp Abhiyan* our team of scientists will go from lab to land providing information about modern agriculture to farmers with all the data to help the farmers before the season starts.
>
> **Shri Narendra Modi**
> Prime Minister of India
> Inaugural Address of *Viksit Krishi Sankalp Abhiyan*

2.1 Genesis of VKSA

VKSA was inspired by the Hon'ble Prime Minister's launch of 109 high-yielding, climate-resilient, and biofortified crop varieties on August 11, 2024, at ICAR-Indian Agricultural Research Institute, New Delhi. He emphasized on frequent farmer–scientist interactions through KVKs, ICAR institutes, and SAUs to address farming challenges. Despite the extensive National Agricultural Research, Education and Extension System (NAREES) network, low awareness of technologies limits productivity. A targeted campaign was proposed to intensify outreach before crop seasons. This idea was endorsed by the Hon'ble Union Minister of Agriculture in April 2025, leading to the formulation of VKSA to foster two-way learning and tackle emerging issues like climate change, land degradation, and socio-economic stress through strong mechanism of convergence and collaboration.

2.2 Objectives of VKSA

In this context, the proposal has been developed with the following key objectives:

- To create awareness among farmers about improved agricultural technologies including livestock, poultry, fishery, etc.

Hon'ble Prime Minister interacting with farmers and scienists at
ICAR-IARI, New Delhi on 11 August 2024

- To create awareness among the farmers about various government schemes and policies on agricultural development.
- To mobilize the scientific fraternity for reciprocal learning and document grassroots insights for strengthening agricultural research.
- To understand local-level needs and document farmer's feedback on improved technologies and their innovations.

2.3 Duration of VKSA

VKSA was implemented during **29th May** to **12th June 2025**, before start of *Kharif* season.

3

Framework of VKSA

VKSA is built on behavioural change theories, adult learning principles, diffusion of innovations, and systems thinking. It outlines a multi-level strategy, from national planning to village-level execution, supporting effective knowledge transfer (Fig. 1).

At the **macro level**, national leadership provided overall guidance by setting the objectives of the campaign, while also ensuring effective monitoring and resource mobilization. A cross-sectoral knowledge network was established to link institutions, departments, and experts, fostering collaborative learning. At the **intermediate level**, regional plans were shaped by translating national strategies into actionable initiatives, ensuring seamless vertical and horizontal communication, team formation, and stakeholder coordination. This level also ensured multi-institutional monitoring for transparency and accountability.

At the **micro level**, implementation was led by multidisciplinary teams at the district and local levels, facilitating inter-institutional collaboration among KVKs, ICAR experts, and line departments. Ground-level execution focused on direct engagement with farmers through interactive methods such as group discussions, two-way learning, demonstrations, and the distribution of extension literature in local languages. The campaign operated across concentric levels of implementation, national, regional, district, and village, ensuring a strong institutional backbone while reaching deep into the rural landscape. The **village level** was pivotal in bringing scientific knowledge to farmers, enabling real-time feedback and farmer participation.

Outputs

The outputs generated at each level were strategically aligned with the main objective of strengthening the 'Lab-to-Land' approach. At the national level, VKSA contributed to policy formulation and development of a future action plan. The regional level focused on identifying grassroots-level issues and mapping researchable problems with potential solutions. The district level enabled the identification of multidisciplinary researchable issues and expansion of research activities. At the village level, the campaign enhanced farmer awareness about technologies, government schemes, while also enabling timely resolution of farm-level problems and capturing feedback for future research along with documenting farmer innovations. Together, these processes fostered demand-driven agricultural development, ensuring that technology outreach and research were informed by actual field-level needs.

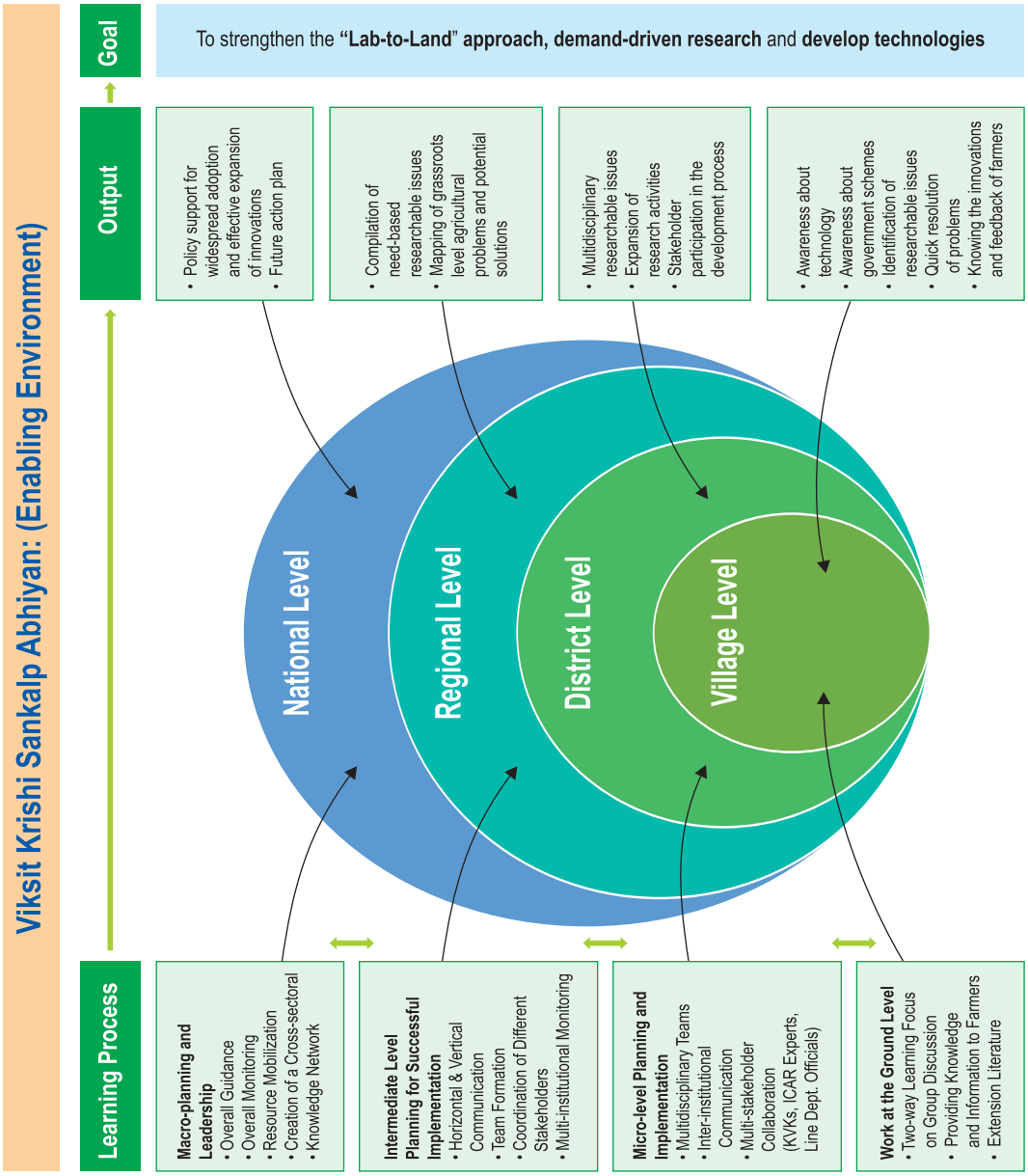


Fig. 1: Framework of VKSA

Goal

To strengthen the "Lab-to-Land" approach by ensuring effective knowledge dissemination and fostering demand driven research based on farmers' field realities.

4

Planning and Methodology

Effective planning and a structured methodology are vital for the success of any extension programme. They ensure alignment with farmers' actual needs, local agro-climatic conditions, and available resources, while also promoting participatory, context-specific, and results-oriented interventions. Together, these elements form the backbone of VKSA's field-level implementation.

Timeline of Planning of VKSA

- **April 26, 2025:** VKSA conceptualized under the leadership of the Hon'ble Minister of Agriculture & Farmers Welfare.
- **May 08, 2025:** The Hon'ble Minister launched the promotional video, marking the public introduction of the campaign during *Kharif* conference..
- **May 9, 2025:** Secretary, DARE and Director General, ICAR reviewed campaign preparations and provided valuable inputs for planning and execution.
- **May 15, 2025:** Multidisciplinary teams constituted to implement campaign activities at the grassroots.
- **May 18, 2025:** Campaign preparations reviewed by the Hon'ble Minister at a high-level meeting held in Nagpur.
- **May 19, 2025:** Press conference held by the Hon'ble Minister of A&FW at National Media Centre, New Delhi to brief media about VKSA objectives and strategy.
- **May 20, 2025:** Action plan and district-wise route maps for field teams finalized to ensure systematic execution of VKSA.
- **May 23, 2025:** Developed promotional materials and extension literature in local languages to support effective communication with farming community.
- **May 24, 2025:** Presented planning, monitoring and execution strategy of VKSA and interaction with teams at ICAR Convention Centre, NASC Complex, Pusa, New Delhi, chaired by the Hon'ble Minister of A&FW.
- **May 25, 2025:** Invitations extended to VVIPs, public representatives, and senior officials for the campaign launch.
- **May 27, 2025:** Curtain raiser of VKSA launched by Hon'ble Minister of Agriculture & Farmers Welfare at Akash Hall, ICAR Convention Centre, NASC Complex, Pusa, New Delhi.

Press conference at National Media Centre, New Delhi
to brief about VKSA on 19 May 2025

4.1 Convergence and Coordination

Convergence and coordination are essential for the effective implementation of any extension programme. They align the efforts of key stakeholders including ICAR Institutes, KVKs, Line Departments, NGOs, and private agencies for greater collective impact. Convergence leverages resources, technologies, and schemes across sectors, reducing duplication and enhancing efficiency. Coordination ensures timely communication, defined roles, and joint action. To translate VKSA's aim into effective field-level outcomes, a focused strategy was adopted to strengthen convergence and coordination for wider participation and outreach.

VKSA was executed through a convergence-based strategy *'One Nation – One Agriculture – One Team'* ensuring unified action across the country. Indian Council of Agricultural Research (ICAR) and the Department of Agriculture & Farmers Welfare (DA&FW) constituted a national-level core group to plan and coordinate activities. Support from State Governments, Agricultural Universities, and local administration was mobilized through formal communications from central leadership.

4.2 Multi-Pronged Mobilization Strategy

A comprehensive mobilization strategy was implemented to ensure strong participation from both rural communities and public representatives. Community mobilization involved leveraging Block Technology Managers (BTMs) and Assistant Block Technology Managers (ABTMs) under the ATMA scheme, issuing press notes, using social media, sharing the 'Route Map Calendar', and targeting diverse stakeholders including farmers, SHGs, FPOs, and others. Public representatives such as Hon'ble Chief Ministers (CMs), Ministers (Central as well as State Government), Members of Parliament (MPs), and Members of Legislative Assemblies (MLAs) were formally invited, with all protocols observed, to enhance the campaign's reach and credibility.

4.3 Dynamic Communication and Outreach Tools

The campaign used both traditional and modern communication methods to ensure impact. ICAR Institutes and KVKs prepared location and season-specific extension materials including PoPs, pamphlets and posters. A key outreach element was 'a mobile van' with an LCD screen showcasing videos and success stories as 'Raths'.

4.4 Formation of Teams

The success of the VKSA heavily relied on the effective functioning of multidisciplinary field teams. These teams were carefully formed to include members from ICAR Institutes, KVKs, State Departments, Agricultural Universities, and other relevant organizations, ensuring diverse expertise and strong inter-institutional coordination. The responsibility for team formation and deployment was assigned to ATARI Directors and KVK Heads.

To ensure wider coverage and efficient outreach, 3 multidisciplinary teams were constituted per district. Each team was led by a KVK Subject Matter Specialist (SMS), while the Head of the KVK acted as the district-level Nodal Officer, responsible for overall planning, coordination, and scheduling of team visits across selected villages. A total of 2,170 teams were formed nationwide. Each team visited 2–3 locations, representing clusters of 3-5 villages, and conducted farmer-scientist interactions and discussion.

4.5 Role of Agricultural Extension Division in VKSA

The overall responsibility of implementation of the *Viksit Krishi Sankalp Abhiyan* (VKSA) was entrusted to the Agricultural Extension Division of ICAR, as the Nodal SMD (Subject Matter Division). This Division ensured proper planning, smooth execution, monitoring and effective convergence of efforts across the country. It provided strategic guidance,

technical support, and institutional linkages for the *Abhiyan*, while also coordinating closely with other SMDs, ATARIs, KVKs, AUs, State Departments, and related stakeholders.

A dedicated **Control Room** was established in this Division to serve as the operational hub of the campaign. It ensured smooth coordination by supporting field teams in resolving logistical challenges, monitoring the accuracy and completeness of data submitted on the digital dashboard, and compiling daily summaries and progress reports for top leadership at ICAR and the Ministry of Agriculture and Farmers Welfare.

Review of preparation of VKSA by Secretary (DARE) & DG (ICAR)

Control room for monitoring of VKSA

The Division played a key role in gathering field-level inputs, tracking implementation progress, analysing outcomes, and documenting learnings to support evidence-based policies and programmes. By performing this role, the Division ensured that the objectives of VKSA were achieved in a well-organized and impactful manner.

4.6 Monitoring and Reporting Framework

A comprehensive monitoring and coordination system was established to ensure smooth execution and real-time tracking of VKSA activities across the country. This framework was built on two pillars: a hierarchical structure of Nodal Officers and digital tools for communication and reporting.

4.6.1 Nodal Officer-Based Coordination Structure

Senior ICAR officials and Vice-Chancellors of Central Agricultural Universities were designated as State or Hub-level Nodal Officers. These officers were responsible for supervising campaign activities in their respective regions, ensuring adherence to guidelines and timelines. They also facilitated coordination among ICAR Institutes, KVKs, and state-level agencies, addressed operational issues, and provided regular feedback to the central leadership for timely support and corrective actions.

Similarly, Nodal Officers from the State and Central Governments were designated to oversee close monitoring and facilitate coordination among stakeholders.

4.6.2 Key Monitoring & Reporting Mechanisms

- **National and State-Level monitoring:** Led by ICAR and DA&FW (GoI) at National Level whereas and ATARIs and State Nodal Officers at state level.
- **Digital Dashboard:** A customized platform (https://vikalp.kisansarathi.in) was developed for daily reporting of VKSA activities. This makes transparent and accountable reporting by each team, updated on daily basis.
- **Media Cell:** A dedicated media cell was established at ICAR-DKMA to manage all aspects of communication, media outreach, and public engagement. This unit spearheaded strategic communication efforts by preparing press releases, managing social media platforms, etc. It played a crucial role in enhancing the campaign's visibility, creating public awareness, and strengthening its overall impact.

5

Major Achievements under VKSA

UNDER the leadership of Hon'ble Union Minister of Agriculture and Farmers Welfare, Shri Shivraj Singh Chouhan, the *Viksit Krishi Sankalp Abhiyan-2025 (Kharif)* was launched across the country. This 15-days national campaign was inaugurated on 29th May 2025 from Puri, Odisha with recorded address by the Hon'ble Prime Minister. The campaign was a historic initiative aimed at bridging the 'Lab-to-Land' gap. The major achievements under VKSA are as follows:

5.1 Achievements across India

Under VKSA, a total of 2,170 teams organized 60,917 programs for creating awareness amongst farmers about latest improved technologies recommended for *Kharif* seasons. More than 1.35 crore farmers (95.7 lakh men and 39.7 lakh women) belonging to over 1.40 lakh villages covering 728 districts, participated in these programs. A wide range of farmer-centric activities were conducted during these programs. The campaign ensured extensive grassroots outreach, covering diverse agro-climatic zones and socio-economic settings across 34 States and Union Territories.

Hon'ble Prime Minister addressing the National Level Inaugural of VKSA (recorded message) at Puri, Odisha on 29 May 2025

Release of fish vaccine (CIFA Argu VAX–I) during VKSA program

Uttar Pradesh led in farmer participation with over 23.8 lakh, followed by Odisha (12.0 lakh) and Maharashtra (10.5 lakh). In terms of the number of programs conducted, Madhya Pradesh (6,909), Uttar Pradesh (5,969), Bihar (4,652), and Maharashtra (4,382) stood out.

Major Achievements across India

- No. of teams : 2,170
- No. of programs : 60,917
- No. of villages covered : 1,40,107
- No. of districts covered : 728
- No. farmers (men) participated : 95,69,693
- No. of farm women participated : 39,72,412
- Total No. of farmers participated : 1,35,42,105

Significant outreach was also observed in Assam, Karnataka, Rajasthan, Tamil Nadu, and Gujarat, each mobilizing hundreds of thousands of farmers. Notably, smaller states and UTs such as Ladakh, Lakshadweep, Goa, Puducherry, and the Andaman & Nicobar Islands also actively participated, ensuring all India coverage. The gender-wise participation indicates considerable involvement of women, particularly in states like Assam, Odisha, Himachal Pradesh, and Jharkhand. This indicates increasing role of women in agriculture and rural leadership.

Overall, the VKSA achieved wide geographical coverage and significant farmer engagement, reflecting effective mobilization and strong coordination among KVKs, ICAR institutes, and the state extension system. This reinforced the strength of participatory extension for achieving national agricultural transformation goals.

Union Minister of Agriculture & Farmers Welfare interacting with farmers in VKSA

5.2 Women Participation

Out of the total farmers, 39,72,412 were women, accounting for 29.3% of overall farmer participation. This data provided a valuable basis for assessing the extent of gender inclusiveness achieved during the campaign.

In terms of absolute numbers, the highest women participation was recorded in Uttar Pradesh (5.33 lakh), Odisha (5.07 lakh), Assam (2.39 lakh), Maharashtra (2.09 lakh), and Karnataka (1.71 lakh). However, absolute figures alone do not tell the full story. When assessed proportionally, several states demonstrated a much higher degree of gender inclusiveness. Meghalaya had the highest proportion of women participants at 64.6%, followed by Arunachal Pradesh (55.9%), Ladakh (53.5%), Himachal Pradesh (52.4%), and Assam (52.9%). This indicates that in these regions, the inclusive approach of the campaign with strong community engagement.

A special mention must be made of the North Eastern States, which performed exceptionally well in terms of proportional women participation. All eight states from this region namely Arunachal Pradesh (55.9%), Assam (52.9%), Manipur (44.8%), Meghalaya (64.6%), Mizoram (42.9%), Nagaland (44.0%), Sikkim (36.8%), and Tripura (34.3%) recorded women participation rates above the national average of 29.3%. Among them, Meghalaya,

View of participation of farm women in VKSA

Minister of State for Agriculture & Farmers Welfare in VKSA

Arunachal Pradesh, and Assam stood out with women comprising more than half of all participants. These figures reflect the pivotal role of women in agriculture in the North Eastern States and highlight the success of context-specific outreach and mobilisation strategies in these culturally distinct states.

On the other hand, some states demonstrated relatively low proportional participation of women, despite having high overall outreach numbers. For example, Haryana (10.4%),

Punjab (11.4%), Madhya Pradesh (16.4%), Maharashtra (19.8%), Uttar Pradesh (22.3), Gujarat (22.4%), Rajasthan (23.5%), Chhattisgarh (23.7%) and Telangana (25.2%) had a comparatively limited share of women participants. These figures suggest potential structural or social constraints affecting women's engagement in extension activities and underline the need for more gender-targeted interventions in such regions.

Union Minister of Agriculture & Farmers Welfare honouring a farm woman during VKSA

5.3 Achievements in Tribal Districts

VKSA also organised programmes in 176 tribal districts across India. A total of 15,445 programs were organized by 504 teams, with participation over 25.5 lakh farmers including 15.42 lakh male and 10.10 lakh female farmers of 31,048 villages.

Tribal Districts

• No. of teams	:	504
• No. of programs	:	15,445
• No. of villages covered	:	31,048
• No. of districts covered	:	176
• No. farmers (men) participated	:	15,41,712
• No. of farm women participated	:	10,10,404
• Total No. of farmers participated	:	25,52,116

Among the states, Odisha recorded the highest farmer participation in tribal districts, reaching out to 5.83 lakh farmers through 948 programs followed by Madhya Pradesh with 2,719 programs and 2.93 lakh farmers, and Jharkhand, where 2,107 programs engaged 2.38

lakh tribal farmers. Other states with significant farmer participation included Chhattisgarh (1.60 lakh), Gujarat (1.58 lakh), and Assam (1.30 lakh).

In terms of the number of programs, Madhya Pradesh, Jharkhand, Chhattisgarh, and Arunachal Pradesh were the leading contributors. States from the North East such as Nagaland, Mizoram, Meghalaya, and Manipur also conducted substantial activities, ensuring deeper penetration in tribal-dominated areas. Even smaller and remote Union Territories like Ladakh, Lakshadweep, and the Andaman & Nicobar Islands played an active role, reaching thousands of tribal farmers, which highlights the inclusiveness and comprehensive geographic spread of the campaign.

An encouraging feature was the high involvement of women farmers in many tribal districts particularly in Jharkhand, Arunachal Pradesh, Assam, Mizoram, and Odisha indicating increasing awareness and participation of tribal women in agriculture and allied activities. Overall, VKSA's implementation in tribal districts successfully targeted remote and tribal farming communities, strengthening outreach, technology dissemination, and farmer empowerment in some of the most vulnerable regions of the country.

Minister of State for Agriculture & Farmers Welfare in VKSA

5.4 Achievements in Aspirational Districts

Activities under VKSA also conducted in 112 aspirational districts across 27 States/UTs. A total of 9,864 programs were organized reaching over 19.89 lakh farmers, including 13.34 lakh male and 6.55 lakh female farmers of 23,483 villages, . Uttar Pradesh led with the highest farmer outreach in aspirational districts, mobilizing 2.93 lakh farmers through 818 programs. It was followed by Odisha with 3.08 lakh farmers, Jharkhand (2.35 lakh), and Bihar (2.18 lakh), indicating robust participation in Eastern part of India where most aspirational districts are located.

Aspirational Districts

- No. of teams : 325
- No. of programs : 9,864
- No. of villages covered : 23,483
- No. of districts covered : 112
- No. farmers (men) participated : 13,34,204
- No. of farm women participated : 6,55,466
- Total No. of farmers participated : 19,89,670

States like Madhya Pradesh (912), Chhattisgarh (829), and Rajasthan (472) also conducted a significant number of programs with impressive farmer participation. Assam, Maharashtra, and Andhra Pradesh also recorded widespread outreach.

In smaller states and hilly/remote regions like Sikkim, Mizoram, Manipur, and Himachal Pradesh, targeted efforts were made to reach farmers, albeit on a smaller scale. Despite limited coverage, high levels of farmer engagement were seen relative to population size, showcasing the inclusivity of VKSA.

The campaign witnessed substantial female farmer participation in several districts particularly in Jharkhand, Odisha and Assam reinforcing the role of women in driving rural transformation.

Overall, VKSA's execution in aspirational districts demonstrated its strategic alignment with national priorities of uplifting backward regions. Through focused interventions and multi-stakeholder collaboration, the initiative succeeded in enhancing awareness about technologies in some of the most developmentally challenged districts of India.

5.5 Participation of Public Representatives

The success and high visibility of the VKSA was greatly enhanced by the active participation of VVIPs and VIPs across the country. The involvement of Chief Ministers, Union and State Ministers, MPs, and MLAs boosted the morale of field teams and farmers, while drawing significant media coverage that helped amplify the campaign's core messages.

Chief Ministers of Uttar Pradesh & Maharashtra and Union Minister of Agriculture & Farmers Welfare interacting with farmers during VKSA

Union Minister of Agriculture & Farmers Welfare interacting with Media during VKSA

This alignment of political leadership with grassroots scientific outreach reflected a strong, unified commitment to agricultural development and farmer welfare. A total of 9 Chief Ministers and 17 Union Ministers participated in VKSA, respectively. Further, 48 ministers of different State Governments, 87 MPs, and 158 MLAs participated in VKSA, respectively.

5.6 Media Coverage (Print, Electronic & Social)

Through social media, the campaign successfully reached more than 5.5 crore people. More than 1,000 articles related to the campaign were published in about 200 editions of leading national newspapers. Around 31 programs were broadcast on DD Kisan, and 850 programs were aired on All India Radio. Besides this, there was also coverage at regional and local level.

TO BOOST AGRI SECTOR| Experts from agricultural varsities & farmers to conduct outreach across 2,931 clusters in 235 talukas

CM Patel launches Viksit Krushi Sankalp Abhiyan

FPJ News Service

लोकमत

प्रयोगशील शेतकऱ्यांना 'कृषी संशोधक' मान्यता द्या : फडणवीस

मुख्यमंत्र्यांचे विद्यापीठांना निर्देश; संयुक्त कृषी संशोधन व विकास समिती बैठकीचे उद्घाटन

किसान कल्याण के लिए हो शोध: रामनाथ

శాస్త్రీయ వ్యవసాయంతోనే ఆరోగ్యం

కృషి ట్రాక్టర్‌ని పంపిణీ చేస్తున్న ఎమ్మెల్యే

THE INDIAN EXPRESS

Shivraj rides tractor, tries direct seeding: 'If Krishi mantri cannot drive a tractor, then how can he understand the pain of farmers'

Hails PAU's direct seeding tech as a 'sanjeevani' for groundwater

ENS & PTI

Union Agriculture and Farmers' Welfare Minister Shivraj Singh Chouhan rides a tractor alone with Punjab

6

Identification of Issues and Problems of Farmers

One of the key objectives of the VKSA was to systematically collect feedback directly from farmers regarding the diverse agriculture-related problems and challenges they are currently facing. The core purpose of this exercise was to ensure that field-level realities are accurately captured, enabling a bottom-up approach for problem identification. By gathering this ground-level data through participatory methods subjected to scientific analysis and prioritisation, taking into account regional variations and severity of problems. The ultimate goal was to utilize these insights to identify demand-driven research priorities, formulate effective extension strategies, and design appropriate policy interventions aimed at ensuring sustainable agricultural development. This ultimately helps in the development of state-specific, need-based action plans. The detailed methodology employed for identifying and assessing the severity of problems in each State and Union Territory is presented below, along with the corresponding results.

6.1 Methodology for Identification of Problems

A robust and methodologically sound approach was undertaken to systematically identify and assess the key challenges confronting farmers in agriculture and allied sectors. As part of this study, a semi-structured open ended interview schedule was developed for collecting data from farmers during Focused Group Discussions (FGDs), and a comprehensive questionnaire was designed to quantify the severity of identified problems. The objective was to generate field-based, context-specific evidence to guide research priorities, strengthen extension strategies, and inform relevant policy interventions.

A representative sample of 448 districts covering 34 States and Union Territories was purposively selected to ensure equitable coverage across the diverse agro-climatic zones and regions of the country. KVKs of these districts conducted a total of 11,477 Focused Group Discussions (FGDs) during the VKSA within area of their route map. A total of 1,63,650 farmers including 55,250 farm women actively participated in these discussions. The FGDs facilitated the articulation of grassroots-level concerns and issues related to agriculture and allied sectors. Based on thematic analysis, the issues were classified into three categories: (i) researchable issues, requiring demand driven scientific inquiry and technological innovation; (ii) extension-related issues, necessitating knowledge and skill gap analysis for targeted capacity building and location-specific unified agro-advisory

services; and (iii) policy-level issues, warranting systemic interventions through regulatory or institutional reforms.

Data on various issues emerging from FGDs were systematically captured by field teams using semi-structured open ended interview schedule. To quantify severity of each identified issue, including their corresponding sub-issues, questionnaire was subsequently provided to the participating KVKs. They were asked to rate each item on a 10-point severity scale, where a score of 1 denoted 'minimal severity' and 10 indicated 'extreme severity'. For the purpose of thematic synthesis and analytical clarity, all identified problems or issues were grouped into 20 broad categories, as outlined in Table 6.1. State and Union Territory-wise ranking of these identified problems is presented in *Annexure-I*.

Ranking was assigned, based on severity score, at both the key-issue and sub-issue levels for each state and UT. The rank positions were determined in descending order of arithmetic mean i.e., highest rank (*viz.* I) has been given to the highest arithmetic mean. Accordingly, other ranks were given based on the descending order of arithmetic mean.

Typology-based ranking frameworks ensured that intra-state diversity was reflected in prioritisation of issues. The arithmetic mean was determined for all the States and UTs, as previously specified, at both the key issue and sub-issue levels.

Table 6.1. Meta-level problems/issues perceived by farmers during VKSA FGD

S. No.	Problems/Issues of farmers	S. No.	Problems/Issues of farmers
1.	Seeds & Improved Varieties	11.	Livestock Production & Dairy
2.	Plant Protection Measures	12.	Poultry Farming
3.	Fertilizer and Nutrient Management	13.	Pig Farming
4.	Protected Cultivation	14.	Fish Farming
5.	Farm Machinery & Implements	15.	Fodder Production
6.	Soil Health Management	16.	Horticulture Including Vegetables
7.	Water Management	17.	Processing & Value Addition
8.	Climate Change and its Impact	18.	Socio-economic Issues
9.	Bio-diversity Erosion	19.	Institutional and Policy
10.	Energy in Agriculture	20.	Miscellaneous Issues

6.2 Diagnostic Matrix of Problems

The matrix of problems identified during FGDs were systematically ranked as outlined above. For each State or Union Territory, the problem receiving the highest severity mean score was assigned the first rank, indicating its critical importance, while problems with lower mean scores were ranked accordingly in descending order of severity. This ranking process helped to prioritize issues that require immediate attention through targeted research, extension, or policy interventions.

Out of 20 identified problems, 11 most commonly and widely prevalent problems across multiple states were shortlisted for matrix analysis. Keeping in view of the size and agro-climatic conditions; the States/UTs were grouped based on cultivable area, farming population, and ecological heterogeneity into four categories: 1) Large States - Uttar Pradesh, Maharashtra, Bihar, Madhya Pradesh, Rajasthan, Karnataka, Tamil Nadu, West Bengal, Andhra Pradesh, and Gujarat; (2) Medium size states - Punjab, Haryana, Jharkhand, Chhattisgarh, Odisha, Kerala, and Telangana; (3) Small States/UTs - Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Delhi, Goa, Andaman & Nicobar Islands, Puducherry, Lakshadweep, and Ladakh; and (4) North-Eastern Region - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, and Sikkim.

6.2.1 Reflections of Problems of Large States

The valuable insights into the most pressing agricultural issues across ten large Indian states are given in Table 6.2. A clear pattern emerged where '*Seeds & improved Varieties'*

consistently rank among the top three problems in states such as Uttar Pradesh, Tamil Nadu, Madhya Pradesh, and West Bengal. This indicates a widespread concern regarding the accessibility, availability, quality, or adaptability of seeds to local and changing climatic conditions. Similarly, *'Climate Change & its Impact'* emerged as a major problem, receiving top rankings in Bihar, Karnataka, Rajasthan and Gujarat, highlighting farmers' increasing awareness and vulnerability to erratic weather, extreme events, and shifts in growing conditions. *'Water Management'* is also repeatedly ranked among the top concerns, especially in arid and semi-arid states like Maharashtra and Rajasthan, reaffirming the urgency of improving irrigation access and water-use efficiency.

Other problems such as *'Soil Health Management'* and *'Farm Machinery & Implements'* showed medium-level concern across several states, indicating a growing need for sustainable soil management practices and regionally appropriate mechanization solutions. On the other hand, *'Plant Protection Measures'*, *'Livestock Production & Dairy'*, *'Fodder Production'*, and *'Institutional Issues'* generally received lower priority, possibly reflecting either lower visibility or less immediate impact from the farmers' perspective. Interestingly, *'Horticulture including Vegetables'* is ranked as the most severe issue in West Bengal, suggesting that states with significant horticultural activity perceived distinct challenges. Overall, the matrix highlighted both common and region-specific problems, emphasizing the need for a two-tiered approach—national-level support for universally critical issues like seeds and climate resilience, and decentralized, state-specific interventions for localized priorities.

Table 6.2. Diagnostic matrix of agricultural problems in large states

State	Seeds	Climate Change	Soil Health	Fertilizer	Water Management	Farm Machinery	Plant Protection	Livestock	Fodder	Horticulture	Institutional
Uttar Pradesh	1	5	3	7	2	4	8	9	9	6	11
Maharashtra	4	6	2	12	1	5	13	8	11	3	10
Bihar	2	1	9	3	4	5	8	7	11	4	2
Madhya Pradesh	1	5	6	5	2	4	3	10	15	8	14
Rajasthan	3	2	9	8	1	4	8	5	6	7	12
Karnataka	4	1	2	11	3	7	9	8	10	5	13
Tamil Nadu	1	7	3	8	2	6	4	9	11	5	7
West Bengal	1	2	4	8	3	3	6	7	9	1	5
Andhra Pradesh	2	1	5	3	4	6	7	9	10	4	9
Gujarat	4	1	3	4	2	7	5	8	12	6	13

Implications and Suggestions

- **Strengthening Seed Systems:** Seeds consistently ranked among the top issues, indicating the need for region-specific seed production system, timely distribution, and improved breeder- foundation-certified seed linkages.
- **Addressing Climate Resilience:** High concern for climate change necessitates developing Climate Resilient Villages (CRVs), scaling up resilient crop varieties, crop diversification, and weather-based unified advisory services across agro-climatic zones.
- **Boosting Mechanization:** Machinery and implements ranked high, pointing to the need for subsidy reforms, custom hiring centres (CHCs), and state-specific mechanization strategies for smallholders.
- **Improved Input Access and Regulation:** Fertilizers and plant protection inputs need better regulatory oversight and localized capacity building and guidance to ensure efficient and safe use.
- **Water Resource Management:** States like Maharashtra and Rajasthan highlighted water as a major issue, underscoring the need to expand micro-irrigation systems, strengthen watershed development using advanced tools and technologies, and invest in groundwater recharge infrastructure. There is also a need for improving water access through solar-powered irrigation systems and enhancing overall water use efficiency in agriculture.
- **Capacity Building for Effective Technology Delivery:** The analysis clearly highlighted the need for KVKs to prioritise need-based capacity building programs to bridge gaps in farmers' knowledge and skills. This requires organising customised training programmes and demonstrations on latest improved varieties of various *Kharif* crops, pest and disease management, sustainable soil management practices and crop-specific mechanisation options suited to smallholders. Focused approach to strengthen demonstrations and advisory services on climate-resilient technologies and diversified cropping systems.

6.2.2 Reflections of Problems of Medium-size States

The perspectives of farmers from medium-sized states regarding key agricultural problems, reveaed both commonalities and state-specific concerns (Table 6.3). *'Seeds & Improved Varieties'* consistently emerge as a top concern, ranked among the top three in nearly all states, including Punjab, Haryana, Telangana, and Odisha. This reaffirmed the critical importance of ensuring timely access to quality and climate resilient seeds. *'Water Management'* also stoods out as a widespread challenge, securing the top rank in Haryana and Telangana, and a high priority in others like Punjab, pointing to persistent issues with irrigation infrastructure, water availability, and recharging structures.

Table 6.3. Diagnostic matrix of agricultural problems in medium size states

State	Seeds	Climate Change	Soil Health	Ferti-lizer	Water Manage-ment	Farm Machinery	Plant Protec-tion	Live-stock	Fodder	Horti-culture	Institu-tional
Punjab	3	7	1	2	2	3	4	6	9	11	10
Haryana	2	4	3	8	1	6	7	6	7	4	10
Jharkhand	2	1	4	8	3	3	6	5	7	3	8
Chhattisgarh	1	7	6	9	2	6	4	8	10	5	13
Odisha	1	4	7	9	2	10	8	5	12	6	14
Kerala	5	3	8	10	7	4	6	5	8	1	9
Telangana	2	4	3	8	1	6	9	12	14	5	7

'Climate Change & its Impact' featured prominently across many states, especially in Jharkhand and Kerala, underscoring increasing farmer awareness about erratic weather and its implications. Similarly, *'Soil Health Management'* and *'Fertilizer and Nutrient Management'* issues were recognized but vary in ranking, likely reflecting differences in soil conditions and input access across agro-ecological zones. In contrast, issues such as *'Fodder Production'*, *'Institutional and Policy'*, and *'Horticulture including Vegetables'* received lower priority in most states, though Kerala is a notable outlier, ranking horticulture highest, likely due to its cropping patterns and reliance on plantation crops. Overall, the table highlighted the need for both universal interventions, particularly for seed systems and water management, and customised state-level responses that reflect regional agro-climatic and institutional realities.

Implications and Suggestions

- **Seed Quality & Accessibility:** Seeds remained a dominant concern; states need decentralised seed hubs, farmer seed banks, and partnerships with private players to enhance access. Extension system needs to create awareness about quality seeds and its availability.
- **Localized Water Solutions:** With water issues topping the list in multiple states, policies must promote convergence of irrigation schemes, farm ponds, and demand-side water management. There is also need for improving recharge of ground water, sensor-based irrigation (Alternate Wetting and Drying for water-saving) and enhancing overall water use efficiency in agriculture.
- **Climate-Specific Interventions:** Jharkhand and Chhattisgarh prioritized climate change, indicating the need for agro-climatic adaptation packages and early warning

systems. Technology support is needed to develop real time district/block level plan. Capacity development of all stakeholders on climate literacy is a key to counter the adverse impact of climate change.

- **Soil Health Monitoring:** Moderate concerns for soil health indicated opportunities for scaling up Soil Health Card based recommended usage, precision nutrient management, and promotion of organic amendments. Also need to encourage natural friendly solutions such as conservation agriculture, regenerative agriculture, natural farming, etc.
- **Livestock & Fodder in Semi-Arid Regions:** While ranked lower overall, some states showed moderate concern, suggesting fodder development programs and cross-sector linkages in rainfed zones. There is a need to emphasize district-level fodder development plans, promote seed production of fodder crops, encourage silage & hay making, and establish community fodder banks.
- **Capacity Building for Effective Technology Delivery:** Both frontline and field extension system should strengthen their efforts in location specific customised capacity building, particularly on timely access and use of quality seeds, efficient water-use technologies, integrated nutrient & soil health management, and climate-resilient practices. Priority should be given to organising state-specific training programmes and demonstrations on micro-irrigation, rainwater harvesting, and use of regionally adapted crop varieties. Given the prevalence of climate-related challenges, there is need to must also expand the delivery of weather-based agro-advisories and promote diversification and resilient cropping systems. Customisation of interventions is essential, especially for states like Kerala where horticulture is a priority, requiring specialised technical support in plantation and vegetable crop management. KVKs should also proactively organise capacity-building programmes on fodder production in semi-arid regions.

6.2.3 Reflections of Problems of Small States or UTs

Farmers from small states and Union Territories faced various agricultural challenges. A key observation is that no single issue dominates across all regions, but several patterns were revealed from Table 6.4. *'Climate Change & its Impact'* and *'Water Management'* consistently received high concern, particularly in states like Himachal Pradesh, Uttarakhand, Goa, and Ladakh, areas prone to fragile ecosystems, extreme weather, and limited irrigation infrastructure. Similarly, *'Seeds & Improved Varieties'* were ranked among the top three issues in A&N Islands, Ladakh, and Goa, highlighting concerns about timely access to quality and location-specific planting material, especially in remote or island territories.

Table 6.4. Diagnostic matrix of agricultural problems in small states and UTs

State/UT	Seeds	Climate Change	Soil Health	Ferti-lizer	Water Manage-ment	Farm Machin-nery	Plant Protec-tion	Live-stock	Fodder	Horti-culture	Institu-tional
Jammu & Kashmir	3	4	7	7	3	5	6	3	2	1	9
Himachal Pradesh	4	1	5	5	4	3	3	4	5	2	8
Uttarakhand	5	1	4	10	2	6	7	9	12	3	11
Delhi	8	11	4	9	3	10	4	3	5	2	1
Goa	3	2	4	10	6	3	7	5	6	1	11
A&N Islands	1	1	4	7	3	6	9	4	6	2	5
Puducherry	8	2	3	10	7	4	10	2	3	1	6
Lakshadweep	3	2	3	3	3	6	3	1	5	1	5
Ladakh	2	2	1	4	3	4	2	3	1	3	4

Interestingly, *'Horticulture including Vegetables'* is often ranked as the most pressing concern, particularly in Jammu & Kashmir, Goa, Puducherry, and Lakshadweep—states where high-value horticultural crops and perishables dominate the cropping systems. This suggests a strong need for investment in post-harvest infrastructure, value addition, and market linkages in these regions. *'Livestock Production & Dairy'* and *'Fodder Production'* issues were perceived as moderately important, particularly in hilly states like Uttarakhand and Ladakh where animal husbandry plays a vital role in livelihoods. In contrast, *'Institutional & Policy'* issues are generally ranked low, possibly indicating less visibility or understanding of systemic or administrative bottlenecks among farmers.

Overall, there is need for context-specific agricultural policies in small states, especially focused on climate resilience, horticultural value chains, and localized input support. Customised extension services, capacity development of all stakeholders is key, improved access to seeds, and better water-use strategies are crucial to address the unique challenges of these diverse agro-ecological and administrative units.

Implications and Suggestions

- **Horticulture Development:** High concern for horticulture in several states (e.g., J&K, Goa, Puducherry) requires focused investments in cold chains, processing, and niche market access.
- **Adaptation to Climate Variability:** States like Uttarakhand, Himachal Pradesh, and Ladakh prioritize climate change, calling for integrated watershed management and

resilient cropping systems. An effective early warning system, implementation of real-time contingency plans, and timely availability of critical inputs are essential for ensuring success in agricultural resilience and productivity.

- **Seed Supply in Remote Areas:** Issues in A&N Islands, Ladakh, and Lakshadweep suggest a need for logistics-based policies ensuring timely delivery of inputs to remote and insular regions. There is a need to implement targeted programmes for developing a robust seed chain in these areas to ensure timely availability of quality seeds to farmers.
- **Integrated Farming Systems (IFS):** Moderate concern for livestock and fodder underscores the relevance of promoting livestock–horticulture–crop integration models, especially in hilly areas. Special plans are required to promote IFS interventions to effectively address climate change while enhancing farmers' income and generating rural employment opportunities.
- **Institutional Access & Outreach:** Generally low ranking of institutional issues highlighted the urgent need for awareness generation, enhanced access to ICT-based advisory services, and inclusive policy communication. To address this, an appropriate strategy must be developed that integrates capacity building, digital outreach, and participatory communication mechanisms.
- **Capacity Building for Effective Technology Delivery:** KVKs need to adopt location-specific extension strategies with strong emphasis on capacity building customised to fragile and diverse agro-ecological conditions. Priority should be given to enhancing farmer knowledge and skills in climate-resilient practices, efficient water management and access to quality seed and planting material suited to remote areas. KVKs should focus on demonstrations and training related to post-harvest handling, value addition and market linkage development in horticulture dominant areas. Strengthening training on fodder development and livestock management in hilly and island regions will also be important.

6.2.4 Reflections of Problems of North-Eastern States

Key agricultural challenges of farmers in the North Eastern (NE) states, revealing unique yet overlapping concerns across this ecologically and climate sensitive and diverse region as indicated in Table 6.5. *'Seeds & Improved Varieties'* and *'Climate Change & its Impact'* emerge as the most frequently ranked top issues, with seeds ranked first in Manipur, Meghalaya, and Tripura, and *'Climate Change'* topping the list in Arunachal Pradesh, Meghalaya, and Nagaland. This underscores the region's vulnerability to climate variability and the critical need for better access to quality seeds suited to hilly terrains, short growing seasons, and shifting rainfall patterns.

Table 6.5. Diagnostic matrix of agricultural problems in North Eastern States

State	Seeds	Climate Change	Soil Health	Fertilizer	Water Management	Farm Machinery	Plant Protection	Livestock	Fodder	Horticulture	Institutional
Arunachal Pradesh	4	1	3	12	2	5	15	8	10	8	9
Assam	3	2	6	11	1	4	5	9	8	7	10
Manipur	1	2	5	6	7	6	8	4	5	2	4
Meghalaya	1	1	3	6	4	3	7	2	4	1	4
Mizoram	3	3	5	5	6	4	7	3	7	2	4
Nagaland	3	1	4	7	5	4	9	3	6	4	5
Tripura	1	2	2	4	4	2	7	1	2	2	2
Sikkim	5	2	2	3	1	2	4	3	2	2	6

'Water Management' is also consistently prioritized, with states like Assam and Sikkim ranking it as the number one concern. Despite the abundance of water in the region, water scarcity during the dry and lean periods remained a serious concern, clearly pointing to inadequate water harvesting infrastructure and practices. There is an urgent need to prioritize water harvesting through focused investment plans and campaigns such as 'Catch the Rain'. This highlights challenges related to irrigation infrastructure, especially in areas with erratic monsoons or inadequate water harvesting systems. In contrast, *'Farm Machinery & Implements'* received moderate rankings, possibly due to the difficult terrain and limited mechanization suitability in most of these states. Meanwhile, *'Fodder Production'* and *'Livestock Production & Dairy'* issues received relatively higher concern in Tripura, Meghalaya, and Mizoram, indicating the region's dependence on integrated farming and animal-based livelihoods.

Overall, the matrix signaled that NE states face a combination of climatic, input-related, and structural constraints, calling for focused interventions in seed systems, climate-resilient practices, and water management.

Implications and Suggestions

- **Climate-Resilient Agriculture:** Climate change consistently ranked high, emphasizing the need for investments in developing resilient crop varieties seed chain, soil conservation, agroforestry, and disaster risk reduction. This indicated technology and knowledge gap which needs to be filled.
- **Seed Security in Remote Zones:** Dominant concern across Manipur, Tripura, and Meghalaya called for localized seed multiplication, preservation of traditional varieties, and enhanced extension. Promoting seed multiplication, establishing seed villages, and

strengthening seed chain development are key interventions that can effectively address the issue of seed scarcity and ensure timely availability of quality seeds to farmers.

- **Water Management in Hill and Valley Regions:** Despite abundant rainfall, water issues (e.g., in Assam and Sikkim) reflected poor distribution and storage, highlighting the need for decentralized water harvesting and micro-irrigation systems.
- **Support for Integrated Livelihoods:** Livestock and fodder issues signal the need for integrated rural development, small ruminant support schemes, and village-level fodder banks. Investment in pasture development and availability of fodder is the key drivers for boosting this sector.
- **Horticulture Value Chains:** High ranking in states like Tripura and Meghalaya suggests the need to strengthen horticultural extension, market infrastructure, transportation and farmer-producer collectives.
- **Capacity Building for Effective Technology Delivery:** Prioritise need of capacity building on climate-resilient practices, water harvesting and quality seed use, customised to the region's fragile ecosystems and hilly terrain. Special emphasis is required on demonstrating climate-adaptive technologies, and organising community-based training on low-cost water harvesting and rainwater management to address dry-season water scarcity. Efforts should be focused on fodder development and livestock-based livelihood practices, while leveraging participatory approaches to enhance community involvement and technology adoption.

6.2.5 Summary and Conclusion

The analysis of key agricultural problems across different categories of Indian states-large, medium, small/UTs, and North-Eastern (NE) states revealed both shared and region-specific concerns. Among large states like Uttar Pradesh, Madhya Pradesh, Tamil Nadu, and West Bengal, *'Seeds & Improved Varieties'* consistently ranked among the top three challenges, reflecting issues related to seed quality, accessibility, and suitability to local conditions. *'Climate Change'* and its impact is another top concern, especially in states like Bihar, Karnataka, Rajasthan, and Gujarat, indicating growing vulnerability to erratic weather, extreme events, and shifting agro-climatic patterns. *'Water Management'* emerges as a repeated concern, particularly in arid and semi-arid regions like Maharashtra and Rajasthan. Other moderate concerns include *'Soil Health Management'* and '*Mechanization'*.

In medium-sized states (e.g., Punjab, Haryana, Odisha, Telangana), similar patterns were observed. *'Seeds'* and *'Water Management'* topped the list, indicating persistent bottlenecks in input delivery and irrigation systems. Climate change was prominently ranked in states like Jharkhand, highlighting the growing urgency for climate-adaptive strategies. '*Soil Health'* and *'Fertilizer Management'* also surfaced as issues of varying intensity across regions.

For small states and UTs (e.g., J&K, Ladakh, Goa, A&N Islands), the issues were more diverse. *'Climate Change'*, *'Water Scarcity'*, and *'Seed Access'* remained major concerns, particularly due to geographic isolation, fragile ecosystems, and logistical constraints. '*Horticulture, including Vegetables'*, was ranked high in states like West Bengal, Puducherry, and Lakshadweep, reflecting the need for post-harvest support and market integration. Moderate emphasis was also seen on livestock, fodder, and institutional issues, especially in hilly or remote areas.

The North-Eastern region presented a distinct set of priorities. *'Seeds & Improved Varieties'* and *'Climate Change'* were consistently top-ranked across states like Manipur, Meghalaya, and Nagaland. *'Water Management'*, although seemingly paradoxical given the region's rainfall, remained a top issue due to poor storage, harvesting, and irrigation infrastructure. Moderate concerns for *'Machinery'*, *'Livestock'*, and *'Fodder'* reflect the challenges of terrain and the significance of integrated farming systems. *'Institutional'* and *'Plant Protection'* issues received lower ranks, possibly due to lesser visibility or inadequate awareness.

Across all regions, the recurring concerns around seed systems, climate impacts, water scarcity, and input management pointed to the need for a two-pronged approach—national-level policies addressing universal challenges, and state-specific strategies that recognize local agro-ecological and socio-economic contexts.

6.2.6 Implications and Suggestions

6.2.6.1. For Research Institutions

The reflections of problems across different categories of states call for the research system to reorient its agenda toward location-specific and demand-driven technology development that addresses critical gaps in seed availability, climate resilience, water-use efficiency and sustainable soil health. Research institutions need to develop and scale up regionally adapted crop varieties, including stress-tolerant and short-duration cultivars, and design cost-effective technologies including farm machinery suitable for smallholders, hilly terrains and fragile ecosystems. Greater emphasis is required on climate-resilient farming systems, water harvesting models, integrated farming and post-harvest technologies, particularly for horticultural and livestock-based systems in hill and island regions. Strengthening multi-location trials, participatory varietal selection and farmer feedback mechanisms will help ensure that technological solutions are relevant to local needs. Further, stronger collaboration between research institutions, KVKs and line departments is essential to ensure field-level validation, refinement and faster transfer of improved technologies to farmers.

6.2.6.2. For Extension System

The reflections across large, medium, small and North-Eastern states clearly indicate that KVKs should adopt a differentiated yet capacity-building focused approach to address the prevailing agricultural problems. Priority areas such as access to quality seed, climate-resilient practices, water-use efficiency and machinery should form the core of national-level and cross-state training and demonstration activities, while decentralised interventions must be designed to respond to state and region-specific needs, such as horticulture in small and hill states or livestock and integrated farming in North-Eastern states. KVKs should intensify frontline demonstrations, need-specific training modules and ICT enabled advisories on sustainable soil and nutrient management, low-cost mechanisation and climate-resilient crop options, along with participatory technology testing and farmer–scientist interfaces. KVKs should take a lead role in supporting Custom Hiring Centres (CHCs) and post-harvest technologies by facilitating entrepreneurship and converging with schemes. Strengthening diagnostic surveys, stakeholder convergence and linkages with research and development agencies is essential for timely technology dissemination and for improving adoption at the grassroots level.

6.3 Analysis of Severity of Agricultural Problems

The collected data were subjected to a rigorous statistical analysis using a multi-step approach to identify both overall trends and specific differences.

6.3.1 Data Analysis

- **Descriptive Statistics:** The initial analysis involved calculating descriptive statistics including the mean ($\bar{x}$), and standard deviation (*sd*), for each of the 20 problem categories. The mean score served as the primary metric for ranking the problems by their perceived severity.
- **Inferential Statistics (One-Way ANOVA):** A One-Way Analysis of Variance (ANOVA) was the primary statistical test employed. Its purpose was to determine if there were any statistically significant differences among the mean severity scores of the 20 problems. A significance level (alpha) of $p < 0.05$ was set as the threshold for rejecting the null hypothesis (which assumed that all group means are equal).
- **Post-Hoc Analysis (Pairwise Comparisons):** Since the overall ANOVA test confirmed a highly significant difference, post-hoc tests were conducted to identify exactly which specific pairs of categories differed significantly from one another. Pairwise Student's t-tests were performed for p-values.

6.3.2 Data Visualization: The Violin and Box Plot

To provide a rich and intuitive understanding of the data, the results were visualized using a hybrid plot that combined the features of both a violin plot and a box plot. This combined visualization offered a more complete picture than either plot could alone.

- **Specific Purpose of the Box Plot (The Inner Diagram):** The box plot provides a concise statistical summary of distribution of the data based on five key numbers:
  - ***The Median:*** The thick horizontal line within the box represents the median score (the 50th percentile), marking the exact middle of the data.
  - ***The Bosx (Interquartile Range - IQR):*** The box itself spans from the 25th percentile (Q1) to the 75th percentile (Q3). Its height represents the IQR, which is the range containing the middle 50% of all responses for that category.
  - ***The Whiskers:*** The lines extending from the box typically show the range of the data, often up to 1.5 times the IQR from the box edges. In essence, the box plot's purpose is to quickly show the central tendency (median) and spread (IQR) of the scores in a way that is robust against outliers.
- **Specific Purpose of the Violin Plot (The Outer Shape):** The violin plot is a mirrored kernel density plot that provides a much more nuanced view of the data distribution.
  - ***Visualizing Density:*** Its primary purpose is to show the full distribution and density of the data. The width of the violin at any given score level is proportional to the number of respondents who gave that score. A wider section indicates a higher concentration of responses, while a narrower section indicates fewer responses.
  - ***Identifying Modality:*** Unlike a box plot, a violin plot can reveal if a distribution has multiple peaks (i.e., bimodal or multimodal), which might suggest that different subgroups are responding in distinct ways.
- **Combined Power:** By overlaying the box plot on the violin plot, the visualization provides a comprehensive diagnostic view. The box plot offers a clear, quantitative summary of the quartiles, while the violin plot reveals the underlying shape, density, and texture of the full response distribution. The large red dot was added to clearly mark the mean score for each category.

To gain deeper insights from the data, the identified problems were first organized into four distinct clusters, namely - 1. *Crop production and protection*, 2. *Animal husbandry and allied sectors*, 3. *Natural resource and environmental management*, 4. *Agricultural diversification, value-addition and others*. Following this categorsization, an Analysis of Variance (ANOVA) was applied further to examine the differences between severity of these problems within these clusters. For a comprehensive and intuitive visual representation of the score distributions, a sophisticated hybrid plotting technique was employed. This method

skilfully integrates box plots with violin plots to achieve a dual objective: providing a concise statistical summary while simultaneously revealing the detailed structure of the data.

Specifically, the box plot component offers a clear, at-a-glance summary of central tendency and spread, highlighting key statistical measures. In parallel, the violin plot component visualizes the full empirical density of the data, allowing for a more nuanced understanding of how responses are distributed, including any variations in modality or skewness. This powerful combination ensures that no detail is lost, offering a richer interpretation than either plot could provide alone. These advanced visualizations were generated using the R programming language, specifically leveraging the functionalities provided by the 'ggstatsplot' and 'PMCMRplus' packages.

The agricultural problems of farmers identified during FGDs, which were subsequently evaluated using a 10-point severity rating scale. To assess the perceived intensity of these issues, responses were collected from KVK scientists through a structured questionnaire covering 20 key identified problems. On this scale, a score of 10 represented the problem being perceived as 'most severe', while a score of 1 indicated it was considered 'least severe'.

6.4 Results of Severity of Problems

The initial ANOVA test was conducted to establish whether farmers perceive all 20 problems with equal severity. The results, presented in Table 6.6, confirmed a highly significant difference in the mean severity scores across the categories.

Table 6.6. ANOVA Test for Significant Differences in Perceived Severity Across All Categories

One-Way ANOVA (Fisher)				
	F	df_1	df_2	p-value
Scores	25.8	19	8896	<.001

The extremely low p-value ($p < .001$) provides conclusive evidence that respondents did not perceive all problems as equally severe. The significant variation in scores justifies a deeper analysis to identify which specific problems are considered most and least critical.

6.4.1 Ranking of Problems based on their Severity Score

The descriptive statistics in Table 6.7 provide a clear ranking of the 20 problems from most to least severe based on their mean severity scores. Table clearly indicates that the *'Seed & Improved Varieties'* category was identified as the most severe problem ($\bar{x}$= 7.09), while 'Miscellaneous' category was rated as the least severe problem ($\bar{x}$ = 5.08).

Table 6.7. Ranking of problems based on their mean severity score

S. No.	Problem	Mean ($\bar{x}$)	Standard deviation (*sd*)
1.	Seed & improved varieties	7.09	1.74
2.	Climate change and its impacts	6.91	1.78
3.	Water Management	6.90	1.6
4.	Soil health management	6.81	1.84
5.	Farm machinery & implements	6.67	1.45
6.	Plant protection measures	6.64	1.75
7.	Fertilizer & nutrient management	6.61	1.87
8.	Horticulture including Vegetables	6.58	2.03
9.	Livestock production & Dairy	6.58	2.01
10.	Fodder production	6.52	1.96
11.	Protected cultivation	6.50	1.8
12.	Processing & Value Addition	6.47	2.03
13.	Institutional & Policy	6.30	1.82
14.	Socio-economic issues	6.29	2.51
15.	Poultry farming	6.29	1.7
16.	Fish farming	6.24	1.8
17.	Pig farming	6.22	1.81
18.	Energy in agriculture	5.58	2.93
19.	Bio-diversity erosion	5.55	3.11
20.	Miscellaneous	5.08	2.59

Cluster 1: Crop Production and Protection

This dimension encapsulates the core operational challenges that directly impact crop production and viability. A comparative analysis of five key problem areas under crop production and protection namely seed and improved varieties, plant protection measures, fertilizer and nutrient management, protected cultivation, and farm machinery and implements revealed statistically significant differences in their perceived severity. The analysis, based on ANOVA results ($F(4,2235) = 7.77$, $p < 0.001$), confirmed that these differences are not due to chance. However, the effect size ($\omega^2_p = 0.01$) indicated that the variation, while statistically significant, is modest in magnitude (Fig 6.1). Despite this, the findings clearly highlighted seed and improved varieties as the most critical concern among

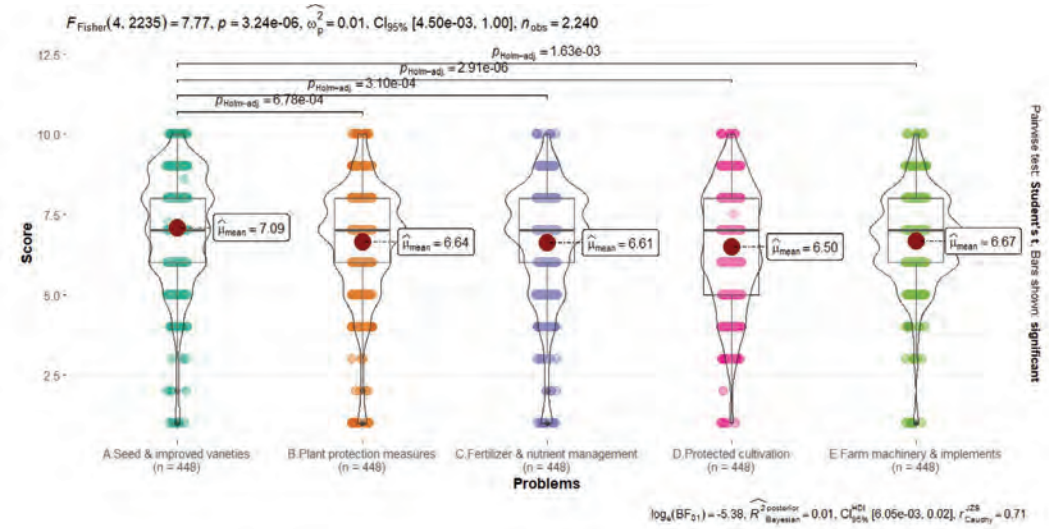


Fig. 6.1 Comparison of problems related to crop production and protection cluster

the five problem categories, warranting greater attention within the broader context of crop production and protection interventions.

Key Insight and Outcome

In this Cluster, *'Seed and improved varieties'* was identified as the most critical problem, with the highest average score of 7.09. This highlighted the continued challenge of ensuring timely access to quality seed and appropriate varietal options suited to specific agro-climatic conditions. The results reinforced the need for robust seed systems, region-specific varietal promotion, and improved availability mechanisms.

The *'farm machinery and implements'*, *'plant protection measures'*, and *'fertilizer and nutrient management'* showed comparable levels of concern, with mean scores of 6.67, 6.64, and 6.61, respectively. These findings reflected persistent constraints in input use efficiency, pest and disease management, and access to mechanization, all of which play vital roles in productivity enhancement and sustainability.

'Protected cultivation', while recognized as a modern agricultural intervention, recorded the lowest average score (6.50) under this Cluster. This relatively lower rating may be attributed to factors such as limited applicability across regions, higher investment costs, or gaps in outreach and support services. This indicated a need for context-specific promotion strategies, along with capacity building to improve adoption and impact.

To address the challenges under this cluster, strengthening seed systems is crucial through the development of climate-resilient, biofortified, and region-specific crop varieties.

Decentralized seed hubs, farmer seed banks, and participatory breeding programs should be promoted alongside robust breeder-foundation-certified seed linkages, ensuring timely delivery, especially to remote and inaccessible areas. Seed multiplication, the establishment of seed villages, and preservation of traditional varieties should be encouraged in suitable regions. Mechanization support should focus on promoting region-specific, low-cost machinery suitable for smallholders, along with establishing and supporting Custom Hiring Centres (CHCs) through skill development, entrepreneurship mentoring, and convergence with mechanization schemes. Handholding support, subsidies, and training on machinery operation and maintenance are vital. In plant protection and fertilizer management, capacity building for pest and disease management and safe, efficient pesticide use must be expanded. Regulatory oversight of agro-chemicals should be strengthened. Protected cultivation should be promoted through low-cost, region-specific models such as polyhouses and shade nets to enhance farm income and local employment opportunities.

Cluster 2: Animal Husbandry and Allied Sectors

A comparative analysis of five major problem categories under animal husbandry and allied sectors namely livestock production and dairy, poultry farming, pig farming, fish farming, and fodder production revealed statistically significant differences in perceived severity. The analysis, conducted using ANOVA, showed a significant variation across the categories (F (4, 2235) = 3.68, p = 0.00538), although the effect size (ω^2_p = 0.00477) indicates that the differences are relatively small in practical terms (Fig. 6.2).

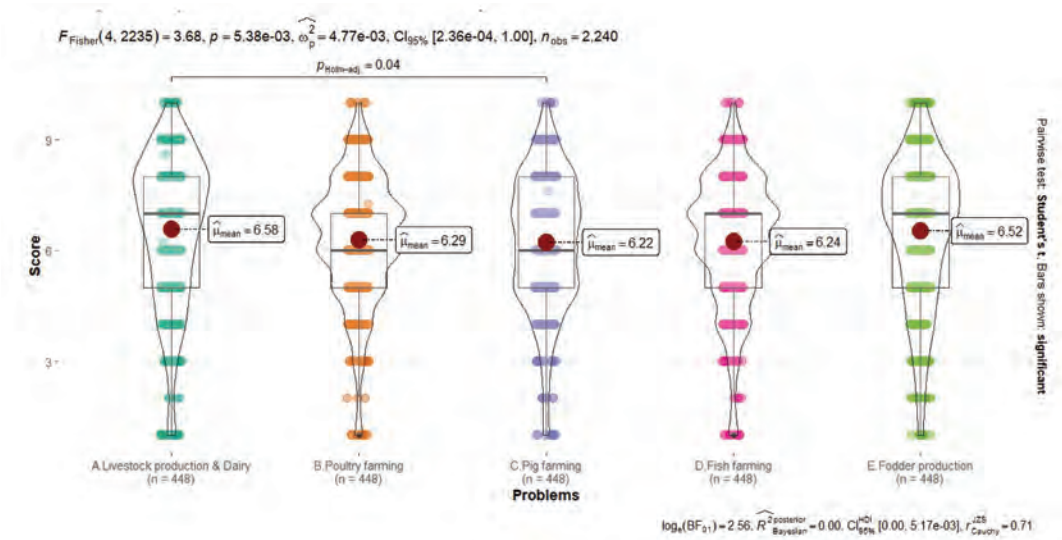


Fig. 6.2 Comparison of problems related to animal husbandry and allied sectors cluster

Key Insight and Outcome

Among the five categories, *'livestock production and dairy'* emerged as the most prominent issue with the highest mean score of 6.58, followed closely by 'fodder production' (6.52). These findings suggested that challenges in livestock productivity, health management, and access to quality feed resources are key concerns that require focused interventions. The prominence of these two areas points to a clear need for improving livestock support services, veterinary infrastructure, and sustainable fodder systems.

'Poultry farming' (6.29), *'Fish farming'* (6.24), and *'Pig farming'* (6.22) were rated somewhat lower, indicating that while issues in these sectors exist, they may not be as pressing or widespread in comparison. These sectors, often associated with niche production systems or regional significance, may benefit from targeted strategies that consider localized constraints, market linkages, and technical capacity building.

The results of the post-hoc pairwise test (Holm-adjusted $p = 0.04$) confirmed that the difference between *'livestock production & dairy'* and *'Pig farming'* is statistically significant. This underlines the relatively higher concern associated with the former, reaffirming its strategic importance in the rural livelihood and animal husbandry landscape.

In the animal husbandry and allied sectors, the focus should be on strengthening livestock and dairy production through pan-India programs for improved veterinary care, artificial insemination, and disease management. Enhancing fodder security requires the preparation of district-level fodder plans, promoting fodder seed production, silage and hay making, and establishing community fodder banks. Pasture development in rainfed and hilly areas can help mitigate fodder scarcity. For poultry farming, interventions should include disease control programs, forewarning systems, improved breed access, low-cost feed solutions, and cold-chain development. Pig farming development should be targeted to specific regions, particularly tribal and North-Eastern states, with emphasis on disease control and breeding support. In fisheries, region-specific programs should focus on hatcheries, feed supply, and marketing infrastructure in coastal and riverine states. Integrated farming systems combining crops, horticulture, and livestock should be promoted to diversify income sources, enhance resilience, and optimize resource use in rural areas.

Cluster 3: Natural Resource and Environmental Management

A comparative analysis of five critical problem areas under natural resource and environmental management namely soil health management, water management, climate change and its impacts, biodiversity erosion, and energy in agriculture revealed statistically significant differences in perceived severity. Each problem area was evaluated. The ANOVA test results ($F(4, 2191) = 41.43$, $p < 0.001$) confirm highly significant differences

across categories, with a moderate effect size (ω^2_p = 0.07), indicating more substantial differentiation compared to other thematic areas. Nevertheless, the very low Holm-adjusted p-values (e.g., < 10^{-14} for many pairs) in the post-hoc analysis show clear statistical differences between the higher and lower rated issues (Fig. 6.3).

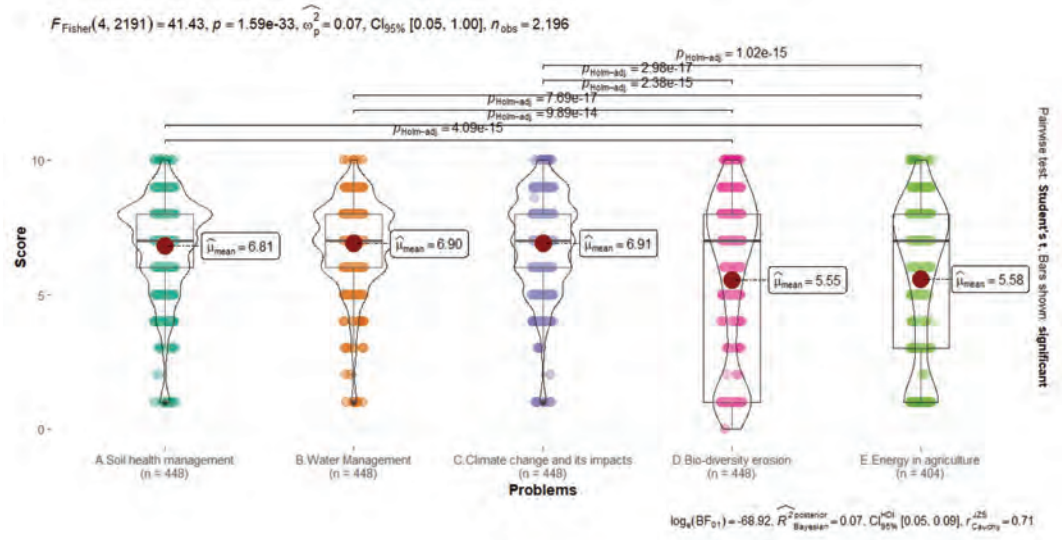


Fig. 6.3 Comparison of problems related to natural resource and environmental management cluster

Key Insight and Outcome

'Climate change and its impacts' ($\bar{x}$ = 6.91) and *'water management'* ($\bar{x}$ = 6.90) emerged as the two most critical concerns, receiving the highest average scores. This highlights the increasing awareness and severity of climate-related disruptions as well as persistent challenges in water availability, quality, and distribution. These findings emphasize the urgency of integrating climate resilience and sustainable water use practices into planning and policy frameworks.

'Soil health management' also featured prominently, with a mean score of 6.81, reinforcing its central role in sustaining productivity and ecological balance. The relatively high rating indicates a strong recognition of issues such as soil degradation, declining fertility, and the need for soil conservation practices, especially in rainfed and resource-constrained regions.

In contrast, *'biodiversity erosion'* ($\bar{x}$ = 5.55) and *'energy in agriculture'* ($\bar{x}$ = 5.58) were rated significantly lower. While these areas are undeniably important, the lower scores may reflect either limited awareness, lower immediacy of impact, or fewer localized experiences of these problems among the respondents.

The findings suggested a clear prioritization of climate, water, and soil-related concerns in natural resource management, with relatively less emphasis currently perceived on biodiversity and energy-related challenges. These insights underscore the need for differentiated and tiered interventions, focusing first on areas of greatest concern, while concurrently building awareness and capacity around less prioritized but strategically important issues like energy efficiency and biodiversity conservation.

Effective natural resource and environmental management requires robust climate change adaptation measures, including the development of climate-resilient varieties and cropping systems, integrated watershed management, real-time contingency plans, and early warning systems. Building climate literacy across stakeholders is essential, along with promoting agroforestry, regenerative agriculture, and disaster risk reduction practices. Soil health can be improved by fertilizer use efficiency and scaling up Soil Health Card based recommendations, precision nutrient management, conservation agriculture, and organic input use. Water management strategies should prioritize decentralized water harvesting, micro-irrigation, building ground water recharge infrastructure, farm ponds, and demand-side water management. Promoting solar-powered irrigation, and introducing sensor-based irrigation methods like Alternate Wetting and Drying. Campaigns such as "Catch the Rain" should be promoted in water-scarce regions. Biodiversity conservation, though a lower-ranked concern for many farmers, must be addressed through awareness generation, promotion of native species, pollinator-friendly practices, and genetic resource conservation. Energy in agriculture should focus on expanding renewable energy access, particularly solar-powered pumps, and ensuring affordable and reliable energy for irrigation, mechanization, and post-harvest operations.

Cluster 4: Agricultural Diversification, Value-Addition and others

A comparative evaluation of five major problem domains within agricultural diversification value-addition and others namely horticulture including vegetables, processing and value addition, socio-economic issues, institutional and policy concerns, and miscellaneous areas indicated statistically significant differences in the perceived severity of issues. The analysis based on ANOVA revealed a highly significant difference across categories ($F(4, 2235) = 33.48$, $p < 0.001$), with a moderate effect size ($\omega^2_p = 0.05$), suggesting a notable variation in how different challenges were rated in terms of their importance or severity (Fig. 6.4).

Key Insight and Outcome

Among these, challenges related to *'Horticulture including vegetables'* ($\bar{x} = 6.58$) and *'Processing and value addition'* ($\bar{x} = 6.47$) emerged as the most critical, closely followed by 'Institutional and policy issues' ($\bar{x} = 6.30$) and *'Socio-economic'* concerns ($\bar{x} = 6.29$). In contrast, issues

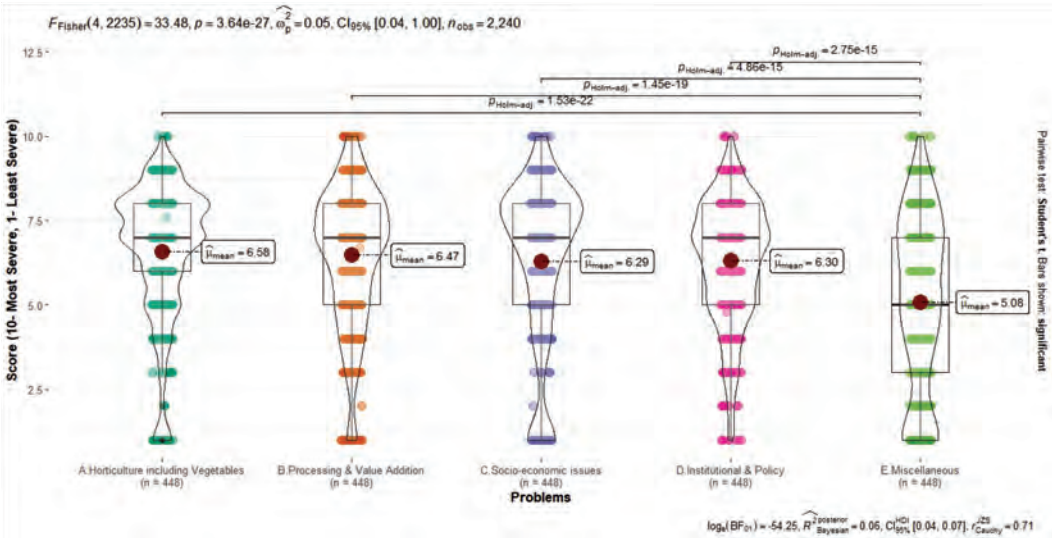


Fig. 6.4 Comparison of problems related to agricultural diversification, value-addition and others

grouped under the *'Miscellaneous'* category received the lowest average score ($\bar{x}$ = 5.08), indicating they were perceived as relatively less pressing. Pairwise statistical comparisons confirmed that the miscellaneous group differed significantly from all other categories, underscoring its distinct, lower perceived relevance.

For agricultural diversification, value addition, and related areas, horticulture development should be prioritized through investments in cold chain infrastructure, processing facilities, niche market access, and quality planting material production. Strengthening horticultural extension services, promoting farmer-producer collectives, and improving transportation infrastructure are equally important. In processing and value addition, capacity building for entrepreneurship in post-harvest management, rural enterprise incubation, and market linkage creation should be emphasized. Socio-economic upliftment of smallholders requires holistic approaches, handholding, and targeted capacity building programs, with special focus on gender-sensitive interventions, youth engagement, and inclusion of marginalized communities. Institutional strengthening must include raising awareness about government schemes, expanding ICT-based advisories, and adopting participatory communication mechanisms to reduce procedural bottlenecks and integrate practical farmer feedback. Stakeholder meetings should be held regularly to ensure policies and services are tailored to local realities. Protected cultivation, as part of diversification, should also adopt low-cost, region-specific models to promote high-value crops, generate rural employment, and increase farmer incomes.

6.4.2 Summary and Conclusion

The analysis of key problem categories faced by farmers, highlights that input-related issues are the most severe and widespread. Among these, lack of access to quality seeds and improved varieties stands out as the top concern, particularly regarding climate-resilient options. This is followed closely by farm machinery and implements, with high severity scores pointing to affordability and accessibility challenges, especially for smallholders. Issues related to fertilizer and nutrient management and plant protection measures also rank moderately high but show greater variability, reflecting differences in regional access, training, and awareness. In the horticulture and value addition domain, concerns are moderate but strategically important for enhancing income, employment, and nutrition, particularly where infrastructure and technical support are lacking.

In the animal husbandry and allied sectors, livestock and dairy production along with fodder availability emerge as high-severity concerns nationwide, indicating systemic gaps in veterinary services, feed supply, and animal health care. Activities like fish, poultry, and pig farming reveal region-specific challenges, necessitating tailored approaches in coastal, tribal, and northeastern areas. Environmental and resource management issues such as climate change, soil health, and water management are increasingly perceived as serious, indicating growing ecological stress across regions. Although biodiversity loss and energy use are rated moderately, they remain critical for sustainability. Finally, socio-economic and institutional issues including limited landholding, poor market access, and procedural delays in schemes, show moderate severity but vary across regions, pointing to gaps in institutional effectiveness and policy implementation.

6.4.3 Implications and Suggestions

6.4.3.1. For Research Institutions

The analysis highlights several implications for research institutions to drive transformative change in Indian agriculture. Most urgent is the need to develop and scale up climate-resilient, biofortified crop varieties and region-specific low-cost machinery, particularly suited for smallholders. Institutions must also strengthen decentralized seed systems, participatory breeding, and custom hiring solutions. In the animal husbandry and allied sectors, high-severity concerns call for targeted Research & Development in disease management, fodder innovation, and localized models for piggery, fisheries, and poultry, especially in tribal, coastal, and northeastern regions. Simultaneously, growing ecological stress demands research on climate-smart practices, water-use efficiency, soil health rejuvenation, and renewable energy applications.

Union Minister of Agriculture & Farmers Welfare addressing the stakeholders during VKSA at Dehradun

Moderate but strategic concerns in horticulture, processing and value addition require research focused on protected cultivation, post-harvest management, and rural enterprise development. Moreover, the variability in socio-economic and institutional issues underlines the importance of interdisciplinary research on market access, scheme delivery, landholding constraints, and inclusive models for women, youth, and marginalized communities. By aligning innovations with regional needs and promoting convergence with national schemes, research institutions can enhance the effectiveness, inclusivity, and sustainability of agricultural development under the vision of *Viksit Bharat @2047*.

6.4.3.2. For Extension System

The findings have significant implications for the agricultural extension system and KVKs, underscoring the need to evolve from traditional technology dissemination toward a more integrated, demand-driven, and inclusive model. Given the severity of input-related issues, KVKs must prioritize farmer-participatory varietal trials, localized seed production, and capacity building of farmers on improved input use and machinery operation. They also need to play a lead role in supporting Custom Hiring Centres (CHCs), particularly through skill development, entrepreneurship mentoring, and convergence with mechanization schemes targeted at smallholders.

In response to climate change, resource degradation, and rising environmental concerns, the extension system must strengthen its capacity for climate-smart advisory, soil and water management training, and renewable energy promotion. KVKs should serve as local hubs for promoting climate-resilient practices, integrating digital tools, and conducting on-farm testing (Adaptive research). In allied sectors, KVKs can organize animal health camps,

The focus must be on 'Lab-to-Land' approach in agriculture. The Chief Ministers, Lieutenant Governors, and Administrators of States and Union Territories need to support *Viksit Krishi Sankalp Abhiyan.*

Shri Narendra Modi
Prime Minister of India
10th Governing Council Meeting of NITI Aayog
24th May 2025

promote fodder banks, and facilitate access to veterinary and credit services. Furthermore, extension efforts must focus on value chain development, rural entrepreneurship, and business incubation, particularly in horticulture and processing. For greater equity and impact, KVKs must adopt gender-sensitive approaches and ensure the inclusion of women, youth, and marginalized communities by engaging community resource persons and aligning with rural livelihood missions. Strengthening the KVK system in these directions is vital for realizing the vision of *Viksit Bharat @2047.*

Union Minister of Agriculture & Farmers Welfare addressing the farmers during VKSA at Meerut (UP)

KVKs are crucial not just for training, but for co-designing solutions, building community institutions, and facilitating convergence of schemes. Uniquely positioned to bridge the last-mile gap in knowledge, skills, and policy outreach.

7

Researchable Issues Identified under VKSA

THE *Viksit Krishi Sankalp Abhiyan (VKSA)*, a nationwide pre-*Kharif* campaign conducted from 29 May to 12 June 2025, was a pioneering initiative aimed at directly engaging with farmers to assess their needs, disseminate the latest technologies, and gather feedback from the grassroots. Spearheaded by the Ministry of Agriculture and Farmers Welfare and implemented in collaboration with ICAR institutions, KVKs, and State Agricultural Universities, the campaign covered over 1.35 crore farmers across 728 districts of the country.

A key component of VKSA was the systematic identification of critical, field-based problems encountered by farmers. These were identified through focused group discussions, farmer-scientist interactions, on-field observations, and inputs from extension personnel. This participatory and interactive process enabled the real-time capture of recurring as well as emerging issues across India's diverse agro-ecological regions. The insights reflect location-specific constraints related to seed availability and quality, climate resilience, pest and disease outbreaks, weed infestation, soil health, input use efficiency, post-harvest management, and access to markets and technologies.

The compilation of these researchable issues represents a bottom-up, evidence-based approach to guiding agricultural research. It is intended to serve as a strategic input for National Agricultural Research Education and Extension Systems (NARES) to prioritize, design, and implement demand-driven research programmes. This alignment with field-level realities will ensure that innovations are need-based, farmer-centric, and more likely to be adopted. In this endeavour, Krishi Vigyan Kendras (KVKs) will play a critical bridging role by continuously engaging with farming communities, validating research outputs under local conditions, and facilitating rapid feedback loops to research institutions. KVKs, being the grassroot-level institution of the National Agricultural Research and Extension System, are uniquely positioned to test location-specific solutions, demonstrate new technologies, collect real-time feedback, and provide insights for refining technologies to enhance their relevance and effectiveness.

Moving forward, KVKs can also assist ICAR institutes by prioritizing field problems, maintaining seasonal records of farmer demands, and participating in multi-location trials. Their role in on-farm trials (OFTs), frontline demonstrations (FLDs) and continuous farmer engagement will be pivotal for ensuring that research is not only responsive to current needs but also anticipates future challenges. Thus, the collaborative synergy between ICAR Institutes and KVKs, rooted in the data and insights from VKSA, holds immense potential

Union Minister of Agriculture & Farmers Welfare and DG, ICAR
interacting with farmers during VKSA

for accelerating inclusive, sustainable, and resilient agricultural development. These issues offer a valuable opportunity for aligning ongoing and future research programmes with the real and location-specific needs of farmers, thereby strengthening the *Lab-to-Land* continuum and ensuring greater relevance, adoption, and impact of agricultural innovations. A list of researchable issues is attached in *Annexure-II*.

> "*Viksit Krishi Sankalp Abhiyan* will open new avenues of progress for farmers driving modernization in agriculture."
>
> **Shri Narendra Modi**
> Prime Minister of India
> Inaugural Address of *Viksit Krishi Sankalp Abhiyan*

8

Extension Issues: Gaps in Knowledge and Skill

THE *Viksit Krishi Sankalp Abhiyan (VKSA)* served not only as a platform for technology dissemination but also as a vital mechanism for identifying gaps in agricultural extension services. The campaign facilitated direct interactions between farmers, extension personnel, scientists, and development agencies. This provided a unique opportunity to capture field-level extension challenges that hinder the adoption of technologies, reduce outreach effectiveness, and limit access to timely and location-specific advisories.

Union Minister of Agriculture & Farmers Welfare in discussion with farmers in Maharashtra

During the campaign, a range of extension issues emerged such as inadequate awareness about technologies and schemes, limited access to agro-advisories, insufficient skills among farmers to adopt improved practices, communication gaps, lack of convergence among departments, and weak feedback mechanisms. These insights highlight the urgent need for structured, responsive, and region-specific training programs aimed at strengthening the competencies of farmers, rural youth, and extension personnel. Addressing these issues through need-based training and capacity development initiatives is essential for improving the last-mile delivery of agricultural innovations and services.

In this context, KVKs play a pivotal role. As the grassroot-level extension wings of the National Agricultural Research System (NARS), KVKs are uniquely positioned to translate field-level challenges into training modules and skill-building programs. Their activities include conducting on and off-campus training, frontline demonstrations, farmer-scientist interactions, and advisory services. Under VKSA, feedback collected directly from farmers, identified skill gaps, and generated actionable insights that can now serve as a foundation for designing targeted capacity development programmes. Furthermore, KVKs are central to the delivery of real-time agro-advisories, using ICT tools, mobile apps, and climate-based forecasts to support timely decision-making by farmers. Strengthening KVKs' capacities to generate, interpret, and disseminate such advisories customised to local cropping systems and weather patterns is critical for enhancing climate resilience and production efficiency.

Union Minister of Agriculture & Farmers Welfare
interacting with farmers during VKSA

Moving ahead, the extension issues identified under VKSA must guide institutional planning of training by ICAR Institutes, Agricultural Universities, and KVKs, ensuring that all stakeholders viz. farmers, farm women, input dealers, FPOs, and grassroots extension workers receive context-specific knowledge and skills to improve their effectiveness. This approach will significantly enhance the inclusivity, reach, and impact of agricultural extension systems in India. The details of extension issues are attached in *Annexure-III*.

9

Development & Policy Issues

THE *Viksit Krishi Sankalp Abhiyan* (VKSA) conducted a landmark initiative aimed at strengthening the agricultural sector through direct engagement with farming communities, scientists, extension personnel, and institutional stakeholders. The campaign provided an unprecedented opportunity to capture field-level feedback and institutional insights on policy gaps affecting agricultural growth and rural livelihoods. The scale and scope of VKSA allowed for the identification of policy-related bottlenecks that impact technology adoption, input delivery, market access, risk mitigation, and resource management.

These policy issues, as surfaced through focused interactions, group discussions, and participatory exercises, reflect the urgent need for systemic reforms and enabling environments to support farmers, especially smallholders and women. Key themes include inadequate policy support for climate-resilient agriculture, fragmented service delivery at the grassroots level, insufficient convergence among departments, lack of incentives for innovation adoption, and limited institutional mechanisms for timely grievance redressal. The diverse and region-specific nature of these issues underscores the importance of context-sensitive policy planning rather than one-size-fits-all approaches.

The findings from VKSA offer a valuable foundation for designing evidence-based agricultural policy interventions at both national and state levels. These insights can guide the Indian Council of Agricultural Research (ICAR), State Agricultural Universities (SAUs), line departments, and policy think tanks in framing region-specific policy recommendations. Moreover, KVKs which serve as the interface between science and society, play an important role in policy feedback loops by continuously engaging with farmers and capturing ground realities. Strengthening institutional channels for bottom-up policy formulation, facilitated by KVKs and research institutions, will ensure that future policies are more responsive, inclusive and effective.

The list of policy issues compiled under VKSA should thus be viewed not only as a record of challenges but also as a strategic input for shaping future agricultural policies that are farmer-centric, innovation-driven, and climate-smart. The details of policy intervention are required is given in *Annexure-IV*.

10

State Specific Researchable Issues

The Viksit Krishi Sankalp Abhiyan (VKSA) was a pioneering initiative aimed at creating widespread awareness about the latest agricultural technologies while simultaneously documenting the real-world challenges faced by farmers across India. With its expansive national outreach and strong grassroots engagement, VKSA was envisioned as a mission to identify, prioritize, and address key issues confronting the farming community, tailored to diverse agro-climatic and socio-economic contexts.

One of the central components of the Abhiyan was the structured, participatory assessment of farmer problems to ensure that both expressed and latent challenges were systematically captured. Using a combination of Focused Group Discussions (FGDs), semi-structured interviews, and field surveys, the campaign enabled evidence-based identification of region-specific, actionable issues. These were further validated and categorized thematically and geographically to ensure relevance for research and policy planning.

The active involvement of KVKs was instrumental in this process. Drawing on their local credibility and outreach, KVKs facilitated direct interaction with farmers, ensured robust data collection, and helped synthesize practical insights from the field. Their role

Chief Minister of Gujarat and Union Minister of Agriculture & Farmers Welfare in closing ceremony of VKSA at Bardoli, Gujarat on 12 June 2025

in contextualizing problems, validating issues, and linking them with appropriate scientific and institutional responses was crucial in converting farmer feedback into researchable themes.

As a result, a wide range of challenges was documented, spanning climate change, water scarcity, seed availability and quality, pest and disease management, post-harvest losses, marketing bottlenecks, mechanization gaps, etc. By disaggregating these issues at the state level, the VKSA provided a clear and nuanced picture of agricultural constraints across the country.

The identification of state-specific researchable problems represents a strategic step toward aligning national and regional research agendas with ground-level realities. It provides a robust foundation for developing need-based, location-specific innovations and technologies, and will help guide the future research priorities of ICAR institutes, State Agricultural Universities (SAUs), and other stakeholders. The insights generated will also inform extension strategies, foster convergence among institutions, and enhance the effectiveness of the research-extension-farmer interface.

This report presents a consolidated overview of the researchable problems identified across various states, with the detailed list of state-specific issues provided in *Annexure-V*.

11

Farmer-led Innovations Documented under VKSA

Innovation may be defined as the application of ideas, knowledge or practices that are new to a particular context and aimed at creating positive change, is the driving force behind agricultural transformation. Whether through substantial breakthroughs or incremental improvements, innovations that respond directly to ground-level needs are central to building a more productive, inclusive and sustainable agricultural system. The *Viksit Krishi Sankalp Abhiyan (VKSA)* has served as a powerful platform to capture such bottom-up innovations from the grassroots level, especially those developed by farmers themselves using frugal, localised, and adaptive solutions to agricultural challenges.

The agricultural sector in India faces the dual challenge of feeding a growing population and improving the livelihoods of over 60% of the rural workforce that depends on farming. As the emphasis shifts from a *Research System* to a comprehensive *Agricultural Knowledge and Innovation System (AKIS)*, the role of farmers innovations, those developed with minimal resources yet delivering resounding impact, has gained increasing importance. These grassroots innovations, many of which were documented during VKSA, represent a vital source of knowledge and solutions to the specific socio-economic and agro-ecological conditions of farming communities.

In India, where three-fourths of farmers are small and marginal, their innovations offer an affordable and scalable alternative to capital-intensive technologies. During VKSA, numerous farmer-led innovations were identified that addressed critical issues such as climate resilience, pest control, water management, farm machinery, and post-harvest processing. These innovations reflect practical wisdom, deep contextual understanding, and the ability to 'do more with less'. Often known in the local vernacular as *Jugaad*, such innovations embrace principles of simplicity, intuition, resilience, and inclusivity.

Recognizing the immense value of these grassroots contributions, VKSA not only documented these innovations but also emphasized the need for their validation, refinement, and upscaling through research institutions. These innovations have the potential to become beneficial to large segments of the farming community, if appropriately supported.

To capitalize on this momentum, institutions under the National Agricultural Research Education and Extension System (NARES), including SAUs and ICAR institutes, should establish Innovation Funds to support the refinement and dissemination of farmer-led innovations. The role of KVKs becomes pivotal here.

Views of farmer-led innovations

Importantly, innovations unearthed under VKSA point toward a viable strategy for achieving sustainable agricultural growth and improving farmers' incomes. They also resonate with broader national priorities under the Sustainable Development Goals (SDGs), particularly those related to zero hunger, climate action, and reduced inequalities.

In conclusion, the VKSA has demonstrated that India's next wave of agricultural transformation can be built not just in research labs, but in the minds and fields of innovative farmers. Their local ingenuity, when nurtured and scaled, holds the key to resilient and inclusive agricultural development. The list of farmers innovations is attached in *Annexure-VI*.

Annexures

Annexure-I

Table 1: Matrix ranking of farmers' problems of large states

Problems/Issues	Uttar Pradesh	Maha-rashtra	Bihar	Madhya Pradesh	Rajas-than	Karna-taka	Tamil Nadu	West Bengal	Andhra Pradesh	Guja-rat
Seeds & improved varieties	I	IV	II	I	III	IV	I	I	II	IV
Plant protection measures	VIII	XIII	VIII	III	VIII	IX	IV	VI	VII	V
Fertilizer and nutrient management	VII	XII	III	V	VIII	XI	VIII	VIII	III	IV
Farm machinery & implements	IV	V	V	IV	IV	VII	VI	III	VI	VII
Protected cultivation	VIII	XVI	XII	XVIII	IX	XVI	III	XIV	V	XIV
Processing & value addition	VIII	VII	XI	V	XI	XV	II	IX	I	XII
Horticulture	VI	III	IV	VIII	VII	V	V	I	IV	VI
Soil health management	III	II	IX	VI	IX	II	III	IV	V	III
Water management	II	I	IV	II	I	III	II	III	IV	II
Energy in agriculture	IV	XV	X	XIII	X	XIII	VII	XII	IX	XI
Biodiversity erosion	XII	XIV	XIV	XI	XVII	XVIII	XIII	XIII	XV	XIII
Climate change and its impact	V	VI	I	V	II	I	VII	II	I	I
Livestock production & dairy	IX	VIII	VII	X	V	VIII	IX	VII	IX	VIII
Pig farming	IX	XVIII	XI	XX	XVI	XVII	XV	VI	X	XV
Poultry farming	IX	XVII	XIII	XVI	XIV	XIV	XII	VI	VIII	XI
Fish farming	IX	XIX	VI	VIII	XV	XI	XVI	V	XIV	X
Fodder production	IX	XI	XI	XV	VI	X	XI	IX	X	XII
Socio-economic issues	X	IX	XV	IX	XI	IX	VI	XI	II	IX
Institutional/ policies	XI	X	II	XIV	XII	XIII	VII	V	IX	XIII
Miscellaneous issues	V	XIX	VIII	XIX	I	VI	XVIII	XV	XVI	XIV

Table 2: Matrix ranking of farmers' problems of medium-sized states

Problems/Issues	Punjab	Haryana	Jharkhand	Chhattisgarh	Odisha	Kerala	Telangana
Seeds & improved varieties	III	II	II	I	I	V	II
Plant protection measures	IV	VII	VI	IV	VIII	VI	IX
Fertilizer and nutrient management	II	VIII	VIII	IX	IX	X	VIII
Farm machinery & implements	III	VI	III	VI	X	IV	VI
Protected cultivation	IX	VII	VII	XV	XV	XV	II
Processing & value addition	VII	V	VI	III	IX	XII	I
Horticulture	XI	IV	III	V	VI	I	V
Soil health management	I	III	IV	VI	VII	VIII	III
Water management	II	I	III	II	II	VII	I
Energy in agriculture	V	XII	VII	XIV	XI	XI	XIV
Biodiversity erosion	VIII	XIII	VII	XI	XVI	XIV	XIII
Climate change and its impact	VII	IV	I	VII	IV	III	IV
Livestock production & dairy	VI	VI	V	VIII	V	V	XII
Pig farming	XII	XIV	X	IX	X	XVI	XVIII
Poultry farming	X	XI	VII	VII	VII	VII	IX
Fish farming	XII	X	IX	V	VI	II	XVI
Fodder production	IX	VII	VII	X	XII	VIII	XIV
Socio-economic issues	IX	IV	VI	VI	XIII	VII	VI
Institutional/policies	X	X	VIII	XIII	XIV	IX	VII
Miscellaneous issues	XI	VII	X	XVI	XVII	I	VII

Table 3: Matrix ranking of farmers' problems of small states and UTs

Problems/Issues	Jammu & Kashmir	Himachal Pradesh	Uttarakhand	Delhi	Goa	A&N Islands	Puducherry	Lakshad-weep	Ladakh
Seeds & improved varieties	III	IV	V	VIII	III	I	VIII	III	II
Plant protection measures	VI	III	VII	IV	VII	IX	X	III	II
Fertilizer and nutrient management	VII	V	X	IX	X	VII	X	III	IV
Farm machinery & implements	V	III	VI	X	III	VI	IV	VI	IV
Protected cultivation	III	II	VII	II	VIII	IX	IX	II	II
Processing & value addition	V	VI	IV	III	IX	V	VIII	II	II
Horticulture	I	II	III	II	I	II	I	I	III
Soil health management	VII	V	IV	IV	IV	IV	III	III	I
Water management	III	IV	II	III	VI	III	VII	III	III
Energy in agriculture	V	VI	VI	VI	XI	VII	IX	IV	VI
Biodiversity erosion	V	X	VIII	X	X	VII	V	V	I
Climate change and its impact	IV	I	I	XI	II	I	II	II	II
Livestock production & dairy	III	IV	IX	III	V	IV	II	I	III
Pig farming	X	XI	XV	XII	X	III	III	VI	VII
Poultry farming	IV	VII	XII	V	V	VI	II	II	III
Fish farming	IV	IX	XVI	XII	IV	III	IV	II	IV
Fodder production	II	V	XII	V	VI	VI	III	V	I
Socio-economic issues	VIII	VII	XIII	VII	VI	VI	V	IV	V
Institutional/policies	IX	VIII	XI	I	XI	V	VI	V	IV
Miscellaneous issues	VIII	VII	XIV		XII	VII	XI	III	VII

Table 4: Matrix ranking of farmers' problems of North Eastern States

Problems/Issues	Arunachal Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Tripura	Sikkim
Seeds & improved varieties	IV	III	I	I	III	III	I	V
Plant protection measures	XV	V	VIII	VII	VII	IX	VII	IV
Fertilizer and nutrient management	XII	XI	VI	VI	V	VII	IV	III
Farm machinery & implements	V	IV	VI	III	IV	IV	II	II
Protected cultivation	XV	IV	VIII	V	VI	VI	II	VII
Processing & value addition	IV	III	III	II	III	V	III	II
Horticulture	VIII	VII	II	I	II	IV	II	II
Soil health management	III	VI	V	III	V	IV	II	II
Water management	II	I	VII	IV	VI	V	IV	I
Energy in agriculture	VI	VIII	VII	II	III	III	III	III
Biodiversity erosion	VII	IX	IV	IV	IV	IV	IV	II
Climate change and its impact	I	II	II	I	III	I	II	II
Livestock production & dairy	VIII	IX	IV	II	III	III	I	III
Pig farming	V	VIII	VII	I	I	I	I	II
Poultry farming	V	IV	VI	II	III	II	II	III
Fish farming	XIV	VI	II	III	IV	VII	I	VI
Fodder production	X	VIII	V	IV	VII	VI	II	II
Socio-economic issues	X	VIII	VIII	III	V	IV	IV	II
Institutional/ policies	IX	X	IV	IV	IV	V	II	VI
Miscellaneous issues			IX	VII	VII	VIII	VI	

Researchable Issues

Soil Health Management, Sustainability & Environmental Stewardship

- Digital soil mapping (DSM) for generating detailed, location-specific soil data at the village level to assess to measure the extent and severity of the salinization to guide technological and policy interventions for effective soil reclamation.
- Nutrient management protocols under different residue management scenarios in intensified cereal based cropping systems, e.g. rice-wheat, rice-rice, rice-maize, maize-wheat, etc.
- Deep insights generation for nutrient dynamics in conservation agriculture.
- Metagenomics of soil fauna and isolation of consortia and use as input for organic, natural and conservation agriculture-based crop management system.
- Nutrient budgeting in IFS model under various agro-ecologies for circular nutrient cycling based self-sustaining models.
- Waste to wealth fertilizer product development from agri and non-agri waste for sustainable nutrient management in agri-horti systems.
- Nutrient dynamics and budgeting in intercropping system and its implication in fertilizer doses optimization
- Development of efficient crop varieties for green manuring and alternative crops (senji, Tephrosia, etc) for soil health improvement in crop nutrition.
- Nutrient management in fish ponds for environmental stewardship
- Nutrient dynamics under different region-specific agroforestry systems
- Improving quality and productivity of grassland through drone and encapsulated based nutrient application protocols
- Crop nutrition for alleviating effect of water logging and drought
- Development of amendment alternate to mine gypsum for alkaline soil reclamation which could be based on by-product of sulphur, press mud of sugar industry or municipal solid waste etc
- Development and standardization of economically profitable agroforestry models for salt affected barren lands
- Research on bioengineering and microbial solutions to enhance crop tolerance to salinity. There is urgent need to study long-term efficacy of microbial and bioengineering solutions for sustaining crop production under salt affected environment
- Standardization of design and operational of controlled sub surface drainage for financial viability and environmental sustainability
- Development of methodology / protocols for rapid assessment of sub surface drainage impacts on reclamation of waterlogged saline soils through integration of ground based sensor and remote sensing
- Development of framework for saline water use through micro irrigation

- Research on integrating salinity management into national agricultural and water policies
- AI Chatbot-enabled storage advisory kiosk

Precision & Digital Nutrient Management

- Research on AI/ML and IOT integration for precision nutrient management specially in drip fertigation
- Site specific nutrient management focusing 'on feed the crop not the soil' for nutrient stewardship towards lowering environmental footprints
- Harmonization and integration of various soil fertility maps developed in devising the eco-regional level nutrient recommendation for field and horticultural crops
- Methodologies & SOP for carbon trading through sustainable agriculture practices
- Technologies of precision agriculture to save nutrients, water and pest control using sensors, drones, and data analytics to optimize crop management practices.
- Research of AI and IoT for better crop monitoring, disease predictions, weather and resource management.
- Developing predicting and forecasting models for early warning to farmers about weather and pest virulence.

Fertilizer Product Development & Innovation

- Scientific validation and enrichment of emerging sources of nutrients e.g., FOM/LFOM/PROM for use in various food and horticultural crops
- Development of low-cost nitrification inhibitors and work on biological nitrification inhibitors (BNI) technology for higher FUE
- Innovative next generation nitrogen fertilizer products for reduced GHGs under transplanted and direct seeded rice conditions for lower environmental footprints
- The use of slow release and nano-phosphorus fertilizers in crops and research on use of legacy phosphorus in cropping system
- Micronutrient enriched fertilizers/nutrition for enhancing NUE in field & horticultural crops
- Customized fertilizers product development for various field and horticultural crops in different ecologies
- Herbicide-pesticide-nutrient mixed application and their interactions protocols and recommendations
- Alternative and indigenous sources of mineral nutrients and their feasibility studies in various crops
- Isotopic, molecular and physiological studies on nano-fertilizers
- Evaluation of marketed fertilizer products including bio-stimulants, growth regulators in different crops

Nutritional Security & Biofortification

- Advanced studies on biofortification through nutrient management e.g., customized fertilizer, seed/seedling inoculation, enrich organic manures/compost etc.
- Nutrient management for enhancing quality (protein, Zn/Fe, Fe, vitamins, flavonoids, anti-oxidants) of foodgrains and horticultural crops for nutritional security.
- Use of biofortified fodder/feed for improving the productivity of animals

Development of Machinery, Implements and Tools

- Diagnostic kit for testing fertilizer quality specially for micronutrients.
- Testing kits/ diagnostics for organic nutrient sources like bio-fertilizer, bio-stimulant, plant growth regulators, humic acid, fulvic acid, etc.
- Machinery development for sub-soil placement of fertilizer (urea/MOP/DAP) in standing crops e.g. DSR, sugarcane, etc.
- Applicator development for top dressing of urea by site directed placement in Kharif crops
- Suitable machines for improving nitrogen placement (basal & top dressing) in conservation agriculture
- Drone based SOP for the nutrient management in various crops at different crop stages.
- Affordable soil health quality testing kit with key parameter of organic carbon, pH, EC, available N etc.
- Develop mechanized way of harvesting in cotton, like cotton picking machines
- Develop mechanized way of harvesting of tall trees like coconut
- Develop appropriate seeders, pneumatic planters for pulses particularly soybean like BBF, ridge and furrow, bed planters

Development of Machines and Tools for Post-harvest Management

- AI-powered freshness scanner for fruits and vegetables
- Vision-guided AI-enabled Robotics Apple harvester
- Low capacity dryer for maize cob
- Mini rice bran oil extractor for local rice mills
- Efficient ethylene degradation unit for transportation and storage of fruits
- Solar assisted cold storage with thermal battery backup
- PCM based vending carts for improved shelf life
- PCM-integrated mini cold room
- Portable pesticide residue detection kit and handy tool/ biosensor kit to detect Aflatoxin content in maize, groundnut and other crops
- Energy efficient hybrid drying technology for flowers
- Spectroscopy-based adulteration detection kit for jiggery, oil etc.
- Low cost freeze drying technology with possible integration of renewable energy
- X-rays based device for overall quality evaluation and monitoring of fruits and vegetables

- Non-destructive device for estimating the volume of tender coconut water
- Design and development of vehicle for transportation of honey bees along with boxes for migration

Natural Farming and Conservation Agriculture

- Suitability mapping areas for suitability of crops for natural farming and conservation farming practices
- Identification and development of varieties suitable for natural farming and conservation agriculture practices
- Natural farming modules of nutrient management in specialty rice (basmati, jasmine, Kalanamak, etc), wheat, pulses, oilseeds, fruits and vegetables
- Protocol for dose and use of concoctions for use in Natural Farming
- Nutrient management in traditional and emerging cropping system and practices (Conservation Agriculture, Regenerative Agriculture etc.)
- Nutrient management protocols for basmati and specialty rice (Kalanamak, black/ red/ jasmine), pulses, plantation and horticultural crops for export potential
- Location specific biofertilizer (nitrogen fixing, phosphorus solubilizing, micronutrient, PGPR) in various agroecologies and their quality maintenance value chain research.
- Optimisation of BNFs in pulses by using consortia approach

Plant Protection

- Investigation of vector-pathogen interactions to better understand the transmission dynamics of viral diseases in *kharif* crops, for example Rice Stunted Virus, Yellow Mosaic Virus in moth bean, and Mosaic in soybean, to develop effective management strategies.
- Development of durable resistant varieties by identifying and deploying resistance genes against major pests and diseases.
- Develop pest outbreak forecasting models, both short-term (3–5 days) and long-term, for timely pest management interventions.
- Development of molecular diagnostic tools and early detection kits for rapid identification of viral diseases at the field level.
- Development of low-cost field diagnostics kits to evaluate quality and concentration of pesticides and bio-agents.
- Studies on pathotype diversity, race identification and virulence to monitor resistance development and potential breakdown in host resistance against new race/pathotype of pathogen.
- Affordable field kits for mycotoxin detection and development of bio-based management approaches.
- Studies on resistance mechanisms for pesticide ineffectiveness to improve chemical control strategies.
- Development of novel pesticide formulations, including nano-pesticides and slow-release types, for improved efficacy and environmental safety.

- Formulation of effective biocontrol agents suitable for seed treatment and foliar applications.
- Post-harvest pest and disease management using novel bio or chemical based formulation.
- Compatibility studies of bio-pesticide formulations with commonly used fertilizers and chemical pesticides to ensure effective integrated use.
- Advancement of biological control strategies and pheromone technologies, particularly for managing termites and sucking pests.
- Innovation in seed treatment technologies to protect crops against soil-borne pests and pathogens from the early stages.
- Research on use of optimized nutritional application strategies manage viral diseases crops.
- Research on intercropping systems to understand effect on pest dynamics.
- Development of IPM modules that support conservation of honeybees and other beneficial pollinators.
- Sustainable pest management practices in high pesticide-use crops like cotton, vegetables, and sugarcane through on-farm-level IPM implementation.
- Strengthening of surveillance and quarantine protocols for managing invasive pest threats such as Coconut spiralling whitefly and Fall Armyworm in maize.
- Utilization of UAVs and remote sensing with AI-based models for accurate crop loss estimation and pest mapping.
- Evaluation and validation of Indigenous Technical Knowledge (ITK) including the use of alum, salt, and country-made liquor for pest and disease management.
- Development of SOPs for pest management in organic and natural farming systems.
- Creation of SOPs for drone-based pesticide application to enhance precision application and reduce environmental contamination.
- Regular quality testing protocols for commercially available growth stimulants and organic products available in market for their efficacy.
- Research of AI and IoT for better crop monitoring, disease predictions, weather and resource management.

Weed Management

- Develop predictive models for evolution of herbicide resistance in weeds
- Development of simple tool or methodology for analysing the potency of herbicide and methodology of identification of resistance biotypes of weeds
- Developing better mechanical tools for small farmers for efficient weeds management including robots for weeding
- Development of judicious use of alternative herbicides, herbicide mixtures and herbicide rotation for long term use of imazethapyr in soybean and other pulses
- Develop strategy for extending the resistance in herbicides for field crops particularly in rice-wheat system where weed resistance has emerged as a common problem
- Management of weedy rice in different rice production system in various ecologies

- Research on defoliants and knock-down herbicides (Paraquat,2,4-D, Glyphosate etc.) for mechanical harvesting of moong, maize, soybean, cotton etc. to encourage
- Research on analysis of herbicide residue in food grains
- Develop sustainable weed management technologies for natural and organic farming systems
- Develop SOPs of herbicide use through drones (full package)
- Developing nano-herbicides and seed coating with nano-fertilizers for better start of crop to compete with weeds.
- Recommendations for herbicide mixtures (2 or 3 ways), adjuvants and efficient spraying methods to delay the onset of resistance in weeds.
- Effective biological control methods for aquatic weeds encroached in water bodies.
- Research on robotic based weed control
- Development of technology for control of parasitic weeds like Orobanchae, Cuscuta, Striga etc.
- Climate smart farming using weed biology knowledge, phenotyping and other technologies to manage weeds thereby reducing insects and disease harbouring.
- Weed management recommendations based on soil types and organic matter content as herbicide dose varies under different situations.
- Develop strategy for checking the menace of alien and invasive weeds spread.
- Development of district-wise Weeds Atlas.

Horticulture

- Breeding for higher productivity, climate resilience and speciality varieties of horticultural crops by use of precision breeding tools, fast breeding approaches, genomics and genome editing
- Breeding for abiotic stress tolerance –high temperature, drought, salinity tolerance etc
- Development of multiple disease resistant varieties
- Breeding dwarf varieties for tall plants like coconut, arecanut, date etc.
- Breeding varieties for longer shelf life and are suitable for processing
- Research efforts on development of improved plant geometry, canopy architecture and productivity of major fruits and vegetables
- Enhancing nutrient use efficiency, water productivity, energy use efficiency
- Strengthening soil health and microbiome research
- Precision crop management using remote sensing, drone, artificial intelligence and machine learning
- Development of low cost region specific protected cultivation techniques
- Development of natural and organic farming practices in horticultural crops
- Use of pollinators and ecosystem services
- Bio intensive pest and disease management by developing location specific insect pest and disease management module
- Development of disease, pest management technologies for protected cultivation like nematode management, sucking pest management etc.

- Climate-linked pest and disease forecasting models and mitigating climate vulnerability
- Developing adaptation and mitigation strategies for climate change issue in horticultural crops
- Developing carbon farming and regenerative practices, integrating horticulture component in designing sustainable and climate resilient Integrated Farming System modules
- Development of techniques and technologies for reducing post-harvest losses and enhancing value addition
- Shelf-life enhancement technologies for perishable crops, processing-oriented varieties to reduce market glut and improve farmer income
- New products and product diversification, smart packaging and storage technologies, development of protocol of long distance shipment through sea route
- Development of technologies, rapid multiplication clean planting material and quality seed
- Development of rapid propagation techniques for elite planting material, strengthening of seed and quality planting material supply chains including certification

Animal Science

- Developing crossbred cattle requiring low-maintenance rations with high feed conversion efficiency.
- Development of crossbred cattle with immunity and disease resistance comparable to indigenous breeds and improving indigenous cattle for enhanced milk production.
- Breeding buffalo with higher adaptability to hot climates
- Develop high-growth 'broiler' varieties of goats and pigs.
- Production of eggs with low cholesterol content.
- Investigate Antimicrobial Resistance (AMR) development mechanisms and explore alternative disease prevention and treatment methods.
- Formulate region- and breed-specific protocols for poultry and livestock disease control, ensuring judicious antibiotic use and adoption of novel therapies.
- Study drivers behind the emergence and re-emergence of poultry diseases.
- Develop quick diagnostic tools, surveillance systems, and cross-border quarantine protocols.
- Understand transmission at the human–animal interface, improve early warning systems, and implement integrated control measures.
- Undertake translational research to create cost-effective, user-operated diagnostic tools and kits for field use.
- Study the effects of climate change on the frequency and recurrence of animal and poultry disease outbreaks.
- Develop heat-tolerant breeds, improve housing and management for heat stress mitigation, and study climate impacts on disease patterns.
- Study impacts on human health from antibiotic and hormone use in animal production, and propose mitigation strategies.

- Evaluate traditional remedies and develop integrated, cost-effective treatment protocols.
- Examine socio-cultural factors behind animal cruelty, design interventions, and evaluate existing animal welfare laws and enforcement.
- Develop low-cost, locally sourced housing solutions for livestock and poultry, addressing heat and flood resilience, while promoting welfare (e.g., free-range, enriched cages).
- Compare palatability and straw quality from mechanically harvested paddy; develop high-yielding, climate-resilient fodder, and explore alternative feeds such as insects and algae.
- Develop breed-, species-, and region-specific nutritional protocols tailored to various agro-climatic zones.
- Design profitable, resource-optimized, environmentally friendly production systems suited to Indian conditions.
- Innovate poultry waste solutions such as composting, biogas, and eco-friendly disposal to curb pollution.
- Improve livestock and poultry product safety through better processing and handling practices.
- Analyze poultry product preferences and create value-added products with suitable packaging.
- Deploy robots for feeding, watering, egg/milk collection, disease detection, waste handling, and health monitoring.
- Use AI, sensors, RFID, and analytics for predictive disease modelling, feed optimization, and precision health monitoring in poultry and livestock.

Fisheries Science

- Round the year availability of seed of important aquaculture species
- Breeding & seed production technology of some freshwater fish species like *Nandas nandas*, *Channa barca*, etc.
- Breeding technology of shrimps and brackish water fish in inland saline areas of Northern India
- Hatchery technology of mud crab species
- Low-cost feed for carps, catfishes, trout and shrimp
- Seed of seaweed with higher growth
- Cage culture technology for major carps
- Reduction of loss due to new diseases in fish and shrimps
- Less capital-intensive, high-profit farming methods for paddy-fish systems in Pokkali and Kuttanad regions
- Minimize quality loss in value chain
- Cost effective technologies and methodologies for RAS and Biofloc to be profit-making

Farmer Practices & Indigenous Knowledge

- Evaluation and assessment of fertilizer application practices of farmers (e.g. DAP application on soil surface after one month in cotton, soybean, zero tillage maize, etc) and their scientific validation
- Recording of indigenous ITKs in nutrient management and their scientific validation, e.g. use of salt, alum, etc.
- Need to validate farmers' frugal innovations, integrate scientific principles and perfection of technologies
- Insights from the historical long-term nutrient management experiments for devising sustainable nutrient management practices
- Optimization of defoliation/desiccation approaches for mechanized harvesting and improving price quality in cotton

Extension Issues (Reflecting Knowledge and Skill Gaps)

Improved Crop Varieties and Seeds Availability

- Lack of awareness, knowledge and low adoption of improved climate resilient biofortified crop varieties
- Lack of knowledge of recommended seed rate, spacing and seed treatment
- Factors for low adoption of improved varieties and adoption analytics
- Lack of knowledge of improved varieties resistant to major abiotic and biotic stresses
- Huge gap in availability and use of machine for seed sowing

Plant Protection

- Lack of knowledge on Integrated Pest Management (IPM) in leading *Kharif* crops and vegetables
- Lack of knowledge of Integrated Weed Management (IWM) technologies in *Kharif* crops
- Lack of knowledge of appropriate dosages of pesticides and lack of skill in pesticides application methods
- Knowledge gap about biological control of insects, pheromone traps etc.
- Lack of knowledge of Integrated Disease Management (IDM) in major *Kharif* crops and vegetables.
- Knowledge and Capacity gap in preparation and application of bio-input resources in organic and natural farming.
- Lack of expertise among the grassroots extension professionals regarding improved IPM, IDM and IWM
- Mixing of herbicides with pesticides due to lack of awareness.
- "Strong Knowledge Gap" for proper use of suitable pesticides
- Mixing of one or more pesticides without having knowledge of antagonistic/synergistic effect
- Lack of knowledge about harmful insects and friendly insects
- Lack of awareness of providing protection to honey bees from pesticides
- Knowledge gap about wearing lit during handling and spraying pesticides

Climate Resilient Agriculture

- Knowledge gap of climate resilient technologies in water conservation, water harvesting and critical/lifesaving irrigation like farm pond, check dam, bora bandi, land configuration techniques
- Developing capacity through awareness and knowledge climate resilient technologies
- Knowledge gap about fertiliser application under dryland farming
- Knowledge gap of use of suitable machines for dryland agriculture
- Confusion on multi-source of agro-advisories

- Developing capacity on climate literacy and timely agro-advisory
- Strengthening TOT under NICRA to enhance decision making ability of farmers
- Lack of information on management of climatic events like frost, heatwave, cold wave, water logging, drainage

Fertilizers and Soil Health Management

- Lack of knowledge and low adoption of Integrated Farming Systems (IFS)
- Knowledge and capacity gap regarding Integrated Nutrient management (INM) in *Kharif* crops and vegetables
- Low awareness about green manuring and availability of seed
- Knowledge gap regarding soil health and soil test based fertiliser application
- Lack of knowledge and skill regarding bio-fertiliser application
- Lack of skill among the grassroots extension professionals regarding soil sample collection and testing
- Low level of awareness about improved Jhum cultivation technologies
- Knowledge gap regarding conservation agricultural practices and other regenerative agricultural practices
- Lack of awareness about farm waste management technologies
- Knowledge gap about the reclamation of problem soils and water quality

Farm Machineries and Implements

- Lack of knowledge about ergonomically designed tools and implements and skill gap in application techniques
- Knowledge gap regarding sensor-based precision farming tools
- Skill deficit in repair and maintenance of farm machineries
- Lack of information about Custom Hiring Centres (CHCs), Machine bank etc.
- Lack of awareness about use of gender friendly tools and implements for drudgery reduction
- Knowledge gap about use of small tools for harvesting vegetables which causes skin irritations
- Lack of knowledge of effective machines like laser leveller, BBF, ridge making machines

Water Management and Fertigation

- Low awareness about water quality, waste water use in irrigation practices and excess irrigation
- Lack of knowledge of Integrated Water Management (IWM) practices in *Kharif* crops and vegetables.
- Capacity and knowledge gap in adoption of soil and water conservation technologies including mulching, bunding etc.
- Capacity development for drip irrigation, solar system, water storage tanks, sub-surface drip irrigation and their interaction

Protected Cultivation

- Knowledge and skill gap in protected cultivation technologies of vegetables and flowers
- Lack of awareness about the design and development of the protected structures
- Gap in understanding of economically viable size of the protected structures
- Lack of knowledge of government schemes for promotion of protected cultivation
- Knowledge gap in pest including nematodes and disease management in protected cultivation
- Lack of knowledge about nursery management technologies, micro irrigation techniques under protected cultivation

Processing and Value Addition

- Lack of knowledge and skill in improved post production primary processing technologies of perishable and semi-perishable commodities to increase shelf life, reduce wastage and ensure higher market price.
- Lack of awareness on developing value chain development in agriculture
- Knowledge deficit in varieties suitable for processing and value addition
- Knowledge gap about scope of value addition
- Lack of information about prospects of APCs

Horticulture

- Enhancing capacity on good quality planting materials in fruits and vegetables
- Lack of knowledge of fertiliser application and insect pest management
- Capacity development on cultivation of high value fruits and vegetables
- Strengthening skills on propagation techniques in fruits and vegetables
- Developing capacity of pruners and gardeners for horticultural crops
- Lack of information about use of micro-irrigation techniques, canopy management (training and pruning)
- Lack of information on high density planting technology of fruit crops and cotton

Energy in Agriculture

- Developing capacity of farmers to access solar schemes for tube well irrigation and connecting them with cross sectoral schemes

Biodiversity

- Capacity development of farmers on conservation led techniques; and their orientation for policy measures related to incentives
- Lack of knowledge on Protection of Plant Varieties and Farmers Right Act

Livestock and Animal Husbandry

- Capacity development of stakeholders for animal health management (deworming, mastitis etc.) and shelter management in the backdrop of climate change

- Capacity development of stakeholders on small dairy and other livestock components
- Strengthening the ability of farmers for preparation of mineral mixtures, silage and controlling repeat breeding
- Knowledge gap on clean milk production
- Capacity gap on shelter management, vaccination and bio-security measures in piggery
- Strengthening capacity of stakeholders on disease management and vaccination in poultry
- Knowledge gap in improved and balanced feed management
- Lack of knowledge on value addition of goat and sheep products
- Lack of information on stall feeding system for goat and sheep
- Lack of knowledge about small machine for wool removal

Fodder

- Capacity development on year-round green fodder production
- Strengthening knowledge and skill on preparation of feed based on local resources
- Capacity development and need for silage and hay making

Fisheries

- Enriching knowledge and build capacity of fish farmers in inland and capture fisheries
- Capacity development of farmers for shrimp and other aquaculture enterprises
- Lack of knowledge and capacity of the stakeholders in value addition in fisheries
- Capacity development of modern techniques in the field of fisheries like Recirculatory Aquaculture system, cage technology etc.

Miscellaneous

- Knowledge and capacity development of extension professionals in improved technologies
- Lack of awareness about government schemes among the farmers and other stakeholders
- Designing institutional mechanism for community participation in agricultural research and development
- Development of convergence led innovative extension models for effective extension delivery
- Designing AI/ML based ICT led platform for agricultural knowledge management and customised agro-advisory to the farmers

Development and Policy Issues

Seeds and Varieties

- Policies needed to ensure timely and adequate supply of high-quality seeds for major Kharif crops.
- Dedicated schemes to enhance Varietal Replacement Rate and Seed Replacement Rate.
- Lack of compensation mechanisms when crop failures occur due to poor quality private seeds.
- Issues of poor-quality seeds and unregistered hybrids, especially in cotton and maize, call for stronger regulation and oversight.
- Farmers should be integrated into public sector seed production chains to ensure future seed security.

Agro-Chemicals and Plant Protection

- Strengthened policy is needed to assure availability and regulation of insecticides, fungicides, biopesticides, and weedicides.
- Farmers face high prices due to lack of price regulation in agro-chemicals.
- Widespread misuse of unapproved pesticides necessitates better surveillance.
- Ensuring that only crop-specific approved pesticides and herbicides are used.
- Regulation of quality in organic growth promoters is lacking.
- Input dealers require structured training to promote fair and farmer-centric practices.

Fertilizer Use and Policy

- Ensuring timely and quality fertilizer supply, including NPK mixtures.
- Policies must promote judicious use to maintain soil health.
- Address the issue of dealers forcing unnecessary inputs along with fertilizers.
- Enabling policy for promoting bio-based inputs and natural farming practices.
- Direct benefit transfers should be operationalized efficiently.
- Need for surveillance of the quality and distribution of nano-fertilizers.
- Mechanism to recognize and incentivize farmers following sustainable practices.

Farm Machinery and Implements

- Promote Custom Hiring Centres with tools suited for small and marginal farmers.
- Ensure affordable machinery access for smallholders.
- Promote adoption of sensor-based and smart agriculture implements.
- Encourage installation of solar energy systems and integrate relevant schemes for easy access.

Protected Cultivation

- Modify subsidies to reflect regional needs and polyhouse designs.
- Ensure the supply of quality materials for protected cultivation structures.
- Provision for repairs and maintenance post-installation.
- Assistance for damage caused by climate events.

Processing and Value Addition

- Certification, quality labs, insurance, and mobile extraction machines are essential.
- Enhance marketing support to compete with large brands and support smallholder cardamom and honey producers.
- Policies to facilitate household-level processing.
- Establish processing facilities for GI-tagged and naturally grown commodities.

Horticulture

- Enforce regulations and certification systems for horticultural and agroforestry planting material.
- Introduce clean plant programs and grafting technology with financial support.
- Policies for market intelligence and international demand forecasting.
- Support for perishable vegetables through schemes like TOP (Tomato Onion Potato).
- Treat trees as financial assets to improve credit access.

Soil and Water Management

- Cross-sectoral approaches involving agriculture, soil, water, and energy sectors.
- Promote regenerative, natural, and conservation agriculture.
- Enable private/cooperative sector involvement in problem soil restoration.
- Empower farmers with digital tools for soil and water diagnostics.
- A dedicated body for planning and execution of soil and water problem management is essential.

Energy in Agriculture

- Mainstream solar energy into agriculture policies for better adoption.
- Support schemes for energy-efficient pumps, tractors, and implements.

Biodiversity Conservation

- Provide incentives to farmers conserving traditional biodiversity.
- Strengthen mechanisms for equitable sharing of farmer variety benefits.
- Encourage inclusion of farmer-breeders in formal seed systems.
- Promote farmer-led innovations under PVFRA.

Climate Change and Agriculture

- Create an index for integrating actual losses with insurance (PMFBY).
- Consider village/farm-level units under PMFBY.
- Ensure convergence and preparedness for climate-related risks.
- Quick compensation and input supply for next cropping after climate failures.

Livestock, Dairy and Fisheries

- Quarantine and health regulation for animal movement.
- Develop plans for their inclusive development.
- Rationalize fishery resources through inter-departmental coordination.
- Address lack of capital and monsoon fishing regulation issues.

Institutional and Policy Issues

- Make access to agricultural credit and subsidies easier.
- Long-term policy support for export of staples and perishables.
- Inclusion of tenants in schemes and benefits.
- Explore low-cost veterinary medicine through existing networks.
- Align rural employment with agricultural activities in MGNREGA.
- Create dedicated sale counters and premium pricing for organic/natural produce.
- Regular review meetings for course correction in policies.
- Develop policy solutions for managing animal intrusions.
- Leverage global partnerships for future-ready agri-technologies.

State wise Researchable Issues

Andhra Pradesh

- Assessment of climate-resilient cropping systems and crop insurance models to mitigate cyclone and flood-induced crop damage in coastal Andhra Pradesh
- Development and evaluation of drought-tolerant cropping systems and micro-irrigation strategies for improving water productivity in the Rayalaseema region
- Reclamation strategies and salt-tolerant crop varieties for managing waterlogging and salinity in Krishna and Godavari delta regions
- Comparative analysis of integrated pest management (IPM) and bio-pesticide strategies for reducing pesticide residues and environmental pollution in major cropping systems
- Economic impact analysis and development of price stabilization models for horticultural crops like tomato, chilli and mango in Andhra Pradesh
- Assessment of long-term fertilization and cropping practices on organic carbon status and soil health indicators in irrigated and rainfed systems of Andhra Pradesh
- Capacity building and on-farm validation of agroforestry models integrated with wild boar deterrent strategies for smallholder farmers
- Eco-friendly management strategies for Rugose Spiralling Whitefly in coconut and other perennial crops in coastal Andhra Pradesh
- Development and popularization of low-cost, farmer-friendly silage making technology for fodder preservation in smallholder dairy systems
- Integrated management approaches for controlling Banana wilt in high-density banana plantations in southern Andhra Pradesh
- Integrated disease management strategies for sooty mold control in cotton, citrus, and other susceptible crops under humid conditions
- Promotion and performance evaluation of mushroom cultivation as an income-generating enterprise for landless and smallholder farmers
- Optimization and performance evaluation of Custom Hiring Centres (CHCs) for improving access to mechanization among small and marginal farmers
- Nutritional and genetic interventions to enhance milk yield and reproductive performance of native cattle and buffalo breeds in Andhra Pradesh.

Assam

- Identification and evaluation of high-yielding, disease-resistant, short duration mustard varieties suitable for agro-climatic conditions of Assam
- Post-harvest handling and drying techniques to reduce quality loss in mustard purchased at high moisture content in Assam
- Screening and promotion of submergence-tolerant paddy varieties for flood-prone and low-lying areas of Assam
- Development of flood-resilient and waterlogging-tolerant cropping systems for improving farm income in chronically affected areas of Assam
- Assessment of lime application and organic amendments for amelioration of acidic soils in different agro-ecological zones of Assam
- Productivity and profitability analysis of replacing traditional low-yielding varieties with improved cultivars in rice, pulses, and oilseeds
- Evaluation of crop diversification models integrating pulses, oilseeds, and vegetables to enhance income and reduce risk in smallholder farms
- Assessment of post-harvest losses in paddy, mustard, and vegetables, and development of cost-effective storage and processing technologies for Assam
- Adoption and impact assessment of custom hiring services and small-scale mechanization for reducing drudgery and improving efficiency in small farms
- Design and evaluation of community-based drainage and soil improvement techniques for flood-prone and waterlogged areas in Assam
- Assessment of climate change sensitivity, vulnerability, and adaptation strategies among farming communities in different agro-climatic zones of Assam
- Conservation, genetic characterization, and sustainable utilization of indigenous livestock and fishery breeds in Assam for livelihood resilience.

Bihar

- Development of post-harvest treatments and packaging technologies to enhance the shelf life and marketability of litchi in Bihar
- Evaluation and promotion of high-yielding, disease-resistant tomato varieties suitable for diverse agro-climatic conditions of Bihar
- Breeding and agronomic evaluation of climate-resilient, off-season mango varieties and management practices in response to changing climate in Bihar
- Development and field testing of short-duration, flood and drought-tolerant rice and pulse varieties for stress-prone ecologies in Bihar
- Breeding and identification of multi-disease resistant vegetable varieties to enhance productivity and reduce pesticide dependence in Bihar

- Design and validation of low-cost, mobile equipment for on-farm rapid quality testing of fertilizers to ensure input authenticity and reduce adulteration
- Genetic improvement and agronomic optimization of traditional Marcha paddy for higher yield and better grain quality in Bihar
- Development of multi-stress-tolerant crop varieties with resilience to drought, flood, and heat stress under Bihar's changing climate scenarios
- Development and evaluation of yellow mosaic virus resistant moong varieties for kharif and summer cultivation in Bihar
- Breeding and selection of short-duration, lodging-resistant paddy varieties for rainfed and flood-prone areas of Bihar
- Surveillance, early detection, and management strategies for controlling Avian Influenza (bird flu) outbreaks in poultry in Bihar
- Development of diagnostic, preventive, and treatment protocols for controlling Lampi disease (Lumpy Skin Disease) in cattle in Bihar
- Identification and promotion of high-yielding, synchronous maturing green gram and black gram varieties for mechanized harvesting and pulse intensification
- Breeding and promotion of vegetable varieties resistant to wilt and yellow mosaic virus for sustainable production systems in Bihar.

Chhattisgarh

- Evaluation of rice varieties suitable for direct seeded rice (DSR) along with integrated single-herbicide-based weed management strategies in Chhattisgarh
- Identification and promotion of suitable crop varieties for rice-fallow cropping systems to enhance productivity and cropping intensity in Chhattisgarh
- Performance evaluation of crop varieties suitable for organic farming systems in the agro-climatic zones of Chhattisgarh
- Optimization of input use and integrated weed management practices for natural farming in major cropping systems of Chhattisgarh
- Development and screening of soybean varieties resistant to yellow mosaic virus and dry root rot under changing climate conditions
- Development of mechanized sowing, weeding, and harvesting solutions for soybean, lentil, and green gram crops in smallholder systems
- Breeding and evaluation of insect-resistant varieties in sugarcane and soybean to reduce pesticide use and crop losses in Chhattisgarh
- Genetic improvement and promotion of root rot and sterility mosaic virus resistant groundnut varieties for Chhattisgarh's rainfed regions
- Development of high-yielding, weed-competitive rice varieties specifically for direct seeded rice (DSR) systems in Chhattisgarh

- Integrated management strategies for panicle mite and false smut disease in rice under humid rice-growing environments of Chhattisgarh
- Surveillance, forecasting, and eco-friendly management strategies for fall armyworm infestation in maize in tribal and plain regions of Chhattisgarh
- Development of market linkages and value chain strategies for minor millets produced in the tribal Bastar region of Chhattisgarh
- Comparative performance of crop varieties under organic and natural farming conditions in tribal and semi-arid regions of Chhattisgarh
- Economic analysis and policy recommendation for incentive frameworks supporting organic and natural farming outputs in Chhattisgarh
- Evaluation of millet threshing and processing technologies with focus on subsidy needs and reducing drudgery for women in tribal areas
- Design and field evaluation of affordable seed drill machines for efficient sowing under direct seeded rice (DSR) conditions in Chhattisgarh
- Development of sustainable models for processing, value addition, and marketing of non-timber forest produce (NTFP) to improve livelihoods in tribal areas of Chhattisgarh.

Goa

- Assessment and revival strategies for traditional cropping systems focusing on paddy, millets, and indigenous crops in Goa under socio-economic and ecological transitions
- Impact assessment and mitigation strategies for salinity intrusion in coastal and khazan lands of Goa to enhance soil health and crop productivity
- Development of climate-resilient cropping calendars and decision-support tools for managing the impact of unpredictable rainfall on planting and harvesting in Goa
- Integrated pest management strategies for controlling tea mosquito bug and eriophyid mites in cashew and coconut plantations in Goa
- Adoption and impact assessment of farm mechanization, drip irrigation, and digital tools in smallholder farming systems of Goa
- Design and demonstration of improved water management systems including drainage and localized irrigation in paddy fields of Goa
- Rejuvenation strategies for aging cashew and coconut plantations through varietal replacement and integrated nutrient management in Goa
- Evaluation of soil health status and development of balanced nutrient management strategies in chemically imbalanced and degraded soils of Goa
- Development of integrated farming models and crop diversification strategies to improve productivity and resilience in rain-fed areas of Goa
- Assessment of post-harvest losses and development of community-based storage, processing, and value addition infrastructure for major crops in Goa.

Gujarat

- Market analysis and value chain development for promoting natural farming produce in Gujarat
- Design and evaluation of low-cost mechanical cotton pickers suitable for smallholder farmers in Gujarat
- Performance evaluation of high-density planting system (HDPS) in cotton under semi-arid conditions of Gujarat
- Development and evaluation of pink bollworm resistant cotton varieties for reducing pesticide load and crop losses in Gujarat
- Design of low-cost mechanized weed control and harvesting solutions for cotton cultivation in Gujarat
- Development of cost-effective, user-friendly kits for early and accurate detection of oestrus in buffaloes in rural Gujarat
- Formulation of an integrated climate action plan for enhancing agricultural resilience across diverse agro-ecological zones of Gujarat
- Standardization of export-oriented production technologies for banana and mango crops in Gujarat
- Breeding and evaluation of summer-season tomato varieties with resistance to prevalent viral diseases in Gujarat
- Development of eco-friendly and cost-effective fruit fly management strategies in mango and vegetable crops
- Post-harvest management protocols for banana, mango, and vegetable crops to reduce losses and improve shelf life in Gujarat
- Development of real-time pest and disease forecasting systems for vegetable crops under different agro-climatic conditions of Gujarat
- Breeding and screening of virus-resistant vegetable genotypes for sustainable production in Gujarat
- Design and optimization of a combined direct-seeded rice (DSR) machine integrated with a sprayer for efficient resource use in Gujarat's rice belt
- Development of climate-resilient sugarcane varieties tolerant to heat, drought, and salinity for long-term sustainability in Gujarat
- Development of integrated management practices for wilt in maize under changing environmental conditions of Gujarat
- Improving the availability, production, and delivery of disease-free planting material and climate-resilient varieties in Gujarat
- Assessment of challenges and solutions in obtaining export-oriented certification for natural farming produce in Gujarat

- Breeding of drought-tolerant varieties in red gram, black gram, soybean, and green gram for enhancing productivity in rainfed regions of Gujarat
- Development of salt-tolerant and waterlogging-resistant crop varieties to enhance sustainability of farming systems in coastal districts like Porbandar
- Strategies to improve availability and awareness of newly released, farmer-demanded crop varieties in Gujarat
- Scientific evaluation and field validation of nano urea and nano DAP application doses and timing across major crops of Gujarat
- Breeding and promotion of short-duration kharif paddy and pigeon pea varieties for rainfed cultivation under erratic rainfall in Gujarat
- Development of climate-resilient crop packages integrating tolerant varieties, agronomic practices, and resource conservation technologies in Gujarat's vulnerable regions.

Haryana

- Evaluation and identification of rice varieties suitable for Direct Seeded Rice (DSR) with integrated weed control through single-herbicide application in Haryana.
- Development of low cost mobile device for rapid quality testing of fertilizers.
- Assessment of the impact of long-term rice cultivation on groundwater decline and nitrate contamination in Haryana's rice-wheat belt
- Assessment of the impact of excessive dependence on rice-wheat monocropping on soil health, water resources, farm income, and ecological sustainability in Haryana, and identification of viable crop diversification strategies for long-term agricultural resilience
- Evaluation of the impact of unbalanced pesticide and fertilizer usage on soil health, crop productivity, and farmer health in Haryana, and development of balanced nutrient and pest management strategies
- Assessment of the environmental and economic impacts of stubble burning in Haryana and development of sustainable residue management practices.
- dentification of economically viable and ecologically sustainable crop diversification models to reduce dependency on rice-wheat monoculture
- Evaluation of natural farming practices and climate-resilient technologies for enhancing farm productivity, resource-use efficiency, and climate adaptation
- Assessment of the current level of integration between crop and livestock farming in Haryana and development of integrated farming system models for enhanced income and sustainability
- Development and field validation of a low-cost, farmer-friendly oestrus detection kit for improving reproductive efficiency in buffaloes in Haryana
- Design and evaluation of a cost-effective subsurface drainage system for improving soil productivity and crop yields in salt-affected and saline groundwater regions of Haryana

- Development of bio-drainage systems and land use planning for saline water conditions.
- Development of efficient agronomic and weed management strategies for Direct Seeded Rice (DSR) and control of parasitic weed Orobanche in mustard under Haryana's agro-ecological conditions
- Evaluation of alternative nutrient sources, including biofertilizers and microbial consortia, and establishment of quality standards for their effective use in sustainable crop production
- Development and field validation of a microbial consortium for rapid rice residue decomposition within 15 days while minimizing greenhouse gas emissions under Haryana's climatic conditions
- Design and evaluation of integrated pest management (IPM) modules for emerging pests such as rice blast, pink bollworm, and red rot in sugarcane in Haryana
- Development and standardization of crop-specific IPM strategies for insect pests in mung bean, mustard, wheat, and major fruits and vegetables grown in Haryana
- Development of easy and low-cost quality testing technology of pesticides and insecticides to ensure quality pesticides in the market.
- Accelerated development and optimization of sub-surface irrigation, DSR techniques, and precision land leveling technologies suited to Haryana's agro-climatic conditions for enhanced water and resource use efficiency
- Development of short-duration varieties of bajra and basmati rice with improved milling traits and higher head rice realization
- Breeding and evaluation of crop varieties with enhanced tolerance to drought, dry spells, and saline groundwater conditions for sustainable agriculture in Haryana's stress-prone regions
- Development of processable varieties of potato, tomato and onion
- Development of milling protocols for new basmati rice varieties and hybrids of rice to have higher head rice recovery and higher return to farmers
- Development and standardization of transport protocols for exotic fruits -dragon fruits, fig and vegetables like broccoli, etc
- Development of robust systems for production, certification, and timely distribution of high-quality planting material, with a focus on horticultural crops in Haryana.

Himachal Pradesh

- Assessment of input supply chain gaps and development of a model market facility for timely and affordable access to natural farming inputs in hill agriculture of Himachal Pradesh
- Development and evaluation of AI-based automated scouting and scarecrow systems for effective management of crop damage caused by wild and stray animals in hill farming systems

- Feasibility study and framework development for establishing a horticulture hub to enhance value chain integration, post-harvest management, and export potential of fruit crops in Himachal Pradesh
- Optimization of high-density planting systems (HDPS) for apple with suitable rootstocks, canopy management, and fertigation practices for enhanced productivity and profitability in mid- and high-hills of Himachal
- Breeding and evaluation of disease-resistant varieties of key fruits and vegetables for improved resilience and reduced pesticide dependency in temperate agro-ecosystems of Himachal Pradesh
- Design and assessment of decentralized cold storage and transportation models to reduce post-harvest losses and enhance market access for perishable horticultural produce in hilly terrain
- Development and performance evaluation of low chilling apple varieties for sustainable apple production in lower and mid-hill zones under changing climatic scenarios
- Characterization of soil microbiome under natural and conventional farming systems to assess its role in nutrient cycling, plant health, and long-term soil sustainability in temperate hill ecosystems
- Development of agroforestry models integrating native species for biodiversity conservation, soil health improvement, and livelihood enhancement in the hill farming systems of Himachal Pradesh
- Exploration of potential and promotion strategies for secondary agriculture (processing, value addition, and agri-enterprise development) in Himachal Pradesh to boost rural income and reduce migration.

Jammu & Kashmir and Ladakh

- Assessment of existing supply chains and development of an integrated input delivery system to ensure timely access to natural farming inputs in Jammu & Kashmir
- Policy and economic analysis for recognizing agro-forestry trees as financial assets, and evaluating the feasibility of providing credit and insurance support to farmers for tree-based systems
- Feasibility study and model development for a horticulture hub to support grading, packaging, cold storage, and export of temperate fruits in Jammu & Kashmir
- Design and field evaluation of artificial intelligence-enabled scarecrow and monitoring systems to minimize crop losses from wild and stray animals in vulnerable zones
- Development of real time district-specific contingency action plans to mitigate the impact of climate variability on major cropping systems in Jammu & Kashmir
- Optimization of high-density apple orchards through selection of dwarf rootstocks, planting geometry, and canopy management practices for higher productivity and profitability

- Breeding and molecular characterization of disease-resistant varieties in apples, apricot, walnut, and vegetables suited to temperate climates of J&K
- Design and deployment of decentralized cold storage and efficient transport logistics to reduce post-harvest losses and improve farmer access to distant markets
- Development and validation of portable, affordable devices for rapid assessment of fertilizer quality to prevent spurious input use by farmers
- Development and evaluation of short-duration, climate-resilient crop varieties suited for different altitude zones of Jammu, Kashmir, and Ladakh
- Long-term assessment of soil nutrient status under temperate cropping systems and development of integrated nutrient management modules for sustainable soil fertility
- Design and validation of efficient water harvesting and micro-irrigation systems tailored to hill topography and seasonal rainfall patterns of the region.

Jharkhand

- Assessment of input use patterns and development of effective, low-cost weed management practices under natural farming systems in tribal regions of Jharkhand
- Evaluation of tree-based farming systems and policy interventions for treating trees as financial assets to facilitate loan access for tribal and marginal farmers
- Design of climate-smart cropping systems and water conservation strategies to reduce dependency on rainfed agriculture in drought-prone districts of Jharkhand
- Development and adoption of decentralized water harvesting and micro-irrigation technologies to enhance irrigation coverage in rabi and summer seasons
- Soil fertility mapping and site-specific nutrient management for addressing widespread deficiencies of nitrogen, phosphorus, and Sulphur in Jharkhand's soils
- Design and validation of low-cost, mini and modular farm mechanization tools suitable for smallholder and fragmented landholding conditions
- Development of a decentralized, ICT-enabled input delivery system to ensure timely access to quality seeds, fertilizers, and plant protection chemicals
- Design of cost-effective post-harvest management, processing, and rural marketing infrastructure for perishable and non-perishable crops in tribal areas
- Participatory research and extension models for transitioning from traditional to modern, sustainable agricultural practices in Jharkhand
- Impact assessment and development of culturally appropriate training modules to enhance technical awareness among tribal farmers
- Development of early warning systems and adaptive farming practices to mitigate effects of climate-induced risks such as erratic rainfall, droughts, and hailstorms
- Strengthening last-mile delivery of agricultural extension through digital and community-based approaches in remote tribal regions

- Assessment of irrigation demand and supply gaps and formulation of water-efficient cropping models for off-season cultivation
- Epidemiological studies and development of preventive healthcare modules to reduce mortality rates in backyard poultry, goats, and pigs
- Development of location-specific IPM modules for managing major pest and disease outbreaks in vegetables and staple crops
- Genetic improvement and agronomic evaluation of Bhutku rice for enhanced yield and adaptation to local conditions
- Breeding and promotion of drought, flood, and heat-tolerant varieties suitable for Jharkhand's agro-ecological conditions
- Development of low-cost technologies and coatings to enhance shelf life of fruits and vegetables in high-temperature regions
- Long-term impact analysis of organic and integrated nutrient management practices on soil health and crop productivity
- Integrated farming systems and value chain interventions to maximize returns per unit of land for small and marginal farmers
- Surveillance, diagnosis, and preventive health management of swine flu in rural pig-rearing systems.

Karnataka

- Assessment of yield constraints and development of location-specific technologies to improve productivity in rainfed farming system
- Development of integrated pest management strategies for cotton, groundnut, and other major crops in the state
- Assessment and strengthening of agricultural marketing infrastructure for improving farm-to-market linkages
- Evaluation of quantity of inputs used and weed management strategies under natural farming systems
- Development and promotion of suitable millet crop varieties tailored for different agro-climatic regions
- Standardization of package of practices (POP) for newly introduced crops in non-conventional areas of Karnataka
- Assessment of the long-term effects of continuous use of water-soluble fertilizers on soil health and formulation of remedial measures
- Development and validation of SOPs for pressure/volume sprayers, drones, and high-volume sprayers for different crops
- Evaluation and enhancement of the efficiency and success rate of sexed semen technology in dairy sector

- Development of non-chemical, eco-friendly weed control practices suitable for Karnataka's cropping systems
- Study of appropriate cropping systems for perennial crops under different agro-ecological zones
- Development of an integrated management strategy for yellowing disease in coconut and areca nut, considering biotic and abiotic factors
- Promotion of tuber crop varietal improvement and establishment of participatory seed production systems for increasing availability of quality planting material
- Development of heat-tolerant vegetable varieties, new rice genotypes, and disease-resistant fish species suitable for varied micro-agro-climatic zones
- Design and field validation of smart, solar-powered, sensor-based technologies for managing wild animal attacks on crops
- Integrated management strategy for controlling Striga weed in sugarcane and other cereal crops
- Assessment of pesticide residue in agri-bio products suspected to cause early embryonic mortality in crops
- Identification and promotion of resistant varieties to yellow vein mosaic virus in green gram and black gram
- Study on the compatibility and viability of combined application of agrochemicals and bio-inoculants in soils of Karnataka
- Development and testing of organic-based storage insecticides and pesticides suitable for grains and pulses
- Discovery and evaluation of new-generation chemical molecules for thrips and mite control in flower crops
- Assessment of different spray pressure volumes and their effect on flower drop in pomegranate
- Effectiveness of organic treatments in managing Panama wilt and other major diseases in banana
- Development of effective and eco-friendly strategies for managing Rugose Spiraling Whitefly infestation in coconut
- Participatory wild animal management systems using sensor-based tools and legal framework integration across major regions
- Integrated pest management strategies for black-headed caterpillar in coconut plantations
- Enhancement of sexed semen technology in dairy to achieve >95% success rate under field conditions
- Design and development of efficient, small-scale harvesting machines for soybean, potato, groundnut, and cotton to reduce labor dependency
- Development of pigeon pea varieties resistant to dry root rot under rainfed conditions

- Integrated management of Cuscuta infestation in green gram, onion, and red gram
- Weed management strategies for maize, particularly for itch grass (Rottboellia cochinchinensis) in Karnataka
- Feasibility and productivity evaluation of coffee-based spice cropping systems in Karnataka's hill regions
- Development of climate-resilient varieties of avocado, black pepper, cardamom, and paddy for improved productivity
- Management of gall midge incidence in nursery and main field of paddy under changing climatic conditions
- Integrated pest management modules for serious thrips in chili and pink bollworm in cotton
- Integrated management of areca leaf spot, virus diseases, and nutrient management in plantation crops like areca nut
- Assessment and mitigation strategies for low SNF/fat content in milk during summer months
- Development of management practices for Ganoderma wilt and spindle bug in areca nut and coconut plantations
- Integrated red palm weevil management in large-scale coconut and areca nut plantations
- Development of flood-resistant paddy varieties tailored for coastal Karnataka
- Promotion and value addition of tuber crops through participatory seed production and processing mechanisms
- Environmental Impact Assessment (EIA) of cage fish farming in open water bodies and development of rapid diagnostic tools for emerging diseases
- Surveillance and management of sub-clinical haemoprotozoan diseases in cattle and goats
- Diagnosis and correction of micronutrient deficiencies in small cardamom, nutmeg, and black pepper
- Ensuring availability and quality of planting materials of high-yielding tuber crop varieties
- Development of a management protocol for Chilly Leaf Curl Disease in GI-tagged Edayur chili
- Development of a paddy variety to replace 'Uma'
- Development of sustainable and legally backed, participatory wild boar management systems in farming areas
- Identification of causes and solutions for muddy odour in Tilapia meat affecting fish marketability
- Comprehensive wildlife management strategies to address crop damage by peacock, wild boar, porcupine, etc.
- Integrated management practices for collar rot in elephant foot yam and mosaic disease in cassava
- Development of technologies for improving quality of value-added products in coconut and fish
- Scaling up of suitable marine ornamental fish species for domestic and export markets.

Kerala

- Development of integrated pest and disease management modules for coconut, arecanut, and banana under Kerala's humid tropical conditions
- Breeding and evaluation of dwarf and high-yielding varieties of coconut and arecanut suitable for high-density planting and mechanization
- Assessment of production costs and identification of strategies to enhance profitability of major farming systems in Kerala
- Study on the impact of high rainfall on soil acidity and development of location-specific amelioration techniques
- Design and development of farm machinery compatible with small and fragmented land holdings in Kerala
- Analysis of declining productivity trends in traditional crops like paddy and identification of appropriate agronomic and varietal interventions
- Development of effective drainage and water management solutions for waterlogging-prone agricultural areas
- Development of low-cost, decentralized storage and primary processing technologies for horticultural crops to reduce post-harvest losses
- Screening and promotion of crop varieties suitable for organic and natural farming practices in Kerala's diverse agro-ecologies.

Madhya Pradesh

- Identification and development of high-performing crop varieties suitable for organic and natural farming conditions in Madhya Pradesh
- Evaluation of effective weed management strategies under organic and natural farming systems for major crops
- Breeding and evaluation of soybean varieties tolerant to yellow mosaic virus (YMV) and dry root rot for enhanced yield stability
- Development of appropriate mechanization solutions and integrated weed management techniques for soybean, lentil, and green gram cultivation
- Development of high-quality, insect-resistant varieties for cotton, sugarcane, and soybean to reduce crop losses
- Identification of suitable rice varieties for direct-seeded rice (DSR) cultivation and evaluation of single herbicide-based weed control options
- Screening and testing of crops and varieties suited for mixed cropping and diversification under local agro-ecologies
- Soil microbial diversity assessment through soil profiling to support sustainable and site-specific farming practices

- Design and evaluation of AI-based surveillance and deterrent systems (e.g., smart scarecrows) for managing damage from wild and stray animals
- Development of high-yielding rice varieties suitable for DSR along with integrated weed management practices
- Integrated pest management strategies to control heavy insect infestation in summer green gram and black gram
- Design and development of suitable harvesters for early harvesting of green gram/ black gram without reliance on desiccants like paraquat/glyphosate
- Development and validation of effective management protocols for false smut disease in rice for yield protection
- Integrated disease and pest management in soybean focusing on YMV, Rhizoctonia aerial blight, anthracnose, girdle beetle, and semi-looper
- Breeding and evaluation of late-maturing (90–95 days) crop varieties for Bundelkhand region as part of climate-contingent planning
- Development of climate-resilient pigeonpea varieties for stable yields under changing climatic conditions
- Development and promotion of groundnut varieties resistant to root rot disease to enhance productivity and sustainability.

Maharashtra

- Development of appropriate mechanization solutions and integrated weed management practices for soybean cultivation
- Breeding and evaluation of high-quality, pest-resistant varieties for cotton and sugarcane to reduce chemical dependency
- Design and validation of cost-effective, efficient machines for cotton picking and sugarcane harvesting suited to small and large farm holdings
- Development of low-cost mobile devices for rapid quality assessment of fertilizers to ensure input-use efficiency
- Integrated pest management technologies for controlling pink bollworm and other major insect pests in cotton
- Assessment and mitigation of the impacts of imbalanced fertilizer and pesticide use on crop yield and environmental health
- Technologies for improving soil health and restoring organic carbon levels through sustainable nutrient and residue management
- Post-harvest management solutions and storage infrastructure to reduce losses in fruits, vegetables, and horticultural produce
- Technology access models and mechanization packages tailored for marginal and smallholder farmers

- Development of adaptive cropping systems and resilient varieties to stabilize crop cycles affected by climate variability
- Development of export-oriented production technologies for banana and mango focusing on quality, residue-free cultivation, and certification
- Breeding of virus-resistant and heat-tolerant tomato varieties suitable for summer cultivation
- Integrated fruit fly management techniques in mango and vegetable crops using eco-friendly approaches
- Post-harvest handling and value-addition techniques for banana, mango, and vegetables to enhance shelf-life and marketability
- Development of real-time pest and disease forecasting and early warning systems in vegetable crops using ICT tools
- Breeding of virus-resistant genotypes in major vegetable crops to enhance productivity and reduce crop loss
- Development of climate-resilient sugarcane varieties beyond Co 0265/Co-86032 with tolerance to heat, drought, and pest stress
- Package of practices for effective management of wilt disease in maize under Maharashtra's agro-climatic conditions
- Research on disease-free planting materials, and development of climate-resilient agricultural technologies
- Breeding and introduction of drought-tolerant varieties in red gram, black gram, soybean, and green gram suited to Maharashtra's rainfed areas
- Development of salinity and waterlogging tolerant crop varieties for enhancing sustainability in coastal and affected regions
- Strengthening seed systems for timely availability of breeder and certified seeds of newly released, farmer-demanded crop varieties
- Scientific evaluation and region-specific recommendations for nano urea and nano DAP application in crop production
- Development of short-duration kharif varieties of paddy and pigeon pea for rainfed systems and late sowing conditions.

Odisha

- Evaluation and development of mango varieties tolerant to high rainfall and humid conditions for enhancing fruit productivity in Odisha
- Quantification and optimization of input use (seeds, manures, biofertilizers, and biopesticides) for major crops under natural farming systems with emphasis on weed management in Odisha
- Policy research on recognizing agroforestry trees as agricultural assets and designing financial instruments, including loans, to promote tree-based farming systems

- Design and implementation of integrated farming systems to reduce the vulnerability of farmers dependent on rainfed agriculture in Odisha
- Development of flood- and cyclone-resilient cropping systems and crop varieties to mitigate crop losses in frequently affected regions
- Assessment of water availability and development of location-specific water harvesting and micro-irrigation technologies for drought-prone areas of Odisha
- Soil health mapping and formulation of site-specific nutrient management strategies to address declining soil fertility and micronutrient deficiencies, especially sulphur and zinc
- Exploration of alternative crops and promotion of diversified cropping systems to reduce over-dependence on paddy and enhance income stability
- Design and diffusion of small and medium-scale farm machinery and tools suitable for Odisha's smallholder farmers to improve mechanization
- Assessment of seed and agro-input supply chains and development of decision-support systems to ensure timely availability of improved seeds, fertilizers, and plant protection chemicals.
- Development and dissemination of cost-effective, decentralized post-harvest management, storage, and processing technologies to reduce crop losses and enhance value addition in Odisha
- Optimization of water use efficiency through integrated water resource management, micro-irrigation systems, and rainwater harvesting technologies for diverse agro-climatic zones of Odisha
- Soil health mapping and development of reclamation strategies for problematic soils (acidic, saline, and degraded lands) to enhance agricultural productivity in Odisha.
- Design and evaluation of integrated farming system models tailored to agro-ecological conditions of Odisha for improved livelihood security, sustainability, and crop diversification
- Development and promotion of need-based farm mechanization solutions, including ergonomically designed women-friendly tools, to enhance productivity and reduce drudgery in Odisha's agriculture.

Punjab

- Identification and development of high-yielding, weed-competitive rice varieties suitable for direct-seeded rice (DSR) along with effective single-herbicide weed management protocols
- Design and validation of low-cost, mobile, user-friendly devices for rapid on-site quality testing of fertilizers for farmers and extension agents
- Breeding of Yellow Mosaic Virus (YMV)-resistant Kharif moong varieties and promotion of short-duration, climate-resilient groundnut and pigeon pea cultivars with improved seed systems

- Development of affordable and farmer-friendly kits for reliable detection of oestrus in buffaloes to enhance reproductive efficiency
- Policy research on integrating agroforestry trees into the credit system by recognizing them as financial assets to facilitate institutional loan availability for farmers
- Development and promotion of climate-resilient crop varieties tailored to Punjab's agro-climatic zones to enhance adaptive capacity under changing climate scenarios
- Innovation and scaling of technologies for reduction of post-harvest losses in cereals, pulses, and horticultural crops through improved storage, handling, and processing
- Precision-based soil health management strategies and integrated nutrient management models for enhancing nutrient use efficiency and maintaining long-term soil fertility
- Development of location-specific, eco-friendly integrated pest management (IPM) modules for major crops to reduce pesticide load and enhance crop protection
- Establishment of robust pesticide quality assurance mechanisms and farmer-level awareness for ensuring safe and effective use of agro-chemicals
- Water-saving irrigation innovations, such as automated scheduling, drip retrofitting, and crop-specific micro-irrigation models for improving water productivity in Punjab.

Rajasthan

- Assessment and optimization of input use and weed management practices under natural farming for major crops in arid and semi-arid zones of Rajasthan
- Design and field evaluation of low-cost, mobile devices for rapid and reliable quality testing of fertilizers at the farmer level
- Development of drought-resilient crop varieties and resource-efficient farming systems for low rainfall and drought-prone regions of western Rajasthan
- Development and application of cost-effective soil and water amelioration technologies for managing saline and alkaline conditions
- Innovative technologies to mitigate wind erosion and improve soil fertility of sandy soils through soil-binding vegetation and organic amendments
- Designing integrated rainwater harvesting and conservation agriculture systems to reduce dependence on rain-fed farming
- Development and promotion of small-scale, affordable mechanization tools tailored to marginal and small farmers in Rajasthan
- Spatial mapping and improvement of irrigation infrastructure to reduce disparity in water access across regions
- Assessment of fertilizer and micronutrient (Zn, S) deficiencies and development of site-specific nutrient management protocols
- Designing digital tools for scientific crop pest and disease diagnosis and integrated management

- Development of integrated crop-livestock systems for enhanced resource use efficiency and income diversification
- Modelling and forecasting the impacts of climate extremes (heatwaves, hailstorms, unseasonal rains) on major crops for climate-resilient farming
- Development of a low-cost, farmer-friendly oestrus detection kit for enhancing reproductive efficiency in buffaloes
- Policy research on recognizing agroforestry trees as financial assets and enabling credit support for tree-based farming systems
- Development and testing of low-cost organic and mineral soil ameliorants for saline/sodic soils and brackish water conditions
- Design of alternative cropping systems for saline soils and water, focusing on salt-tolerant and short-duration crops
- Isolation and formulation of effective microbial consortia for enhancing biological nitrogen and phosphorus availability in dryland crops
- Determination of optimal application rates and timing of fermented organic manures (FOM) and liquid FOM (LFOM) for bajra, maize, soybean, and groundnut
- Development of IPM strategies against key pests: fall armyworm (maize), pink bollworm (cotton), hairy caterpillar (soybean), phyllody (sesame), white grub (groundnut), and blight (cumin and pomegranate)
- Development of IPM modules for pod bug (mung bean), fruit and stem borer (brinjal), and nematode management in guava and pomegranate
- Design of low-cost pesticide and insecticide quality testing kits for farmers and extension workers to ensure quality inputs
- Standardization of pesticide spray protocols and dosages for agricultural drones in different cropping systems
- Breeding and promotion of YMV-resistant varieties in mung bean, black gram, and okra suited to arid environments
- Development of high oil-content, dwarf mustard varieties adapted to Rajasthan's climatic conditions
- Breeding of ultra-early maturing (≈90 days) dwarf bajra (pearl millet) cultivars for western Rajasthan and Shekhawati region
- Development of processable and high-yielding varieties of pomegranate, potato, tomato, and onion for value-added processing
- Standardization of post-harvest handling, packaging, and transport protocols for exotic fruits (dragon fruit, fig) and high-value vegetables like broccoli
- Strengthening of certified planting material production and distribution systems for timely supply in horticultural crops

- Development of disease management strategies for mastitis in dairy cattle and protocols for vaccination, artificial insemination, and deworming in goats
- Genetic improvement of livestock through the supply of elite bulls and semen for cattle and bucks for goat farming
- Breeding of multi-cut, high biomass fodder varieties suitable for saline water irrigation and seasonal adaptability.

Tamil Nadu

- Assessment and promotion of region-specific crop diversification strategies to reduce excessive dependence on paddy in Tamil Nadu
- Development and dissemination of low-cost, scalable moisture conservation technologies for rainfed and irrigated systems
- Monitoring and integrated pest and disease management strategies to address the rising incidence of whitefly and other emerging pests in Tamil Nadu
- Study on the impact of climate change on cropping cycles and developing climate-resilient agricultural practices in Tamil Nadu
- Reclamation and management strategies for saline and alkaline soils, particularly in the delta regions of Tamil Nadu
- Optimization of input use and development of effective weed management protocols for different crops under natural farming systems
- Ecological and technological solutions for managing wild boar-related crop damage in Tamil Nadu's farming areas
- Development of integrated pest management (IPM) technologies for controlling Rugose Spiralling Whitefly in horticultural crops
- Design and validation of low-cost, farmer-friendly drones for precision agriculture applications in Tamil Nadu
- Development and promotion of affordable silage-making technologies for enhancing fodder availability and livestock productivity
- Breeding and integrated management strategies for controlling banana wilt and yellow mosaic virus in Tamil Nadu
- Integrated management of sooty mould disease in fruit and plantation crops using eco-friendly approaches
- Promotion of low-cost mushroom production technologies and value chains for rural income generation in Tamil Nadu
- Strengthening the supply chain of high-quality dairy animals to enhance milk production and rural livelihoods in Tamil Nadu.

Telangana

- Assessment of crop diversification strategies to reduce overdependence on monocropping of cotton in Telangana
- Spatial analysis and optimization of water resource use to address uneven irrigation availability across agro-climatic zones
- Evaluation of integrated nutrient and pest management practices to reduce unbalanced use of fertilizers and pesticides
- Development of decentralized, low-cost post-harvest processing and cold storage infrastructure for perishable agricultural produce
- Standardization of crop-specific best management practices for Kharif and Rabi crops under varying agro-climatic conditions
- Studies on soil conservation practices to mitigate erosion and restore soil fertility in rainfed and degraded areas
- Optimization of input use and weed control strategies under natural farming systems across major cropping patterns
- Eco-friendly and community-based approaches for wild boar management and crop damage mitigation
- Integrated pest management (IPM) technologies for controlling Rugose Spiralling Whitefly in key horticultural crops
- Development and field validation of low-cost drones for real-time crop monitoring and input application
- Development of cost-effective silage-making techniques for enhancing year-round fodder availability
- Breeding for controlling banana wilt and yellow mosaic virus in banana-growing belts of Telangana
- Integrated approaches for managing sooty mold disease across fruit and plantation crops.
- Promotion of mushroom cultivation through training, low-cost infrastructure, and value chain development in rural Telangana
- Strengthening of Custom Hiring Centres (CHCs) to increase access to farm mechanization among small and marginal farmers
- Development of systems for supply and genetic improvement of high-quality dairy animals to enhance livestock productivity.

Uttar Pradesh

- Development and evaluation of high-yielding, pest-resistant sugarcane varieties suitable for different agro-climatic zones of Uttar Pradesh
- Optimization of input use and weed management strategies in major crops under natural farming systems in Uttar Pradesh

- Design and testing of AI-based automated scarecrow systems for effective management of wild and stray animals in agricultural fields
- Breeding and agronomic practices for development of climate-resilient, off-season mango varieties adaptable to changing weather patterns
- Development of low-cost, portable devices for rapid and reliable quality testing of fertilizers at farm level
- Production and timely distribution of quality seeds of short-duration pigeon pea varieties for rainfed and irrigated conditions
- Designing institutional mechanisms for treating agroforestry trees as financial assets to facilitate credit access for farmers
- Development and field validation of waterlogging-tolerant sesame varieties for cultivation in flood-prone areas of Uttar Pradesh
- Integrated disease management strategies for common scab in potato with emphasis on eco-friendly and cost-effective methods
- Eco-friendly and sustainable management of shoot borer and false smut diseases in rice through resistant varieties and biocontrol
- Replacement of Co-0238 with improved sugarcane varieties and development of organic and sustainable solutions for red rot and shoot borer
- Strategies for prevention and reduction of reproductive problems in dairy animals through improved nutrition, healthcare, and breeding practices
- Scientific interventions to minimize infertility in milch cattle through hormonal, nutritional, and management approaches
- Development of green-seeded black gram and MYMV-resistant green gram varieties for summer/spring and kharif cultivation
- Development of MYMV-resistant mung bean varieties for enhanced productivity in summer/spring and kharif seasons
- Evaluation of biocontrol agents for effective and sustainable management of leaf Webber in mango orchards
- Development of suitable agronomic and post-harvest practices to manage jelly seed disorder in mango fruits
- Integrated approaches for effective control of guava wilt through resistant varieties and microbial biocontrol
- Design and validation of income-oriented Integrated Farming System (IFS) models tailored for small and marginal farmers of Uttar Pradesh
- Integrated pest management technologies for viral diseases like fruit fly in bitter gourd and mosaic virus in cucumber
- Development of resistant varieties and biocontrol-based strategies for managing mosaic virus in cucumber.

Uttarakhand

- Assessment of input supply chain gaps and development of efficient market facilities for natural farming inputs in hill and valley regions
- Development of a model horticulture hub to enhance production, processing, and value chain integration for fruits and vegetables in Uttarakhand
- Evaluation and promotion of High-Density Plantation Architecture (HDPA) for enhancing apple productivity in temperate zones of Uttarakhand
- Development and dissemination of disease-resistant varieties of major fruits and vegetables suited to the agro-climatic conditions of Uttarakhand
- Strengthening of cold storage infrastructure and transport logistics to reduce post-harvest losses and improve market access for perishable crops
- Design and deployment of AI-based smart scarecrow systems for management of wild and stray animals in hill farming systems
- Formulation and implementation of district-wise contingency action plans for climate-resilient agriculture in the context of changing climate scenarios
- Breeding and evaluation of climate-resilient varieties of millets and horticultural crops suited to different elevations in Uttarakhand
- Assessment of the awareness, accessibility, and utilization of government schemes by hill farmers and strategies for improving outreach
- Post-harvest handling and packaging innovations to extend the shelf life and marketability of litchi in Uttarakhand
- Development of water-efficient irrigation technologies and practices to improve water use efficiency in rainfed and irrigated hill agriculture
- Developing technologies for effective management and deterrence of wild animal attacks in agricultural areas using eco-friendly and technological tools
- Establishment of decentralized nurseries and seed production hubs to ensure timely availability of quality seeds and planting materials
- Streamlining of input delivery systems to ensure timely and adequate supply of seeds, fertilizers, and pesticides to remote and hilly areas
- Development of sustainable and inclusive marketing infrastructure in remote areas to support smallholder farmers and hill-based produce
- Research for strengthening of farmer-producer organizations (FPOs) and self-help groups (SHGs) to establish market linkages and improve farmer incomes
- Development of cost-effective IoT-based systems for real-time crop protection against wild animals in hilly terrains
- Design and pilot testing of long-distance surveillance and control room-based systems for early detection and deterrence of wild animals in farming areas.

West Bengal

- Diagnosis and reclamation strategies for soil nutrient deficiencies and saline/acidic soils across diverse agro-climatic zones of West Bengal
- Impact assessment of imbalanced pesticide and fertilizer usage on soil health, crop productivity, and farmer safety, with a focus on integrated nutrient and pest management
- Promotion of crop diversification strategies to reduce over-dependence on rice and enhance income and resource sustainability
- Development of equitable irrigation infrastructure and policies for efficient water distribution across districts with variable water access
- Assessment of the impact of climate change (cyclones, untimely rainfall) on major cropping systems and development of early warning and adaptive strategies
- Technological interventions and value chain approaches to reduce post-harvest losses and strengthen storage and agro-processing infrastructure
- Integrated pest and disease management strategies for key horticultural crops (mango, litchi, vegetables) using eco-friendly and precision-based approaches
- Design of region-specific farm mechanization tools suitable for marshy and water-prone areas of West Bengal
- Socio-economic evaluation of the sharecropping system and its impact on land use, productivity, and long-term sustainability
- Development and adoption of efficient irrigation and water management technologies for climate-smart agriculture in water-scarce and waterlogged areas
- Soil health restoration through resource conservation technologies, organic amendments, and soil carbon enhancement strategies
- Design of climate-resilient integrated farming system models tailored to coastal and inland zones of West Bengal
- Designing training module for farmers for adoption of inclusive, location-specific, and gender-responsive agricultural technologies
- Designing institutional mechanisms to address land tenure, climate adaptation, marketing, and agro-ecological transitions in West Bengal.

North-eastern Region

- Integrated strategies to manage citrus decline caused by biotic and abiotic stresses and nutrient imbalance
- Understanding the physiological and environmental factors causing early fruit drop in Sohphie (Myrica esculenta) and Sohiong (Prunus nepalensis), and developing measures to improve fruit retention for wine and pickle industries

- Etiology and management of bud rot disease in areca nut plantations under humid subtropical conditions
- Development and standardization of propagation protocols for the production and distribution of quality planting materials of citrus, pineapple, avocado, strawberry, kiwi, and litchi in hill regions
- Post-harvest handling, storage, and value addition technologies for indigenous fruits like Sohphlang, Sohshang, and Sohiong to enhance market value and shelf life
- Development of ergonomic harvesting tools and mechanization options for oil palm suitable for Meghalaya's terrain
- Extraction, characterization, and value chain development for bioactive compounds from high-value local fruits grown in Meghalaya
- Breeding and evaluation of high-yielding rice and maize varieties that match local taste preferences, especially traditional sticky rice types
- Identification of low-input responsive HYVs for jhum (shifting) farming systems and development of organic herbicides for weed management in hill agriculture
- Design and development of nutrient-dense, low-volume organic manure formulations for use in sloping land farming
- Innovation in compact and terrain-adapted farm machinery suitable for smallholders in hilly regions
- Development of integrated organic input packages to improve both soil health and plant disease resistance in organic farming systems
- Research and development of a vaccine and preventive strategies for African Swine Fever (ASF) affecting piggery in Meghalaya and the wider NEH region.

Andaman & Nicobar Islands

- Development and evaluation of low-input, climate-resilient rice and vegetable crop varieties suited for saline and upland soils of the Andaman & Nicobar Islands
- Participatory identification and promotion of climate-resilient and disease-tolerant livestock breeds for integrated smallholder farming systems in Nicobar Islands
- Design and testing of locally adaptable, low-cost farm machinery and tools for hill and terrace farming in the island ecosystem
- Assessment of decentralized models for production and distribution of bio-inputs to support organic/natural farming in the islands
- Optimization of cost-effective post-harvest handling and solar-powered storage technologies for banana, spices, and other horticultural crops in the Andaman Islands
- Evaluation of integrated agro-tourism models incorporating indigenous culture, farming diversity, and natural heritage for livelihood diversification in Andaman & Nicobar Islands

- Field testing and refinement of eco-friendly pest management approaches using local botanical extracts and bio-control agents in major cropping systems of Andaman Islands
- Modeling integrated farming systems (IFS) with climate-smart crop-livestock-fishery combinations for livelihood and food security in the Nicobar group of islands
- Developing scalable incubation and entrepreneurship support models for island youth in agri-based processing, value addition, and bio-enterprise development.

Delhi

- Assessment of awareness, access, and implementation gaps in agricultural schemes and programs of the Department of Agriculture among peri-urban farmers in Delhi
- Design and impact assessment of need-based training and capacity-building programs for enhancing the technical knowledge and entrepreneurial skills of farmers in urban and peri-urban areas.

Puducherry

- Development of effective and eco-friendly technologies for wild boar management to minimize crop damage in Puducherry's peri-urban and rural areas
- Integrated pest management approaches for controlling Rugose Spiralling Whitefly in horticultural crops under coastal agro-ecologies
- Design and field evaluation of low-cost, lightweight drones for smallholder applications in precision agriculture in Puducherry
- Development and dissemination of affordable, small-scale silage-making technologies for year-round green fodder availability to dairy farmers
- Identification of resistant varieties and integrated disease management strategies for Banana wilt and Yellow Mosaic Virus in banana-growing regions
- Innovative and sustainable methods for the control of sooty mold disease in fruit and plantation crops in humid climates
- Technology refinement and capacity building for round-the-year mushroom cultivation to enhance rural livelihoods and nutritional security
- Strengthening custom hiring services with location-specific farm machinery to promote mechanization among small and marginal farmers in Puducherry
- Establishment of supply chains and breeding programs to ensure timely availability of high-yielding and disease-free dairy animals in the Union Territory.

List of Farmer-led Innovations Captured during VKSA

- Alternate row intercropping of onion and coriander for enhanced foliage yield
- Application of *chaur* soil to improve cauliflower seed viability
- Bamboo-framed solar dryer for multi-crop post-harvest drying
- Battery-operated multi-crop weeder-cum-cultivator
- Indigenous method of direct seeding of onion
- Conserving traditional crops through innovative marketing solutions
- Cucurbits and french bean relaying tomato as compensating crops for enhancing livelihood
- Design of multi-purpose seed drill for diverse cropping systems
- Digging hoe with detachable blades for multi-crop use
- Gap filling in french bean early spring crop through plug nursery for income enhancement
- Gladiolus–sugarcane intercropping for enhanced dual yields
- Homemade manual seeder for uniform sowing in raised beds
- Improved pepper thresher for post-harvest crop processing
- Indigenous seed cleaner using sieve and blower mechanism
- Innovative intercropping models with coconut and medicinal plants
- Innovative line sowing of minor millets using tine-based '*patta*' device
- Innovative paired-row planting strategy for true potato seed establishment
- Innovative technique for sowing of potato on beds after managing paddy straw
- Innovative technique for transplanting cotton and vegetables seedling for gap filling
- Inter-cropping of garden peas and capsicum for income enhancement
- Inter-culture plough specifically designed for row management in cotton crop
- Low-cost packaging and transport system for live fish seed distribution
- Intercropping of pea in pear orchard
- Manual sugarcane seed-cutting tool in the furrow
- Manually crafted sugarcane seed sett cutter
- Manually operated marking tool for line/row planting
- Model of relay cropping technique for year-round vegetable production
- Modified bicycle frame for spraying herbicides in crop fields
- Modified seed drill for sowing sunflower in intercropping systems
- Multi-tier bamboo structure for vegetable nursery seedling production
- New intercropping system (watermelon and muskmelon) in apple orchards
- Novel method of transplanting innovation for advancing watermelon harvest
- Novel technique of turmeric intercropping
- Onion–cabbage intercropping for resource optimization

- Redesigned rice drum-seeder for line-sowing and seed-saving
- Safety rope and ladder system for cliff farming and crop transport
- Seed bio-priming method to improve germination in cucurbit crops
- Seed-drill machine for onion
- Self-designed manually operated seed drill for wheat bed planting under organic farming
- Simplified line planting model for cost-effective rice cultivation
- Solar-powered dryer for processing areca and other plantation crops
- Sugarcane harvesting tool in trench planting
- Intercropping of sunflower with tomato
- Innovative seed-extraction machine for tomato and chilli
- Intercropping of tomato with rajmah
- Turmeric intercropping in plantation crops
- Use of leaf sheath mulch in plantation crops
- Use of traditional bio-stimulants 'sing ki khad' and 'amrut pani' in crop nutrition
- Novel method of ratoon crop in cabbage
- Use of bamboo made marker for line sowing of wheat and black gram
- Indigenous method of seed preservation in bamboo cylinder (*chungo*)
- Zero tillage cultivation of garden pea & cole crops in rice fallow
- Modifications in zero tillage machine for sowing in ploughed field
- Control of ectoparasites in goat with lotion made from custard apple seed
- Sprayer on wheels-improves efficacy of crop protection
- Intensive intercropping in sugarcane (potato–onion–turmeric)
- Seed germination enhancer and organic pest repellent
- Neem and wood ash dry-mixture for seed treatment
- Automatic BBF (Broad Bed and Furrow) machine for intercropping in sugarcane
- Growing of rice seedlings in bamboo splits
- '*Ananda sagar*': a stable high-yielding mango grafting technique
- Adjustable row marker for smallholder vegetables and cereals
- Alternate-year pruning strategy to enhance rose productivity
- Areca-based agroforestry model integrating banana and pepper
- Bamboo-constructed tool for harvesting orange fruits
- Bamboo based drip irrigation for water management in fruit crops
- Carbonized arecanut husk as novel soil amendment in acidic soils
- Clay-coated bamboo storage chambers for post-harvest preservation of ginger
- Coconut root feeding fertilizer application method
- Coconut/arecanut de-husking tool for farmer convenience and labor reduction
- Community-based okra selection for better yield and quality traits
- Contracting farming of exotic vegetables-innovative way of farming for assured income

- Cost effective modified gladiolus digger
- Design of water drip irrigation from clay pots for vegetable beds
- Development of low-cost coconut de-husker
- Farmer-led low-cost sapota propagation technique
- Fiber extraction device from banana pseudo-stems for cottage industries
- Harness design for safe climbing on tall coconut plants
- Improvised pole harvester for arecanut collection
- Integrated arecanut de-husker with collection separator
- Increase in shelf-life of litchi fruit by glucose solution
- Innovative approaches to turmeric polishing
- Innovative blend of technology and skill in muskmelon production
- Innovative integrated banana–sugarcane cultivation for increased returns
- Innovative marketing channel for exotic vegetables
- Innovative protocol for accelerated mango plant multiplication
- Innovative technique of value addition to underutilised fruit-Indian cherry
- Innovative technique of vegetable nursery production in pro trays
- Innovative vertical tomato storage using hanging vines
- Instant cooling system for marketing of tender coconut water
- Ladder-mounted platform for coconut harvesting and pruning operations
- Locally made vegetable grader based on size rollers
- Low-cost arecanut grading system for smallholders
- Low-cost indigenous gladiolus digging machine
- Low-cost machine for gap filling of cotton and vegetables
- Low-cost mulching for soil moisture conservation in coconut
- Management of honey bees in cold desert for pollination in apple: innovative rearing during winter without migration
- Managing apple root borer with self-designed solar light trap
- Mobile fruit juice extraction and vending unit for rural areas
- Modified double-ring tree climber for tall coconut plants
- Motorized coconut husk removal tool
- Multi-purpose bicycle-mounted sprayer for coconut and arecanut palms
- New model of canopy management in summer guava for higher fruit set
- Nipping technique in chrysanthemum to boost flower production
- Novel mobile fruit juice extraction van for village-level processing
- Organic pest repellent using castor cake and ash in coconut cultivation
- Ratooning practice for rapid recycling of short-duration banana varieties
- Root feeding technique in coconut trees for targeted nutrient absorption
- Tool for extracting banana suckers without damaging parent plant
- Traditional rodent management in coconut plantations
- Use of vine-based bio-decomposer as potash supplement in vegetables

- Vegetable stacking unit with rolling and stretching functionality for market display
- Vertical vegetable farming for doubling income
- Water-saving and weed-control through indigenous mulching in vegetables
- Introduction of exotic "*apple ber*" cultivation in assam
- Management of FMD with lotion prepared of roasted brinjal, camphor and coconut oil
- Bio-pesticide for disease management in pomegranate
- Clayed bamboo wall structure for reducing storage loss of ginger
- Murugesan's banana fiber spinning device
- Innovative cultivation of hybrid muskmelon with drip, silver mulching and FIRBS method
- Development of low-cost germination box for winter vegetables
- Arecanut dehusking machine for small holdings
- Hand operated ginger-turmeric slicer
- New method of nursery raising of paddy in bamboo splits
- Innovative single bud method of propagation of ginger/ turmeric
- '*Amulya amrit'*: a farmer-innovated organic pest and disease control formulation
- Alternate irrigation protocol for efficient cashew cultivation in water-stressed areas
- Carrot washing machine
- D.C. Powered sugarcane de-trashing machine
- Eco-friendly bamboo trap for low-cost inland fisheries
- Indigenous herbal remedy for foot-and-dhengri mouth disease in goats
- Pot-based yellow sticky traps for insect pest management
- Red ant colonies as a natural biocontrol for tea mosquito bug
- Refined trap for catching moles and field rodents using castor cake
- Use of lime-coated straw as fly repellent in cattle shed
- Use of papaya latex-asafoetida-based mixture as insect repellent
- *Tulsi* plantation in poly house for eradication of insect pest problem
- *Kakee*- indigenous rodent trap made of local cane
- Pest management in chilli using butter milk and ash
- Use of asafoetida for management of termite
- Indigenous bamboo trap for fish and crab
- Bamboo rat trap for rodent control in paddy field
- "*Achook*- the *antipest*": the 24x7 solar light trap
- '*Valarpirai milker*': a unique hand-operated milking device for small herds
- Household-scale hatchery system using glass jars for aquaculture
- Improved livestock yoke for better animal comfort and efficiency
- Improved milking stand with restraint system for safe animal handling
- Improvised milking stall to restrain animal movement during milking
- Indigenous ethno-veterinary herbal tonic for cattle fertility improvement
- Innovation for conversion of defunct refrigerator into a low-cost poultry incubator

- Innovative community-based fodder banking system for drought preparedness
- Innovative fodder production in the cold desert
- Innovative integration of backward and forward linkages in dairy business
- Innovative technology to produce odourless azolla-a protein rich fodder for livestock
- Novel fodder chopper operated by bicycle mechanism for fuel-free operation
- Portable incubator for hatching indigenous (desi) hen's eggs
- Self-designed automatic livestock waterer
- Silage in portable plastic drum for small dairy units
- Use of fermented herbal extracts as natural anthelmintics in livestock
- Use of modified ceiling fan for shrimp hatchery aeration
- Shelter management for goat & kids in wooden / bamboo shed
- Use of satawari for management of mastitis
- Low-cost broiler brooding system
- Handmade manual egg incubator for small-scale poultry hatching
- Development of automatic drinking facilities for dairy animals
- Indigenous cardboard box hatchery of japanese quail
- Traditional way of treatment of pigs using the locally available medicinal herbs
- Floating duckery unit integrated with fish farming
- '*Kothandam's machine*': casuarina stubble remover-cum-cultivator
- Basket sprayer attachment for uniform fertilizer application in sloped terrains
- Design and development of manual tine weeder for cotton fields
- Design and development of multipurpose platform trolley for farm transport
- Farmer-invented modification in paddy transplanter for labour efficiency
- Grating machine using bicycle pedal mechanism for copra making
- Improvised motorbike operated paddy thresher
- Innovation in deep plough attachment for country plough
- Innovative motorcycle-operated sprayer for enhanced agrochemical application efficiency
- Innovative sugarcane bud-chipper machine
- *Kanghi* manual weeding tool for sugarcane furrow
- Low-cost machine for weeding and hoeing of cotton
- Manual sugarcane stripper & leaf-remover
- Modified diesel plough
- Multipurpose digging hoe made from recycled motorcycle shock absorber
- Multi-purpose ratoon transplanter-cum-hole-digger
- Multipurpose thresher for finger millet, paddy and horse gram
- Roller and hooked hand weeders for precision intercultural operations
- Self-designed multi-utility tudi making machine from paddy residue
- Self-propelled sugarcane harvesting machine
- Development of sugarcane collecting & grabbing tool
- Novel sugarcane fertilizing tool

- Innovative sugarcane pulldown tool
- Improvised sugarcane-cum-green top collecting tool
- Tractor mounted rake for paddy straw collection
- Tractor-mounted ridger-cum-raised bed-maker
- Tractor-operated farm waste shredder for biomass management
- Tractor-powered winnowing machine for large-scale operations
- Novel remote-operated sugarcane-loading machine
- Low cost and easily fabricated homemade honey extractor
- Machine for green gram pod thresher
- Low-cost combine harvester with grain and straw separator
- Chip maker machine for value addition in cassava
- Improvised groundnut pod stripper
- Portable automated sugar cane juice extractor
- Indigenous iron made manual-weeder
- Low-cost wooden palm oil extractor
- Novel smart chaff cutter
- Innovative diesel operated drum-type paddy thresher
- Development of spike cutter for large cardamom
- Innovative egg laying cabin
- Improvised hybrid device for grating and drying of copra
- Indigenous scented land race of rice in hills
- *Jhaar Karela* - a selection of wild bitter gourd
- Farmer's innovation of wheat variety and paddy variety *mahakranti*
- '*Jim Tenga*': traditional ready-to-eat product from fermented bamboo shoots
- '*Toyatebtsu*': a multi-functional indigenous farm tool
- Affordable vermi-compost sieving device for compost grading
- Attractive income through innovative breed up-gradation
- Biomass-powered cooking stove for on-farm use
- Community-operated cassava slicing unit with safety features
- Design of a small-scale areca slicer for value addition units
- Development of '*kranti*': farmer-innovated spray pump
- Development of community biogas plant
- Development of disc-type bund maker with integrated roller attachment
- Development of low-cost mechanized turning unit for mushroom compost
- Eco-friendly dust suppressant to minimize particulate pollution in drying yards
- Energy-free manual winnowing device for grain separation
- Engine-driven spraying unit suitable & scalable for medium-scale farming
- Ergonomic sugarcane bud chipper for speedy plantation preparation
- *Halodu*-a manually operated mini cultivator
- Hydraulic lever tool for casuarina stump removal

- Improved water-lifting device using lever and counterweight
- Indigenous fishing techniques for sustainable biodiversity
- Indigenous pit-level soil and fertilizer mixing tool
- Indigenous poly-herbal formulation for manger management in swine
- Indigenous technique to prevent contamination in mushroom spawn production
- Indigenous vertical tree-cutting device powered by motorbike engine
- Innovative approach to inculcate entrepreneurship traits among farmers
- Innovative bottomless sacks for manual decortication of groundnut pods
- Innovative cotton boll picker made from brush head and pipe
- Innovative entrepreneurship through soil analysis laboratory
- Innovative long-term storage solution for processed vermi-compost
- Innovative method of preparing compost from fym with waste decomposer
- Innovative multi-chamber grain storage bin for climate-resilient warehousing
- Low-cost groundnut pod breaker using wooden lever system
- Low-cost oyster (*dhingri* mushroom) production technology in cold desert
- Low-energy water mill for traditional rice pounding
- Management of brinjal bottom rot using *panchagavya* drench
- Manual pollination protocol for improved yield in pointed gourd
- Manual tapioca chopper for household and farm use
- Multipurpose carrying basket with shoulder frame support
- New design of cost-effective shade net houses for protected cultivation
- New tool for removing mulch in poly-mulched beds
- Noor waste straw reaper for straw management
- Novel technique for simultaneous rice-fish integrated cultivation
- Portable cardamom drying unit using low-cost energy sources
- Processing technique for fermented bamboo shoots for culinary use
- Reviving groundnut cultivation with mechanized cultivation
- Self-designed innovative way to channelize the bio fertilizer dose
- Self-designed pulley operated power lift for handling multiple operations in mushroom cultivation
- Self-designed underground method of irrigation for the orchard
- Small-scale windmill for operating a water lifter in rural fields
- Soil pulverizing roller adaptation for dryland fields
- Solar automated hydroponic system
- Spray technique innovation for efficient application of bordeaux mixture
- Sugarcane stubble trimmer
- Two-wheeler mounted spraying unit for small and fragmented farms
- Urban roof tops farming for growing organic food
- Low-cost sterilization technique of rice/wheat grain for mushroom spawn production with *handi & soriya*

- Innovative weed control cum straw decomposer
- Moisture conservation in milky mushroom bag through t-cup watering
- Prune to flourish-pruning tool for jasmine
- Mulching made easy-tool for punching grow out holes
- Development of intelligent alarm system for elephant problem
- Innovative technique for silage-making
- Technology in a capsule-a contingency measure for direct sown paddy
- Indigenous method for rainwater harvesting
- Novel method for treatment of poor-quality irrigation water
- Development of biochar stove
- Modified row spacing in cotton for better resource management
- Artificial pollination in pointed gourd
- *Chandraprabha*'s rain gun-sprinkler system with modified nozzel size
- Modified lift irrigation system for enhancing water discharge
- Improvised approach for trench farming of sugarcane via modification in the trench opener
- Sand-mulching for soil moisture conservation
- Farmer-designed ber shredder: a low-cost mechanized solution for pruning and organic recycling
- *Makhah*: a farmer-friendly ergonomic tool for jhum land preparation
- Improvised technique of using bicycle wheel pin as jet nozzle for spray irrigation
- Use of perforated PVC pipes in fishbone design for sludge removal in shrimp culture ponds
- Development of low-cost structure for mushroom spawn production
- Charcoal-fired two shelf multipurpose drying oven
- Periphyton-based aquaculture using bamboo mat as substrate
- Therapeutic pillows from traditionally processed buckwheat hulls
- Development of smart maize grinder
- Innovative low-cost solar dryer
- Novel v-shaped wooden double row furrow maker for potato (TPS) production
- Low-cost bamboo-made potato storage structure
- New technique of using palm oil cake as fish feed
- Tea processing through indigenous method
- Innovative way of making decorative items utilizing banana fibers
- Water reed (*Scirpus lacustris*) cum fish farming
- Innovative method for packaging and marketing of jaggery (*gur*)
- Novel way of making homemade natural soap
- Innovative ways of making value-added products from underutilized indigenous mushroom
- Innovative use of natural dyes for preparation of garments.

"Last year, when I visited the Pusa campus on 11th August, I had urged that efforts be increased to take agricultural technology from the 'Lab-to-Land'. I am pleased that the *Viksit Krishi Sankalp Abhiyan* was launched during May–June. For the first time, scientists' teams, around 2,200 in number, participated across more than 700 districts in the country. Over 60,000 programmes were conducted, and, more importantly, direct engagement was established with around 1.25 crore aware and informed farmers. This effort by our scientists to reach more and more farmers is truly commendable."

Shri Narendra Modi
Prime Minister of India
Address at M.S. Swaminathan Centenary International Conference, New Delhi
7th August, 2025

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