A Comprehensive Report
on
Capacity Enhancement and Needs Assessment (CENA) Exercise
under

The World Bank Maharashtra Project on Climate Resilient Agriculture (POCRA) – II
(NANAJI DESHMUKH KRUSHI SANJIVANI PRAKALP – II)

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Foreword

Climate-resilient agriculture (CRA) in Maharashtra is crucial for protecting the region's agricultural sector from climate change impacts. Maharashtra's diverse agro-climatic conditions face challenges like erratic rainfall, prolonged droughts, and extreme weather, threatening productivity, farmers' livelihoods, and food security. Traditional farming, reliant on predictable weather, is becoming unsustainable. CRA aims to adapt and transform these practices, incorporating technological innovations, sustainable methods, and policy interventions to build resilience, enhance soil health, and optimize water use.

The Government of Maharashtra has launched programs promoting CRA. Initiatives like Pradhan Mantri Krishi Sinchai Yojana (PMKSY) and the National Mission for Sustainable Agriculture (NMSA) focus on efficient irrigation and sustainable practices. State-specific efforts like Jalyukt Shivar Abhiyan emphasize watershed development and water conservation. These programs, supported by capacity-building initiatives and financial schemes, mitigate risks and encourage CRA adoption.

Nanaji Deshmukh Krishi Sanjeevani Prakalp Phase II (PoCRA-II) exemplifies these efforts, improving climate resilience among Maharashtra farmers through sustainable practices, water conservation, and soil health management. PoCRA-II emphasizes community involvement, training, and advanced technologies to tackle drought, soil erosion, and water scarcity, ensuring long-term sustainability and better livelihoods for small and marginal farmers.

This report explores PoCRA-II's work in districts like Bhandara, Gondia, Chandrapur, Gadchiroli, Nagpur, Nashik, Latur, and Amravati, assessing capacity enhancement needs and training plans. By examining Maharashtra's agro-climatic fields, the report identifies training program requirements and stakeholder strategies, highlighting the supportive roles of government, financial institutions, and educational bodies in advancing CRA.

Understanding these dynamics from the perspectives of Maharashtra's farming communities, the report aims to provide insights into the broader landscape of CRA in the state, contributing to sustainable agriculture, food security, and rural development.

Acknowledgement

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Disclaimer

This report on the exercise; Competency Enhancement Needs Assessment (CENA) conducted under NANAJI DESHMUKH KRISHI SANJIVANEE PRAKALP i.e. Project on Climate-resilient Agriculture (POCRA) is presented with the intent to contribute valuable insights to the Project Management Unit for enabling its functionaries for creating functional framework for managing training function as per the development objectives of the project.

Scope and Methodology:

The study focuses specifically on the area under study i.e. eight districts namely Amravati, Nagpur, Bhandara, Chandrapur, Gondia, Gadchiroli, Latur and Nashik in the State of Maharashtra. Methodological approaches, while rigorous, may have inherent limitations that could impact the comprehensive understanding of the exercise.

Data Limitations:

The availability and reliability of certain data sources may influence the depth and precision of the study's findings. Gaps in data where present, are acknowledged, and efforts have been made to mitigate their impact.

Generalization Caution:

Findings and Recommendations are specific to the context of the study area and may not be universally applicable. Caution is advised against making broad generalizations without considering regional or contextual variations.

External Factors:

The study is subject to external factors that may have influenced the research process and outcomes. Unforeseen events during the study period could impact the relevance of certain findings.

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Executive Summary

Introduction:

The report summarizes the findings of a comprehensive survey conducted under the Project on Climate Resilient Agriculture (PoCRA), covering 79 villages across 55 talukas in eight districts. The primary objective of the survey was to analyse responses from diverse stakeholders to assess agricultural practices, challenges, and opportunities from the PoCRA perspective. The survey included farmers (categorized into subgroups such as female, young, and SC/ST farmers), Gram Panchayat Committee members, members of Farmer Producer Organizations (FPOs), Self-Help Groups (SHGs), NGOs, financial institutions, educational institutions, and officers from the Department of Agriculture (DOA).

Using both group discussions and individual interviews, the survey sought to identify current agricultural practices, constraints, and the support needed to promote climate-resilient farming practices. The findings provide actionable insights into the adoption of sustainable farming techniques, awareness of climate challenges, and institutional support mechanisms, laying the foundation for targeted interventions to enhance agricultural resilience and productivity.

The stakeholder wise summary of the survey is presented herewith for holistic understanding of the activity. The training programmes indicated here are based on the findings of the survey and also are based on the felt needs emerged during the discussions held with respective Subject Matter Specialists.

Focussed Group Discussions with Farmers (FGD):

The survey, conducted with 610 farmers across 8 districts, assessed challenges and identified the agricultural practices to help address the climate resilience in the project areas.

Key findings include:

- Farmers predominantly cultivate staples like Tur/Arhar, Rice, and Soybean, with limited adoption of horticulture and minor cereals. While some practice mixed or intercropping, barriers such as knowledge gaps hinder broader adoption.
- Irrigation in the region relies heavily on rainfall, with limited access to advanced irrigation systems like drip or sprinkler methods. The use of eco-friendly inputs, such as bio-pesticides and organic farming, is low due to cost and resource constraints. Mixed farming, combining organic and chemical inputs, is common.

- Access to soil testing services is inconsistent, with few farmers utilizing paid services. The use of soil health cards to guide fertilizer and pesticide applications remains rare.
- Farmers recognize climate change, citing irregular rainfall, pest attacks, and delayed monsoons. They adopt adaptation strategies like crop diversification and rainwater harvesting, though financial and knowledge barriers limit broader implementation.
- Financial constraints, lack of resources, and limited technical knowledge are major challenges. NGOs provide training and infrastructure support, but financial aid and market access are minimal.
- Farmers face issues with inadequate storage, poor transport, and high post-harvest losses. Engagement in value addition and agri-allied practices such as poultry or fisheries is minimal.
- Farmers seek training in water management, soil health, pest control, and value addition. They recommend improved market linkages, credit access, modern practices, and supportive policies to enhance their incomes.

In view of the above, various training programs to effectively address the farmers' knowledge gaps, financial limitations, and technical needs, and to equip them with the skills and tools required to enhance productivity and income while building climate resilience are proposed as follows. (*In alphabetical order*)

1. Climate-Resilient Farming Practices
2. Integrated Water Management and Irrigation Practices
3. Market Linkages and Financial Literacy
4. Post-Harvest Management and Value Addition
5. Soil Health Management and Testing

<u>Women Farmers' Responses:</u>

The survey explored the challenges, support needs, and training preferences of female farmers, highlighting their unique circumstances. Key challenges include balancing household and farming duties, limited access to resources like land and credit, and a lack of family or community support.

Although most female farmers could attend training programs, some faced obstacles such as household responsibilities, transportation issues, and childcare needs.

Women farmers expressed the need for flexible schedules, financial support, transportation, childcare, and gender-sensitive agricultural programs. They also suggested improvements like more female trainers, women-only sessions, on-site farm training, and tailored content to address specific challenges, with local women's groups involved for better outreach. The findings emphasize the importance of overcoming logistical, financial, and social barriers to empower female farmers and increase their participation in agricultural development.

Based on the findings, the three most relevant training programs for female farmers to address their unique needs and challenges are suggested: (*In alphabetical order*)

1. Access to Credit and Financial Management
2. Gender-Sensitive Farm Management Training
3. Skill Development for Value Addition and Promotion of Agri-Allied Enterprises

These programs address logistical and social barriers while empowering female farmers with practical skills and knowledge, enabling their active participation in agriculture and income generation. The programme details are provided in the report.

Young Farmers' Responses:

The survey examined young farmers' training needs, motivations, and challenges. It revealed a strong preference for on-site training, involvement of young trainers, and youth-focused sessions. Respondents emphasized the importance of addressing land, technology, and financial access in training content, suggesting the inclusion of local youth groups.

Key motivations for farming include family tradition, passion for agriculture, and economic opportunities. Fewer respondents were driven by technological advancements or learning prospects. Training preferences focus on modern farming techniques, business management, and sustainable practices. This highlights the demand for practical, youth-centred training that blends technical skills with entrepreneurship and business knowledge. Based on the findings, the three most relevant training programs for young farmers to address their specific needs are suggested: (*In alphabetical order*)

1. Agripreneurship and Agribusiness Management
2. Collaborative Farming Models and Resource Optimization
3. Modern Farming Techniques

Scheduled Casts and Scheduled Tribes Farmers' Responses:

The survey highlighted significant challenges faced by SC/ST farmers, particularly in accessing financial support. High interest rates, limited knowledge of schemes, and lack of collateral restrict their ability to secure loans and credit. Farmers identified grants, subsidies, low-interest loans, and crop insurance as crucial financial aids to manage risks and enhance stability.

Training in modern and sustainable farming techniques, along with business management, is critical for capacity building. However, the adoption of modern agricultural tools remains limited due to high costs, lack of availability, and inadequate training. Awareness of government schemes for SC/ST farmers is low, underscoring the need for better outreach and information dissemination.

Farmers recommended increased financial aid, improved implementation of existing schemes, and more inclusive training programs to address their challenges and support agricultural growth effectively. In light of the above the five most relevant training programs for Scheduled Castes (SC) and Scheduled Tribes (ST) farmers based on the identified challenges and recommendations are indicated herewith: (*In alphabetical order*)

1. Awareness of Government Schemes and Projects
2. Business Management and Market Linkages
3. Capacity Building in Group Farming and Cooperatives
4. Financial Literacy and Access to Agricultural Credit
5. Introduction to Modern and Sustainable Farming Practices

FPO Farmers' Responses:

The survey highlighted the training needs and priorities of Farmer Producer Organization (FPO) members. Key training areas include water use efficiency, soil health improvement, integrated pest management, and post-harvest management, with additional focus on storage, packaging, branding, and FPO governance. Farmers also expressed the need for training in organic production, micro-irrigation, bio-fertilizers, and protected cultivation technologies.

FPO members aim to enhance skills in organizational management, sustainable farming practices, and accessing government policies and schemes. These insights emphasize the need for tailored, practical training programs to address the unique challenges faced by FPOs in improving operational efficiency and sustainability.

Based on the findings, the ten most relevant training programs for Farmer Producer Organization (FPO) members have been suggested as mentioned herewith: (*In alphabetical order*)

1. Accessing Government Schemes and Policies for FPO Growth
2. Contract Farming
3. Enhancing Access to Markets
4. FPO Governance
5. Integrated Pest Management for Sustainable Farming
6. Micro-Irrigation Systems: Efficient Water Management for FPOs
7. Natural Resource Management
8. Organic Farming Certification Procedures
9. Post-Harvest Management: Storage, Packaging, and Branding for FPOs
10. Protected Cultivation
11. Soil Health Management for Enhanced Agricultural Productivity
12. Sustainable Farming Principles and Practices
13. Value Addition in Agriculture
14. Water Use Efficiency and Sustainable Irrigation Practices for FPOs

These programs address the diverse needs of FPO members, combining technical, managerial, and market-oriented training to enhance their capacity for sustainable growth and collective success. The details of programme contents are provided in the report.

<u>Department of Agriculture (DOA) Officers and Staff Responses:</u>

The survey explored the Department of Agriculture (DOA) officers and Staff members' perspectives on agricultural training and climate-resilient agriculture (CRA). Key climate challenges identified included erratic rainfall, pest outbreaks, rising temperatures, reduced water availability, and soil degradation. To address these, officers actively promote CRA practices such as crop diversification, soil conservation, organic farming, and water-efficient irrigation systems. However, implementation is hindered by insufficient farmer training, funding constraints, infrastructure gaps, and resistance to adopting new practices and technologies.

Officers currently rely on strategies such as awareness campaigns, technical workshops, and subsidies to promote CRA, though collaboration with NGOs and financial assistance initiatives remains limited. Farmer participation in CRA varies, with over 60% involvement reported in some areas. Technologies like weather forecasting tools, drip irrigation, and solar energy are popular, while precision agriculture and drought-resistant crops have seen lower adoption rates.

Support schemes targeting smallholder farmers emphasize crop insurance, subsidies for resilient seeds, and loans for solar-powered irrigation systems. Officers suggested strengthening these by increasing subsidies, promoting crop diversification, implementing integrated pest management policies, and improving credit access. DOA Officers suggested focussing on soil health management, renewable energy, and precision agriculture as key areas for advancing CRA practices.

Suggested Training Programs for DOA Officers:

The DOA Officers identified critical training needs in areas such as value addition, post-harvest management, agricultural marketing, agribusiness, and Agri-startup promotion. Awareness about climate resilience was found to be limited, with minimal access to training in agricultural technology, soil health improvement, organic farming, and water management, alongside constrained financial assistance. The survey findings highlight the key subjects for training programmes for DOA Officers and Staff members and are as follows – (*In alphabetical Order*)

1. Agricultural Extension Management
2. Agroforestry and Carbon Trading Opportunities
3. Developing Community-based Organizations
4. Effective Communication
5. Enhancing Market Access
6. Exports in Agriculture – Procedures and Documentation
7. Extension Approaches for promotion of Agribusiness
8. Integrated Nutrition Management
9. Integrated Pest Management
10. Integrating Renewable Energy in Agriculture for Carbon Offsetting
11. Natural Resource Management

12. Organic Farming Certification Procedures
13. Organic Farming Principles and Practices
14. Plant Health Management
15. Post-Harvest Management
16. Precision Agricultural Technologies
17. Soil Health Management
18. Sustainable Agriculture Principles and Practices
19. Value Addition in Agriculture
20. Value Chain Extension
21. Water Resource Management
22. Water Use Efficiency
23. Women Empowerment for Climate Resilient Agriculture

Based on the felt needs for capacity building of DOA Officers and Staff members have been ascertained. The corresponding training programmes that may be considered are as indicated herewith –

1. Carbon Credits and Climate-Smart Agriculture
2. Carbon Markets and Trading Mechanisms
3. Carbon Sequestration Techniques in Farming Systems
4. Developing Carbon Credit Projects for Smallholder Farmers
5. Digital Tools and Technologies for Carbon Accounting in Agriculture
6. Managing Climate Change
7. Measurement, Reporting, and Verification (MRV) of Carbon Credits
8. Promoting Organic Farming for Enhanced Carbon Storage
9. Role of Soil Health in Carbon Sequestration

<u>Responses of Financial Institutions:</u>

Fourteen institutions, including banks, cooperative societies, and other entities with over 20 years of financial service experience, participated in the survey. They primarily offer equipment financing, crop loans, and microloans, while weather insurance remains underutilized. Most

institutions recognize the importance of climate resilience, citing drought, flooding, and extreme temperatures as significant risks for agricultural borrowers.

Nine institutions have programs like insurance and subsidies to support climate-resilient agriculture, but adoption gaps persist. Climate risk assessment is limited to practices like using climate data in loan analyses and including risk indicators in credit scoring. Challenges such as lack of awareness, resource constraints, and regulatory hurdles hinder broader institutional support for resilience.

To address these issues, institutions are exploring digital financing platforms, climate-smart credit products, and partnerships. Policymakers are encouraged to provide capacity building, funding, and regulatory incentives to strengthen institutional efforts in promoting climate resilience.

In view of the above, the most relevant 4 training programmes for members of the Financial Institutions as come out from the survey activities are – (*In alphabetical Order*)

1. Building Financial Solutions for Climate-Resilient Agricultural Practices
2. Climate Risk Assessment and Financial Products Development
3. Facilitating Access to Credit and Insurance for Climate-Resilient Farming
4. Financial Risk Mitigation in Agriculture
5. Understanding Climate Risks: Integrating Climate Data into Financial Decision-Making

<u>Responses of Educational Institutions:</u>

Eight of the 14 institutions surveyed offer courses on climate-resilient agriculture, integrating them into undergraduate programs, workshops, and field training. These programs focus on key research areas like soil health, water management, and pest management. All institutions provide extension services, including technical training, soil testing, and mechanization support, often working with government agencies, NGOs, and private entities.

To bridge academic knowledge and practical application, institutions engage farmers through workshops, field demonstrations, and participatory research. Eleven institutions have implemented programs that enhance crop yields, soil health, water management, and climate adaptation. However, there is a need for increased technical expertise, financial resources, infrastructure, and collaborations to further strengthen these efforts.

Recommendations include boosting research funding, developing climate-resilient crop varieties, expanding farmer training programs, and incorporating digital tools to advance agricultural education and climate resilience.

In light of the discussion with respective stakeholders, the training programmes for members of Educational Institutions are proposed as follows – (*In alphabetical Order*)

1. Extension Services Management for Climate-Smart Farming
2. Management Development Programme for Farmers Field Schools
3. Trainers Training Programme for Integrated Nutrient Management for Climate-Smart Agriculture
4. Trainers Training Programme for Integrated Pest Management for Climate-Smart Agriculture
5. Trainers Training Programme for Soil Health and Water Management for Climate Adaptation
6. Trainers Training Programme for Sustainable Farming Practices

<u>Responses of NGO:</u>

The survey findings reveal that NGOs are involved in a range of agricultural projects, with a focus on climate-resilient agriculture, organic farming, and water management. They also work on livelihood enhancement, environmental conservation, and agricultural infrastructure, with a few other specialized projects.

Most NGOs collaborate with other organizations or government bodies to strengthen their initiatives. They promote a variety of climate-resilient practices, including organic farming, efficient irrigation techniques, crop diversification, and water management, with some also focusing on agroforestry and integrated pest management.

The challenges faced by NGOs in promoting climate-resilient agriculture include a lack of awareness, limited technical support, and resistance to change. Financial constraints and high implementation costs also pose significant hurdles.

The impact of their projects on local agriculture and farmers is largely positive, with improvements in crop yields, soil health, income levels, and water management. Many projects

have also contributed to the adoption of climate-resilient practices, community empowerment, and enhanced food security.

To enhance project effectiveness, NGOs require better financial support, improved community engagement, and greater collaboration with the government and private sectors. Access to quality inputs, technology, and technical expertise are also critical for scaling up their efforts.

Based on the survey findings, the most useful training programs for NGOs involved in the project CRA are – (*In alphabetical Order*)

1. Agroforestry – Opportunities for NGOs
2. Building Community Engagement for Sustainable Agricultural Projects
3. Climate-Resilient Agriculture: Strategies for NGOs
4. Enhancing Technical and Networking Support to Farmers.
5. Integrated Nutrient Management for Resilient Farming
6. Integrated Pest Management for Resilient Farming
7. Integrated Water Management for Agricultural Development
8. Promoting Organic Farming and Sustainable Practices
9. Resources Management and Community Engagement for Agricultural Projects
10. Strengthening NGO-Government-Private Sector Collaborations

These programs aim to address the primary challenges faced by NGOs, focusing on improving technical capacity and financial sustainability, while also strengthening the collaboration and engagement necessary to enhance their effectiveness.

<u>Responses of SHG:</u>

The survey reveals that Self-Help Groups (SHGs) are involved in a variety of activities, primarily focusing on agricultural production, microenterprises, and livestock rearing. They also engage in handicrafts and other diverse activities.

SHGs provide essential financial services to their members, including savings, loans, and insurance, with no responses indicating services outside these categories. Many SHGs conduct training and capacity-building programs to enhance the skills of their members.

Regarding climate-resilient practices, SHG members have adopted several strategies, with a strong focus on Agri allied services, efficient irrigation techniques, organic farming, and drought-

resistant crops. However, some practices like agroforestry and mulching are less commonly adopted. The main challenges faced by members in adopting climate-resilient practices include lack of awareness, high implementation costs, and limited technical support. Resistance to change and lack of cooperation from farmer members also hinder progress.

Although many members report no change in productivity or income after adopting climate-resilient practices, a notable proportion have seen increases in both. However, a small percentage reported decrease. To improve productivity and income, SHGs seek financial support, technical training, and improved market access. Access to quality inputs is also needed, with a significant portion indicating other forms of support as necessary for further progress.

Based on the survey findings, here are a few most relevant training courses for Self-Help Groups (SHGs - (*In alphabetical Order*)

1. SHGs Capacity Building for Agri-Enterprises Promotion
2. Sustainable Agriculture Principles Practices
3. Efficient Natural Resources Management
4. Financial Literacy for SHG Members
5. Technical Training on Sustainable Livestock Management and Agri-Allied Services

These training programs would address the key needs of SHG members, focusing on improving technical knowledge, financial management, and market access while promoting climate-resilient and sustainable farming practices.

Responses of Gram Panchayat Committee Members:

The survey highlights several key findings related to climate-resilient agricultural practices and support mechanisms in rural areas.

Regarding awareness, a significant number of participants are not familiar with PoCRA, with only a small proportion reporting awareness among their communities. Similarly, a majority of political representatives and government employees have not participated in training on climate-resilient agricultural practices, although a few have attended such sessions. The Gram Panchayat's role in supporting sustainable agricultural practices is limited, with most respondents indicating they do not receive adequate information or support from it. However, the Gram Panchayat has contributed to climate resilience through groundwater recharge facilities and other initiatives.

Government schemes such as agricultural subsidies, crop insurance, and capacity-building programs are available but may not be fully utilized. Institutional support from various entities

like banks, NGOs, and SHGs is also present but not widespread. Traditional agricultural practices like animal husbandry integrated with farming and the use of natural fertilizers continue to play an essential role in the community. Several challenges hinder the Gram Panchayat's implementation of climate-resilient practices, including budget limitations, lack of technical knowledge, and insufficient infrastructure.

Community resistance and migration of youth to urban areas also pose obstacles. To help farmers adapt to climate-resilient practices, support is needed in areas such as infrastructure, training, financial assistance, and exposure visits. Improving farmers' income can be achieved through modern agricultural practices, strengthening market linkages, and providing access to credit and finance. Respondents suggest training in project planning, sustainable agricultural practices, water resource management, and the use of technology to support farmers in adapting to climate challenges.

Based on the given survey findings, here are five most relevant training courses for Gram Panchayat Committee members associated with supporting climate-resilient agricultural practices (*In Alphabetical Order*):

1. Climate-Resilient Agriculture and Sustainable Practices
2. Promotion of Agroforestry Policies and Schemes
3. Project Planning and Management for Rural Development
4. Technology Applications in Agriculture for Climate Adaptation
5. Water Resource Management and Groundwater Recharge

These training courses would address the primary needs for improving awareness, technical skills, infrastructure, and support systems in rural communities to promote climate-resilient agriculture and sustainable rural development.

Concluding Remarks:

The central idea that connects various elements of the project across all stakeholder groups is the need for tailored, practical training programs that equip farmers and institutional actors with the knowledge and skills as required to effectively adopt climate-resilient agricultural practices. These training programs; having designed scientifically must be implemented with systematic approach in mind, addressing the specific challenges faced by different groups—whether they are women farmers, young farmers, marginalized communities, or institutions.

Furthermore, fostering collaborative efforts, improving financial support mechanisms, and enhancing technical expertise will go a long way in enabling stakeholders to overcome challenges and accelerate the transition to sustainable, climate-resilient agriculture.

The proposed training modules collectively aim to build the capacity of agricultural extension functionaries to support climate-smart agriculture, carbon credit generation, and sustainable farming practices. The general agricultural extension modules empower extension workers to assist farmers in enhancing productivity, improving resource management, and accessing markets while promoting sustainability. At the same time, the specialized modules on carbon credits and climate-smart agriculture provide essential knowledge for extension professionals to help farmers transition to practices that reduce greenhouse gas emissions and generate income through carbon markets.

By integrating digital tools, promoting carbon sequestration practices, and ensuring sustainable resource management, these modules provide a comprehensive framework for extension functionaries to help farmers not only improve agricultural productivity but also contribute to climate change mitigation and resilience. These modules aim to prepare extension workers to act as change agents, fostering climate resilience and sustainability in agriculture while driving economic benefits for farmers through carbon markets and green technologies.

In conclusion, this study is a snapshot of a dynamic and complex subject of understanding the needs of stakeholders as regards to the training and capacity building aspects. Readers are urged to approach the findings with an understanding of the outlined limitations. We welcome constructive feedback and encourages stakeholders to explore additional avenues for advancing knowledge in this field.

1 Chapter 1. Introduction of the Institute; VASANTRAO NAIK State Agriculture Extension Management Training Institute (VANAMATI)

The VASANTRAO NAIK State Agriculture Extension Management Training Institute (VANAMATI); having established in the year 1992, operates as the apex training centre under the aegis of the Department of Agriculture, Government of Maharashtra. Its primary mandate is to conduct comprehensive training and capacity-building programmes for the officials and staff members of the Department of Agriculture, Government of Maharashtra.

Over the years, VANAMATI has evolved to become a cornerstone in the realm of training, extending its purview beyond conventional agricultural extension management. Since its inception, VANAMATI has been at the forefront of empowering officials and staff members with the knowledge skills, and attitude needed to navigate the complexities of extension management for modern agriculture sector especially in context of Maharashtra.

The institute oversees a network of seven Regional Agriculture Extension Management Training Institutes located at Nagpur, Amravati, Ch. Sambhaji Nagar, Nashik, Pune, Kolhapur, and Khopoli. This network not only reinforces the institute's statewide reach but also positions it to cater to a diverse spectrum of stakeholders in agriculture sector throughout the state of Maharashtra.

The apex institute has sound physical infrastructure and has capacity to organize on an average 5 training programmes with a batch size of 40 each at any given point of time. The facilities such as required for organizing the programmes in residential mode are available with the institute. To supplement this, related facilities such as IT labs, Library, Conference Halls, Auditorium etc are also available for the trainee officers. The apex institute VANAMATI has a network of seven regional institutes having suitable infrastructure to cater to the training needs of staff members of the Department of Agriculture of respective regions.

The institutes have its own HR base with officers having expertise and domain experience are onboard. Additionally, it has developed a vast talent pool of Resource Persons who are Subject Matter Specialists in their respective areas and are associated with the institute as Visiting Faculty members. (The further details can be accessed at www.vanamati.in)

2 Chapter 2. Overview of the Principal Thrust Areas and the Training Programmes of the institute for Officers and Staff members of the Department of Agriculture

The focal points of training at the institute encompass a comprehensive array of subjects crucial for the development and enhancement of agricultural extension management practices. These thrust areas are systematically designed to address various facets of the agricultural sector, ensuring a comprehensive approach to training and capacity building in the domain of agricultural extension management.

Agriculture Extension Management is an important thrust area; emphasizing the intricacies of managing and implementing agricultural extension services to the primary stakeholders. The training involves strengthening the capacities of agricultural filed officers for disseminating cutting-edge research findings and innovative agricultural practices to farmers and rural communities.

Another thrust area has a significant emphasis on Agribusiness and Agricultural Value Chain Management. The programme in this area provides an in-depth exploration of the business aspects of agriculture, spanning the entire value chain from production to consumption. Participants are equipped with knowledge and skills related to marketing, distribution, and processing.

Human capital is recognized as a vital asset in the agricultural landscape. Hence, the institute is committed to Human Resources Development for Agriculture, offering training programs that foster skill development, capacity building, and professional growth for individuals working in various capacities within the agricultural sector.

Recognizing the transformative power of technology, the institute integrates Information and Communication Technology (ICT) enabled interventions for Effective Agricultural Extension. This thrust areas underscores the importance of leveraging technological tools to modernize and enhance the impact of agricultural extension services, ensuring efficient and widespread dissemination of information.

In response to the ever-growing challenges posed by climate change, the institute addresses the aspects of building resilience in agriculture through Climate Resilient Agriculture training. Participants learn sustainable farming practices and adaptation strategies.

Postharvest Management and Marketing are important aspects in agriculture. Therefore, organizing training for participants so as to help them learn about the essentials of Postharvest

Management and the intricacies of marketing principles, concepts, processes and strategies specific to the agricultural sector is the focus of programmes in this thrust area. The concepts of Market-led Extension is emphasized so that the participating extension functionaries learn the dynamics of agricultural trade and business.

The training programmes under the thrust area of Natural Resources Management covers sustainable agricultural production practices for the conservation and management of natural resources, including soil, water, and biodiversity. Similarly, in line with the growing global trend towards sustainable practices, the training programmes under the thrust area of Organic Agriculture are important part of the annual training plan.

Training in this area equips participants with the principles and practices of organic farming, promoting environmentally friendly and sustainable agricultural production management methods.

Gender Mainstreaming is a critical component, ensuring that training initiatives integrate a gender perspective across all aspects of agricultural development in the state. The training programmes under this thrust area are crucial and instrumental in developing a sensitivity expected from extension functionaries to accomplish inclusive and holistic development.

Last but not the least, is the thrust area of Agricultural Mechanization. The training programmes under this area provides participants the knowledge and skills related to the use and management of agricultural technology, machinery and tools.

In essence, these thrust areas and various training programmes under each thrust area collectively form a broad framework for training and capacity building interventions with an objective of empowering trainee officers and staff members functional in the state agricultural sector with the knowledge, skills and attitude necessary for managing sustainable and effective agricultural extension management practices. The institute is also engaged in training the functionaries working for World Bank assisted projects in agriculture sector in the State. The training function currently being managed for project by the institute is State of Maharashtra's Agribusiness Project for Rural Transformation (SMART).

The state schemes under which various training programmes are organized in the institute are

- Rashtriya Krushi Vikas Yojana (RKVY)
- Agriculture Technology Management Agency (ATMA)
- State Training Policy (STP)

3 Chapter 3. A Generic Overview of the Status of Agriculture Sector in Maharashtra:

3.1 Introduction

Maharashtra, India's second most populous state and third largest in terms of area, holds the distinction of having the highest share of Gross Domestic Product (GDP) among all Indian states. With over half of its population residing in rural areas and a literacy rate of 82.3%, the state plays a crucial role in the country's economic landscape.

Maharashtra exhibits a climatic diversity that unfolds in distinct phases throughout the year. The seasonal progression includes hot summers, monsoons, and mild winters. This climatic differentiation varies across the state's regions, contributing to its unique ecological profile.

The coastal belt of Maharashtra falls under the Hot, Humid Eco-Region, where summers are characterized by high temperatures and humidity. The region experiences a substantial annual rainfall exceeding 2000 mm. Moving inland, the western and central parts of Maharashtra fall under the Hot Semi-Arid Eco-Region, featuring hot and humid summers, mild and dry winters, and a moderate annual rainfall ranging between 600-1000 mm. On the eastern side, most of Maharashtra lies within the Hot Sub-Humid (Dry) Eco-Region, with hot summers, mild winters, and an annual rainfall ranging from 1000-1500 mm, gradually increasing towards the eastern boundaries.

Agriculture is an integral part of Maharashtra's socio-economic structure. It heavily relies on rainfed practices, with a mere 18.2% of the crop area benefiting from irrigation. Despite over 50% of the state's population depending on agriculture for their livelihoods, the sector contributes only 11.7% to the Gross State Value Added. The average operational holding size, a key metric in agricultural dynamics, stands at 1.34 hectares, categorizing holdings as small.

The prominent crops in the State are cereals, pulses, oilseeds, cotton, and sugarcane. Soybean takes the lead in oilseed production, closely followed by groundnut. However, despite the agricultural significance, around 40% of Maharashtra is prone to drought, a critical factor influencing crop outcomes and rural livelihoods.

The regions—Khandesh, Marathwada, and Vidarbha—are particularly susceptible to drought. These regions have their unique challenges posed by Hot, Semi-Arid and Hot, Sub-Humid ecological zones. Drought events in these areas trigger a domino effect, resulting in crop failure, reduced employment opportunities, and an upswing in farmer debt.

A noteworthy example is the 2012 drought, which led to substantial yield reductions across cereals, pulses, and total food grains production. Additionally, crops like sugarcane, citrus fruits, and vegetables faced significant losses.

Central Maharashtra and Marathwada are focal points for drought incidence, rendering them highly vulnerable to climate change. The cyclical nature of drought events necessitates a good understanding of their impact on agriculture, emphasizing the urgency for adaptive strategies and resilient practices in these regions.

(Data Source: Economic Survey Report of 2021 – 22.)

3.2 Climate Change and its impact on Agriculture in Maharashtra

The impacts of climate change on agriculture are multifaceted, encompassing various interconnected factors. These effects can be broadly categorized into distinct groups, each arising from different aspects of the changing climate. A summary of effects is provided below-

(A) Temperature Rise

- Shortened crop duration, leading to less time for grains to develop
- Harm to reproductive system—flowering and fruiting
- Direct damage to plant cells
- Increased transpiration and water loss
- Increased pests and diseases
- Damage to plant-microbe relationships
- Changes in soil nutrient cycles

(B) Unpredictable Rainfall

- Reduced yield from drought stress
- Loss to rainfed farmers due to rain schedule changes
- Root damage from flooding
- Loss of soil nutrients from flooding

(C) Atmospheric Carbon Dioxide Rise

- Increased photosynthesis
- Decreased O2 related photosynthesis loss

- Possibly higher water use efficiency
- Changes in Nitrogen use of plants
- Changes in plant C:N ratios leading to altered pest and disease patterns

(D) Atmospheric Ozone Rise

- Oxidative damage to photosynthetic machinery
- Possible reduction of radiation available to plants

(Source: Institute for Sustainable Communities; ISC)

Understanding these distinct categories of climate change effects on agriculture is crucial for devising adaptive strategies and mitigating potential risks. The complexity lies in the interconnected nature of these factors, as changes in one aspect can have cascading effects on others, necessitating a holistic approach to address the challenges posed by a changing climate in the agricultural sector.

We observe that the landscape of conventional farming practices has been disrupted by Climate Change, giving rise to heightened occurrences of extreme events. This has had a profound impact on agricultural yields, livelihoods, and the overall health of the soil. Various well-known institutions, both nationally and internationally, have conducted studies revealing the potential effects of temperature and rainfall variations on the growth and development of crops.

These studies sound warning bells for agriculture in general and therefore Maharashtra can also not remain immune to this. This explains the need for attention and proactive measures to be initiated by the institutional network members engaged in managing the development of agriculture in the State.

A noteworthy study titled "Climate Change Impacts on Maharashtra Agriculture," carried out by the Institute for Sustainable Communities (ISC), a US-based organization, delved into the local factors of climate change impacts. The findings emphasized significant variations at the local level, highlighting a critical knowledge gap that requires more detailed assessments and resilient strategies. The study aimed to bridge this gap, intending to provide actionable insights for key decision-makers, researchers, and farming communities to enhance their understanding and preparedness for the challenges posed by climate change.

The study conducted an in-depth analysis across key regions in the state including Vidarbha, Marathwada, and Khandesh—focusing on four major crops: Soybean, Cotton, Wheat, and Gram.

The findings underscored that, the fluctuations in temperature and rainfall patterns adversely affected the growth and development of these essential crops.

Specifically, for Kharif crops such as Soybean and Cotton, excessive rainfall during crucial stages like pod development, maturity, boll formation, and boll bursting significantly impacted both production and the quality of the yield.

In the case of Rabi crops, namely Wheat and Gram, elevated temperatures during grain formation and filling stages similarly posed challenges to the quality of the produce.

The report not only highlighted the challenges but also thrown light on the adaptive measures taken by farming communities to navigate these trends. By demonstrating localized scalable solutions, the report lays the groundwork for promoting climate-resilient agriculture in the state.

The report can be accessed at https://sustain.org/report-climate-change-impacts-on-maharashtra-agriculture/

4 Chapter 4. Overview of the Project; PoCRA Phase – I:

4.1 Introduction:

The Government of Maharashtra has approved and is actively implementing a groundbreaking initiative known as the Climate Resilient Agriculture (PoCRA) project. Spanning 5,000 villages across 15 districts in the state, this project is undertaken with the financial support from the World Bank. Its primary objective is to address the vulnerability of the agriculture sector to drought-related challenges.

The central focus of PoCRA is to strengthen the resilience of farmers engaged in rain-fed farming against the unpredictable impacts of climate change. The ultimate goal is to ensure a stable and secure livelihood, particularly for the impoverished and vulnerable farming communities in the state. Notably, this project represents a pioneering effort in the Indian agricultural sector, standing out as the first of its kind.

The project covered all eight districts of Marathwada, six districts of Vidarbha (including Akola, Amravati, Buldhana, Yavatmal, Washim, and Wardha), and the Jalgaon district from Khandesh. Among the 5,000 villages selected for the project, 4,000 are characterized by a high susceptibility to climate-related risks, while 1,000 exhibit elevated levels of soil salinity and sodicity – (*Sodicity in soil is the presence of a high proportion of sodium ions relative to other cations. As sodium salts are leached through the soil, some sodium remains bound to clay particles—displacing other cations. Soils are often considered sodic when the amount of sodium impacts soil structure.*).

PoCRA stands as a comprehensive and solid endeavour, aiming not only to enhance climate resilience but also to improve the profitability of smallholder farming systems. By addressing the specific challenges faced by different regions and incorporating innovative strategies, this project strives to create a blueprint for a more sustainable and resilient agricultural sector in Maharashtra

4.2 Basic Elements of the Project – Phase I:

A. Project Development Objective:

- The Project Development Objective (PDO) of the PoCRA project is to augment the climate resilience and profitability of smallholder farming systems in the selected 15 districts of Maharashtra.

B. Project Guiding Principles:

- The project operates on the following key guiding principles:

i. Enhancing resilience through the introduction of cropping patterns and agronomic practices that enhance water productivity.

ii. Promoting the sustainable and efficient use of water resources, incorporating improvements in on-farm water use efficiency.

iii. Improving soil health by augmenting soil organic carbon levels and implementing better management practices for saline soils.

iv. Encouraging increased private sector participation in the development of climate-resilient value chains.

v. Strengthening the adaptive capacity of smallholders through the provision of weather information, techno-managerial support for aggregation, and fostering innovation to attain the project's objectives.

C. Project Components:

The project unfolds through three principal components, each strategically designed to contribute to the overarching goals.

(A) Promoting Climate Resilient Agriculture Systems: Under this component, the focus is on fostering agricultural systems that can withstand and adapt to climatic challenges. The specific sub-components include:

A.1: Participatory Development of Mini Watershed Plans: Engaging local communities in the collaborative creation of mini watershed plans to optimize water usage and enhance resilience.

A.2: On-Farm Climate-Resilient Technologies and Farming Systems: Implementing innovative technologies and farming practices that fortify the system against climatic variations.

A.3: Climate-Resilient Development of Catchment Areas: Ensuring the sustainable and climate-resilient development of catchment areas, recognizing their critical role in water management.

(B) Climate Smart Post-Harvest Management and Value Chain Promotion: This component revolves around intelligent post-harvest practices and the promotion of value chains resilient to climate impacts. The detailed sub-components include:

B.1: Promoting Farmer Producer Companies: Facilitating the establishment and growth of Farmer Producer Companies to empower and unify farmers in the face of climate challenges.

B.2: Strengthening Emerging Value-Chains for Climate-Resilient Commodities: Supporting the development of value chains that align with climate-resilient practices, ensuring the sustainability of commodities.

B.3: Improving the Performance of the Supply Chain for Climate-Resilient Seeds: Enhancing the efficiency and reliability of the supply chain specifically for climate-resilient seeds.

(C) Institutional Development, Knowledge, and Policies for a Climate-Resilient Agriculture: This component is dedicated to the overarching institutional and knowledge aspects critical for climate resilience. The specific sub-components include:

C.1: Sustainability and Institutional Capacity Development: Focusing on building sustainable practices and enhancing the capacity of institutions involved in agriculture.

C.2: Maharashtra Climate Innovation Center: Establishing a dedicated center for climate innovation in Maharashtra to promote research and technological advancements.

C.3: Knowledge and Policies: Emphasizing the development and dissemination of knowledge and policies that facilitate climate-resilient agricultural practices.

Each component, with its detailed sub-components, forms a comprehensive approach towards building climate resilience and ensuring sustainable agriculture in the targeted regions of Maharashtra.

4.3 Project Management Overview:

The project is structured with a comprehensive three-tier project governance mechanism to ensure effective management and implementation.

1. High-Level Steering Committee:
    a. Role: Provides conceptual, strategic, and policy guidance.

b. Composition: Comprising key stakeholders, responsible for reviewing progress, approving annual work plans and budgets, ensuring inter-departmental convergence, and offering overarching guidance.

2. Project Technical Advisory Committee:

    a. Role: Offers technical advice and solutions for technical challenges during implementation.

    b. Composition: Comprised of technical experts to provide specialized insights and recommendations.

3. Project Management Unit (PMU):

    a. Role: Conceptualizes, prepares project documents, and implements the project.

    b. Leadership: Headed by a Project Director providing guidance, coordination, and oversight.

4. Field-Level Coordination:

    a. Divisional Joint Directors of Agriculture: Provide coordination and oversight at the field level.

    b. District Superintending Agriculture Officers: Coordinate project activities at the district level.

    c. Sub Divisional Agriculture Officers: Responsible for executing activities within their designated clusters at the subdivision level.

    d. Agriculture Assistants: Implement project activities at the village level with support from cluster assistants.

5. Community Engagement:

Village Climate Resilient Agriculture Management Committee (VCRMC):

    a. Role: Central building block of PoCRA at the village level.

    b. Composition: Members selected by the Gram Sabha, representing various stakeholders.

    c. Responsibilities:

        i. Prepare participatory village micro-plans.

        ii. Select beneficiaries for individual benefit activities.

iii. Plan and execute community works as per the approved annual action plan.

iv. Maintain project assets.

v. Facilitate social audits of project activities.

6. Support Systems:

   i. Monitoring & Evaluation Framework: Ensures systematic project assessment.

   ii. Financial Management System: Governs financial aspects of the project.

   iii. Procurement System: Manages the procurement process efficiently.

   iv. Social & Environmental Management Framework: Addresses social and environmental considerations.

   v. Citizen's Grievances Redressal System: Facilitates the resolution of grievances for effective project management.

This comprehensive management structure for the project, spanning from high-level to community-level committees, is designed to foster collaboration, ensure accountability, and facilitate the successful execution of the PoCRA project

4.4 Project Development Strategy:

The PoCRA Project is employing the following strategies to ensure an effective implementation of the project.

1. Resilient Cropping Systems: Developing resilient cropping systems and practices tailored to current climate variability, potential El Niño events, and the overarching impact of climate change. This is particularly crucial for rain-fed areas within the project, which are susceptible to all three events.

2. Location-Specific Natural Resource Management: Recognizing that the impact of climate change and variability varies by location and context, the project strategy emphasizes natural resource management. It focuses on developing cropping systems and practices aligned with clusters of villages organized around mini-watersheds (MWS). This approach ensures a multiplier effect due to the interdependence of these villages.

3. Farm-Level Advisories for Enhanced Resilience: Enhancing the recommended package of resilience practices through periodic farm-level advisories. These advisories will be

crafted considering local area weather forecasts, cropping patterns, crop conditions, and soil health at the cluster level, providing targeted and context-specific guidance.

4. Diversification for Community Resilience: To build resilience in rural communities, the project includes a diverse set of activities such as cropping systems, agroforestry, horticulture, afforestation, varied livestock systems, and sustainable value chain activities. This approach aims to diversify farming systems, livelihoods, and incomes.
5. Enhancing Resilience Through Technological Interventions: Boosting resilience through the promotion of drought-tolerant seed varieties, efficient water management using micro-irrigation, and adopting protected cultivation with climate-controlled structures like polyhouses and shade nets. Timely agricultural operations will be facilitated through farm mechanization services available on a custom hiring basis.
6. Supporting Post-Harvest Efficiency: Supporting improved productivity levels by establishing efficient post-harvest infrastructure on a custom hiring basis. These facilities, managed by farmer producer companies, aim to increase the share of farmers in the final price of agricultural commodities, contributing to a more equitable and sustainable agricultural value chain.

5 Chapter 5. NDKSP Phase II Project Overview:

5.1 Introduction:

Many parts of the state have been facing droughts on a recurrent basis since decades. While investment in irrigation infrastructure has been a priority for the state as a long-term drought mitigation strategy, a major area of the state (about 82%) remains rain-fed with no access to water for protective irrigation. In case of a drought, the state has been adopting a short term, multi-pronged strategy to reduce its impact on the farmers. Waiver of interest rates and rescheduling of the payment of crop loans, supply of fodder for cattle, providing drinking water by tankers and other means, providing food grains at highly subsidized rates, and enhancing allocation for Rural Employment Guarantee Scheme (MGNREGS) are some of the measures which have been adopted by the GoM in the past to provide relief to the farmers and other affected people.

The Government of Maharashtra (GoM) has taken a progressive step by formulating a long-term, sustainable strategy to address the challenges posed by climate variability and climate change in the agricultural sector. Recognizing that climate change will lead to increased rainfall variability and more frequent droughts in the coming years, the GoM has developed the Nanaji Deshmukh Krishi Sanjeevani Prakalp (NDKSP) as a comprehensive solution. This initiative, the first large-scale climate-resilient agriculture project in India, focuses on building adaptive and resilient agricultural systems to mitigate the impacts of climate change.

NDKSP aligns closely with the United Nations Sustainable Development Goals (SDGs), contributing to SDG 2 (Zero Hunger) by enhancing food security through sustainable agricultural practices; SDG 13 (Climate Action) by improving farmers' resilience to climate risks; and SDG 15 (Life on Land) by promoting the sustainable management of ecosystems and preventing land degradation. By addressing these critical areas, NDKSP aims to empower farmers, support sustainable livelihoods, and create a robust, climate-resilient agricultural framework for Maharashtra.

The project will be implemented in 21 districts in Maharashtra and cover 7201 villages affected by drought. The estimated cost of the project is approximately USD 723.5 million and will be funded by the World Bank and the GoM in the ratio of 80:20.

5.2 Project Objectives:

The Project Development Objective (PDO) is to improve the resilience and profitability of small farmers by promoting resource use efficiency and emission-competitive production systems with data-driven tools.

The project aims to position Maharashtra as a leader in addressing the challenges of climate change and its emerging impacts in the agriculture sector. The project focuses on transforming agriculture into a resilient and productive system tailored for marginal and smallholder farmers (up to 5 ha. of landholders) with particular focus on vulnerable populations whose livelihood is impacted by changing climate conditions and climatic uncertainties. The interventions will be coupled with optimizing both natural and external resources to enhance ecosystem resilience, resulting in an emission-competitive and profitable production system.

Emission competitiveness is defined as achieving net greenhouse gas (GHG) emission reductions through improved packages of practices involving similar cropping systems compared to conventional methods. The design of these interventions will be guided by the development of a data-driven Decision Support System.

5.3 Project Components:

5.3.1 Component 1: Resource-Efficient Productivity Enhancement.

The Resource Efficient Productivity Enhancement (REPE) initiative under NDKSP Phase II aims to help farmers maximize resource efficiency while building resilience to the challenges posed by climate change. The program encourages sustainable farming techniques, such as adopting drip and sprinkler irrigation systems to conserve water. These practices are promoted under the *Per Drop More Crop* (PDMC) component of the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), which focuses on improving irrigation efficiency. PDMC is being implemented under Rashtriya Krishi Vikas Yojna (RKVY) from 2022-23. Additionally, REPE supports the use of solar-powered pumps to ensure energy-efficient water management, in line with the government's Kisan Urja Suraksha Evam Utthaan Mahabhiyan (PM-KUSUM) initiative.

The program also prioritizes reducing reliance on chemical inputs by encouraging the use of organic fertilizers and bio-pesticides, aligning with national schemes like the Paramparagat Krishi Vikas Yojana (PKVY) that promote organic farming. Furthermore, it emphasizes cultivating climate-resilient crops and maintaining soil health through regular testing under the Soil Health

Card Scheme. Techniques that restore and enhance soil quality are also integral to the initiative, supporting sustainable agricultural practices outlined by the Government of India.

By reducing the input costs, REPE aims to improve farmers' incomes while equipping them to handle unpredictable climate conditions. For instance, techniques like alternate wetting and drying in paddy cultivation recommended under NDKSP Phase II guidelines help conserve water and lower greenhouse gas emissions. This program is particularly critical for drought-prone regions in Maharashtra, enabling farmers to adopt smarter, resource-efficient practices that protect vital resources and ensure sustainable agricultural development for the future.

The Sub-components for Component 1 are as follows –

- Promoting Production Systems Efficiency.
    - Enhancing Soil Fertility.
    - Improving Nutrient Efficiency.
    - Enhancing Pest Management Efficiency
    - Promoting Good Agricultural Practices
    - Promoting Judicious Use of Fertilizers
- Promoting Efficient Water Use
    - Enhance Access to Water
    - Promote Micro Irrigation
- Promoting Climate Resilient Technologies
    - Promoting Sustainable Agriculture Practices
    - Promoting Adaptation and Mitigation Strategies to Address Climate Changes
    - Encouraging Crop Diversification

5.3.2 Component 2: Promoting Precision Agriculture for Emissions Management

Precision agriculture plays a pivotal role in reducing greenhouse gas emissions and improving the efficiency of farming practices. By using advanced technologies such as sensors, satellite imagery, and data analytics, farmers can monitor crop health, soil conditions, and weather patterns with greater accuracy. This enables them to optimize inputs such as water, fertilizers, and pesticides, which not only improves crop yields but also minimizes unnecessary emissions associated with overuse of chemicals and energy. Additionally, precision agriculture facilitates the development

of tailored crop advisories, providing farmers with real-time, location-specific guidance on the best planting, irrigation, and harvesting practices. These advisories help farmers make informed decisions, reducing environmental impact while boosting productivity. By incorporating precision agriculture into emissions management strategies, we can support sustainable agricultural practices that are both environmentally responsible and economically viable, contributing to long-term climate resilience (Ministry of Agriculture and Farmers Welfare, 2020; National Mission on Sustainable Agriculture, 2021).

The Sub-components for this 2nd component are as follows –

- Assessment of Greenhouse Gas Emissions (GHG)
- Enhance Carbon Sequestration
- Reducing Methane emission from Paddy
- Reducing energy consumption in agriculture

5.3.3 Component 3: Improving and Building Income Resilience through Agri-entrepreneurship

Improving and building income resilience through agri-entrepreneurship involves empowering farmers to diversify their income sources and reduce their dependency on traditional farming. By promoting value-added activities such as food processing, packaging, and direct marketing, farmers can earn higher returns for their produce. Encouraging the adoption of innovative business models, such as Farmer Producer Organizations (FPOs) and cooperative ventures, enables smallholders to access better markets, technology, and financial resources. Additionally, training programs and support for agri-startups help farmers develop entrepreneurial skills and explore opportunities in agro-tourism, organic farming, and niche crop cultivation. These initiatives strengthen farmers' financial stability and resilience against market and climate uncertainties.

The Sub-components for this 3rd Component are as follows –

- Promoting FPGs/FPCs as the Vehicle of Transformation
- Strengthening the Agribusiness Value Chain
- Agribusiness Growth Centres
- Promotion of agri-entrepreneurship among youth

5.3.4 Component 4: Institutional Strengthening and Innovations

In NDKSP Phase II, institutional strengthening and innovation play an important role in fostering sustainable agricultural development. The project adopts a consortia-based approach, bringing

together Farmer Producer Organizations (FPOs), government agencies, financial institutions, and private sector stakeholders to create a robust ecosystem for collaborative growth. This approach emphasizes capacity building, resource sharing, and the implementation of innovative agricultural practices to address challenges faced by smallholder farmers.

Through this initiative, the project supports the development of model institutions that act as "lighthouses," showcasing successful, replicable practices for other regions. These institutions are equipped with the necessary tools, knowledge, and technologies to improve services for farmers, strengthen market linkages, and promote resilience in the face of climate challenges. By focusing on institutional strengthening and fostering innovations, NDKSP Phase II aims to enhance productivity, sustainability, and the overall livelihoods of farming communities across Maharashtra.

Through this framework, NDKSP Phase II aims to enhance institutional capacities, ensuring that farmers have access to the necessary resources, technologies, and market opportunities to thrive. By strengthening these institutions, the program fosters a more inclusive, sustainable, and resilient agricultural landscape.

The Sub-components for the 4th Component are as follows –

- Consortia Approach
    - Networking with Knowledge Partner Institutions
    - Leveraging Benefits of the Consortia Approach
- Implementation Arrangements
- Digital Innovations
- Capacity Development
- Human Resource Management
- Monitoring and Evaluation

The NDKSP is a transformative initiative aimed at addressing the challenges of climate variability and building a sustainable, resilient, and profitable agricultural framework for Maharashtra.

6 Chapter 6. The Objectives of the Capacity Enhancement and Need Assessment (CENA) Exercise and Benefits for Stakeholders:

The Capacity Enhancement & Need Assessment (CENA) exercise for assessing the capacity & developing training modules for different stakeholders in the districts to be covered under Phase-2 in the project is proposed to be undertaken by VASANTRAO NAIK State Agriculture Extension Management Training Institute (VANAMATI) – Ref: PoCRA letter No-na-de-kru-s-pra-0522/TRG/73/2023-24/03 dated 01/01/2024.

6.1 Objectives of the Study:

With the aim to provide the framework for a strategic and well-informed approach to stakeholder engagement and capacity-building within the project framework, the thematic areas and the objectives under each thematic area of this exercise are as indicated below –

1. Comprehensive Stakeholder Assessment:

   Objective: To collectively understand the existing knowledge, skills, and capacity of stakeholder groups operating at different levels within the identified project area.

2. Capacity Gap Analysis and Remedial Recommendations:

   Objective: To identify capacity gaps and weaknesses among stakeholders and recommend effective remedies. Additionally, to study the institutional environment within the thematic area contributing to productive action.

3. Enhancing Project Stakeholder Capacities:

   Objective: To explore strategies for effectively and efficiently strengthening the capacity of diverse stakeholders. This includes planning, implementing, and monitoring various developmental activities proposed under the project to ensure its success.

4. Development of Multi-Dimensional Capacity Programs:

   Objective: To prepare multi-dimensional capacity enhancement programs tailored for respective stakeholders in the targeted area of Phase-2 of the project. These programs aim to address specific needs and foster holistic development.

5. Analysis of Stakeholder Relationships and Ecosystem Dynamics:

Objective: To understand the intricate relationships between various stakeholders, including community members, civil society organizations, executive and non-executive VCRMC members, and institutional actors operating at different levels. This analysis will delve into the ecosystem dynamics to ensure a comprehensive understanding of the project landscape.

6.2 Benefits for Stakeholders:

The practical benefits and advantages that stakeholders stand to gain through the proposed objectives under each thematic area, emphasizing the positive impact on their capacities, collaboration, and overall contributions to the project's success are outlined below –

1. Comprehensive Stakeholder Assessment:

   Advantages for Stakeholders:

   a. Informed Decision-Making: Stakeholders gain insights into their existing knowledge and capacities, allowing for more informed decision-making.

   b. Targeted Capacity Building: Identifying strengths enables targeted capacity-building efforts, ensuring resources are efficiently utilized.

   c. Collaborative Synergy: Understanding collective capabilities fosters collaborative synergy among stakeholders.

2. Capacity Gap Analysis and Remedial Recommendations:

   Advantages for Stakeholders:

   a. Focused Improvement: Stakeholders benefit from a focused approach to address identified gaps and weaknesses.

   b. Strategic Interventions: Remedial recommendations guide strategic interventions, optimizing efforts for maximum impact.

   c. Institutional Strengthening: Analyzing the institutional environment enhances the effectiveness of stakeholder actions.

3. Enhancing Project Stakeholder Capacities:

   Advantages for Stakeholders:

   a. Increased Effectiveness: Strengthening stakeholder capacities ensures more effective planning, implementation, and monitoring of activities.

b. Improved Project Success: Empowered stakeholders contribute significantly to project success, fostering positive outcomes.

c. Adaptive Resilience: Enhanced capacities enable stakeholders to adapt to changing circumstances, fostering resilience.

4. Development of Multi-Dimensional Capacity Programs:

   Advantages for Stakeholders:

   a. Tailored Solutions: Multi-dimensional programs are tailored to stakeholder needs, ensuring relevance and applicability.

   b. Holistic Development: Stakeholders experience holistic development through programs addressing diverse aspects of capacity.

   c. Sustainable Impact: Comprehensive programs lead to sustained impact, contributing to long-term stakeholder growth.

5. Analysis of Stakeholder Relationships and Ecosystem Dynamics:

   Advantages for Stakeholders:

   a. Improved Collaboration: Understanding stakeholder relationships fosters improved collaboration and coordination.

   b. Ecosystem Awareness: Stakeholders gain insights into the broader ecosystem dynamics, enabling strategic alignment.

   c. Enhanced Impact: A holistic view of relationships enhances the overall impact of stakeholder actions within the project.

7 Chapter 7. An Overview of Area Under Study:

7.1 Introduction:

The Nanaji Deshmukh Krishi Sanjivani Project (NDKSP) Phase II has expanded its scope to include 21 districts across Maharashtra, representing diverse agro-climatic zones. This selection of districts ensures the project addresses a broad spectrum of agricultural challenges being posed by climate variations to different regions.

The included districts are Chhatrapati Sambhaji Nagar, Beed, Jalna, Parbhani, Dharashiv, Latur, Nanded, Hingoli, Amravati, Akola, Washim, Yavatmal, Buldhana, Wardha, Jalgaon, and Nashik. Additionally, the project has extended its coverage to the eastern Vidarbha region, incorporating Nagpur, Bhandara, Gondia, Chandrapur, and Gadchiroli.

Spanning across 7201 villages, the initiative prioritizes implementing climate-resilient agricultural practices tailored to the unique needs of each district. This geographical diversity ensures a balanced focus on both drought-prone and high-rainfall areas, addressing critical challenges such as water management, soil conservation, and sustainable farming techniques.

By reaching deeper into these regions, NDKSP Phase II aims to empower farmers with enhanced resources, improve agricultural productivity, and establish a foundation for long-term sustainability in Maharashtra's farming sector. The initiative underscores its commitment to fostering resilience and driving meaningful change in agriculture across the state.

7.2 Area under Study:

As mentioned above, the project is going to be implemented in 21 districts in the State. Therefore, in order to consider area for conducting the survey exercise we have decided to do it in eight districts i.e. 38% of the total area in the State to be considered under Phase II.

Out of the eight districts, the six districts namely; Bhandara, Chandrapur, Gadchiroli, Gondia, Nagpur, Nasik are selected from the list of Phase II districts and two districts namely Amravati and Latur are considered from the existing Phase I districts.

The brief particulars of the Area Under Study are outlined below –

7.2.1 BHANDARA:

Bhandara District, with its more than 3500 small lakes is known as the “District of Lakes” in Maharashtra. According to the 2011 census Bhandara district has a population of 1,200,334 with

a population density of 294 inhabitants per square kilometre. The literacy rate here is of 83.76% with almost 98% of the people speak Marathi language.

Figure 1 Map of Bhandara district

Bhandara has a mixed economy with agriculture, industries and forest resources. The district is mainly popular for its large production of rice, and is thus termed as the "Rice Bowl of Maharashtra". Tumsar, a tahsil town, is a well-known rice market centre. The rice mill cluster of Bhandara is more than a decade old and there are about 243 rice mills as of now. Many millers in the district are paddy farmers who have now also undertaken rice milling activity.

The normal annual rainfall in the district is 1250 to 1500 mm with Wainganga River and its tributaries like Bagh, Panghodi Suz, Gadhavi, Chandan, Bavanthadi constitutes the major water resources. Soil is rich alluvial and are clayey loamy in texture, very deep, sticky and retentive of moisture. As per the Ground Water Information Report (2013) of Central Ground Water Board; GOI, falling water level trends are observed in almost entire Tumsar, Mohadi, Bhandara and Pauni talukas and major parts of Sakoli and Lakhandur talukas. Various Water Conservation measures are being undertaken by the department of agriculture to address the issue. Although paddy is the major crop of the district, other crops such as Soybean, Millets, Oilseeds are also considered by the farmers.

Covering an area of 3716 Sq. km, the district of Bhandara is segregated into two sub-divisions, Bhandara and Sakoli, that are further divided into seven talukas.

Bhandara sub-division is divided into four talukas:

- Bhandara
- Tumsar
- Pauni
- Mohadi

Sakoli sub-division is divided into three talukas:

- Sakoli
- Lakhani
- Lakhandur.

7.2.2 CHANDRAPUR:

Chandrapur district comprises of the tehsil of Chandrapur, Bhadravati, Warora, Chimur, Nagbhir, Bramhpuri, Sindhewahi, Mul, Gondpipri, Pomburna, Saoli, Rajura, Korpana, Jivati and Balharshah.

Table 1 Chandrapur District at a Glance:

Particular	Details
Headquarter	Chandrapur
Area	11,443 sq. Km
Population	2194262
Population Density	155 Per Sq. Km

Particular	Details
Literacy	59.41%
No of Talukas	15
No of Sub Divisions	8
No of Municipalities	7
No of Villages	1836
Loksabha Constituencies	2
Assembly Constituencies	6
Number Of Gram Panchayats	847

(Source: District Administration Data)

The major food crops cultivated are soybean, rice, jowar, tur, gram and wheat, whereas, the major commercial crop cultivated in Chandrapur district is cotton. Further, groundnut, safflower, sunflower etc. are also cultivated in the region. Chandrapur district soils of the farm are clay textured in the surface ranged from 41.36 to 62.13%. The soils of the farm are slightly alkaline in reaction.

The total geographical area of Chandrapur district is 11,443 sq. kms. As per 2011 census, the population of the district is 22.04 lakh and population density is 181 per sq. km. The district is

considered as the rice bowl of the State. The major crops grown in the district are paddy, cotton, soybean, jowar and pulses in Kharif and wheat, gram, pulses, linseed and chilly in Rabi seasons.

Agriculture in the district mostly depends on monsoon. Due to inadequate irrigation facilities, double cropping could not stabilize. The average yield of the crops is poor due to small land holdings. Annual average rainfall is 1337 mm with 66 normal rainy days.

The National Horticulture Mission (NHM) has been launched in Maharashtra since the year 2005-06, broadly covering four Mini-Missions. Out of total net sown area of 451500 ha. in the district, fruit crops cover 17503 ha (4 %), vegetable crops cover 5305 ha (1%) and floriculture crops covers only 18 ha area.

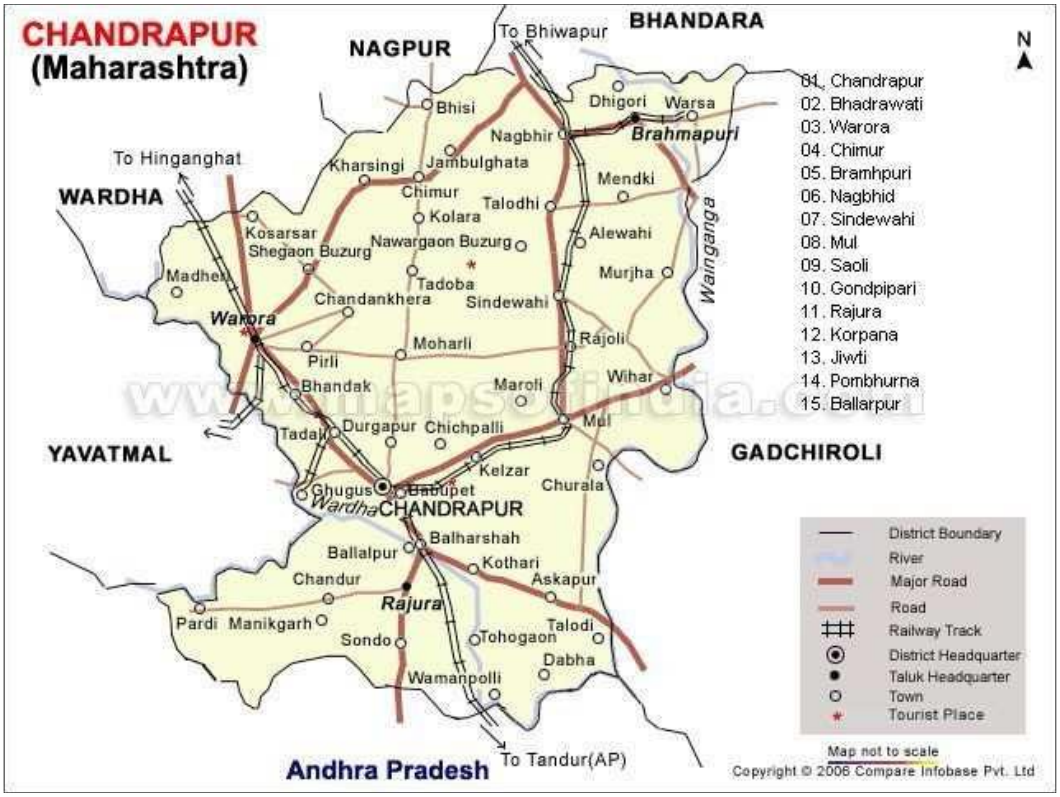


Figure 2 Map of Chandrapur district

<u>Major Soils type classification</u>:

(Area ('000 ha) Percent (%) of total area)

- Deep black soils 618.5 - (56.6%)
- Shallow black soils 278.7 - (25.5%)
- Medium deep black soils 114.7 - (10.5%)

<u>Agricultural land use Area ('000 ha):</u>

- Total geographical area of 1092 and Net sown area is 451.5

- Gross cropped area is 532.1
- Net irrigated area is 107 and Rainfed area 344.5

Data Source: ICAR - CRIDA

7.2.3 GADCHIROLI:

District At a Glance:

- Geographical Area: 14412 Sq. Km
- Average Rainfall: 1430.8 mm (Ref Year 2019)
- Sub Divisions: 06 – (Gadchiroli, Desaiganj (Wadsa), Aheri, Chamorshi, Etapalli and Kurkheda)
- No of Blocks: 12
- No of Villages in the District: 1675 (Ref 2011 Census)
- No of GPs: 457
- Total Population: 10,72,942 (M-541328 and F-531641)
- Population Density: 74 / Sq. Km
- Literacy Rate: 74.4% (M-82.3% and F-66.3%)
- Net Cultivable Area: 195570.29 ha (Ref 2017-18)
- Major Crop: Paddy

Data Source: District Administration

Figure 3 Map of Gadchiroli district

Gadchiroli district, classified as a tribal and underdeveloped region in the state, is predominantly characterized by vast forests and hills, covering more than 75.96% of its geographical expanse. The district is administratively divided into three subdivisions: Gadchiroli, Aheri, and Desaiganj, each further segmented into 12 Tahsils, with four talukas in each subdivision.

Gadchiroli subdivision encompasses Gadchiroli, Dhanora, Chamorshi, and Mulchera talukas. Aheri subdivision comprises Aheri, Sironcha, Etapalli, and Bhamragad talukas, while Desaiganj (Wadsa) subdivision includes Wadsa, Armori, Kurkheda, and Korchi Talukas.

Renowned for its bamboo and Tendu leaves, Gadchiroli's agricultural landscape is dominated by paddy cultivation, supported by other crops such as Jwar, Linseed, Tur, and Wheat. The primary occupation of the local population is farming.

Despite the absence of large-scale industries, notable establishments include a Paper Mill in Ashti, Chamorshi Taluka, and a Paper Pulp Factory in Desaiganj. Rice mills are prevalent due to the significance of paddy cultivation. Additionally, Armori taluka hosts the Tussar Silk Worm Centre in the district.

Gadchiroli experiences an average temperature of approximately 28°C, ranging from 21°C in winter to 36°C in summer, with May being the hottest month. The district encounters southwest monsoons from June to September, followed by post-monsoon months of October and November. Annual rainfall ranges from 1300 mm to 1750 mm.

The region predominantly features Red Lateritic and Yellowish-Brown soils, with significant areas covered by black soils. Rice cultivation is prominent, and the district is known for its extensive forest resources, covering 85.76% of the total area.

Gadchiroli is primarily inhabited by tribal communities, constituting nearly 38% of the population. Despite being industrially underdeveloped, the district's economy relies significantly on forest resources, including bamboo, Tendu leaves, Mahuva Flower, Lac, and silk

7.2.4 GONDIA:

Gondia district is located in the eastern part of Maharashtra and comprises 8 blocks with a total geographical area spanning 5641 square kilometres. Out of the total area, which is 5.64 lakh hectares, the cultivable land covers 2.20 lakh hectares. The district experiences an average annual rainfall of 1326.54 mm. As of the 2011 Census, the population of the district is 13.22 lakh, with 82.98% residing in rural areas. According to 2011 Census, the demographic features observed in Gondia District are as follows:

Table 2 The demographic features of Gondia District

Particular	Nos.
Total Number of Household	2,91,708
Total Population of District	13,22,507
Total Male population	6,62,656
Total Female Population	6,59,964
Sex Ratio	999
Urban Population	2,25,700
Rural Population	10,96,631
% of Urban Population to the total population	17%
Population Density	253 / Sq. Km.
Literacy Rate	84.95%
Male Literacy Rate	83.65%
Female Literacy Rate	69.55%

Data Source: District Administration

Figure 4 Map of Gondia district

The main agriculture crops in the district along with the cropping period and market area is given as follows.

Type of Crops	Name of Crops	Cropping Period	Market
Major Crops (Irrigated)	Kh Paddy S/Paddy	June – October Jan – May	District, State, Interstate
Major Crops (Non-Irrigated)	Kh. Paddy	June – October	District, State, Interstate
Major Cash Crops	Sugar Cane		District, State

The classification of Land Holders are given below:

- Number of Cultivators Holding Land Less than 2 Hect. — 306553
- Number of Cultivators Holding Land above 2 Hect — 53754
- Land holders holding land above 10 hectares — 1232
- Total Land Holders — 248423

Gondia district lies at latitudes 20.39 and 21.38 North and longitudes 79.27 to 80.42 east. The adjoining districts to Gondia are on Northen side Balaghat district of Madhya Pradesh and on eastern side Rajnandgaon district of Chhattisgarh state

Agriculture is predominant economic activity, followed by dairy. Gondia district has good potential for agricultural development keeping in view of water resources such as groundwater, rivers, reservoirs and village ponds. Major cereal crop is paddy. In pulses, Tur (sowing bunds), Gram, Lakh are the main crops.

Soil type of Gondia district is alluvial sandy loam. There are 9 agro climatic zones of Maharashtra, Gondia district is under eastern Vidarbha zone. The rainfall of district is 950mm-1250mm.

Gondia District experiences extreme variations in temperature with very hot Summers and very cold Winters and an average relative humidity of 62 percent. The temperature range is from a minimum o 7.4 D.C. to a maximum of 47.5 D.C.

At present, total 4,052 number of water bodies with 22,825 ha water spread area are mapped; of which 3,722 are seasonal (14,284 ha) and 330 are perennial (8,542 ha) water bodies.

There are 2.58 lakh landholders, with 69.63% being small and marginal farmers. The average landholding in the district is 0.61 hectares. Major crops cultivated during Kharif include paddy, oilseeds, and vegetables, while Rabi sees the cultivation of paddy, maize, and vegetables. The cropping intensity is 140%, and as of March 31, 2022, the CD ratio stands at 38.30%. The district is prominently recognized for paddy cultivation, covering more than 85% of the cultivable land.

There are many rice mills in the district as paddy is the main agriculture produce here. Gondia city is popularly known as RICE CITY due to large number of rice mills. Farmers are progressively embracing crop diversification to enhance their income, and the Agriculture Department and ATMA play a pivotal role in facilitating this shift in cultivation patterns.

Data Source: NABARD

7.2.5 NAGPUR:

Emerging as a metropolis, Nagpur is the fastest-growing millionaire city and a key center of commerce in the Vidarbha region. Renowned for its competitiveness, the city is ranked 11th in the country according to the Institute for Competitiveness. As of the 2011 census, Nagpur District, comprising 14 tahsils, had a population of 46,53,171. Nagpur city alone housed 24,05,421 residents, contributing to the urban agglomeration's total population of 25,23,911.

The district exhibited a sex ratio of 948 females per 1000 males, marking an improvement from the 2001 census figure of 932. The average literacy rate surged to 89.52%, up from 84.03% in 2001, with male literacy at 93.76% and female literacy at 85.07%. Notably, 52.5% of Nagpur's population falls within the 15–59 years age category, while 10.35% are under six years old. In terms of residence, 68.30% of the total district population resides in urban regions. Nagpur district predominantly relies on an agrarian economy, interwoven with the overall district economy. Encompassing a total geographical area of 9892 sq. km, with 644 thousand hectares designated as cultivable, the primary crops include Paddy, Jowar, Cotton, Tur, and Soyabean. Significant crops such as jowar, rice, wheat, cotton, tur, and oranges contribute to the district's economic strength. Notably, the region is renowned for its high-quality orange variety.

Geography & Climate: Surrounded by Madhya Pradesh districts, Nagpur boasts natural and constructed ponds, with Ambazari Lake being the largest. It is recognized as the second-greenest and cleanest city in India. The district features an abundance of vegetables, grasses, soybeans, and mineral wealth.

Weather: Nagpur experiences predominantly dry weather, with the monsoon season from June to September, peaking in May. Winter spans November to January, with temperatures sometimes dropping below 10 degrees Celsius. Annual rainfall averages 1,064.1 mm, varying across different tehsils, with Umred, Kuhi, and Bhivapur receiving the highest rainfall.

The Land Utilization data (*Source: District Administration*) provides insights into how the geographical area of the Nagpur district is distributed across various classifications. The key points are:

1. Total Geographical Area (986,000 hectares):
    - The total geographical area represents the overall landmass of the region, indicating its size. It serves as the baseline for understanding the distribution of land across different classifications.
2. Forest Land (159,000 hectares):
    - Forest land constitutes a significant portion of the total geographical area. This highlights the presence of a substantial forest cover in the region, which can have ecological, environmental, and biodiversity implications.
3. Barren Land (128,000 hectares):
    - Barren land refers to areas with limited or no vegetation, often characterized by arid conditions. The presence of a considerable amount of barren land may indicate challenges related to soil fertility or unsuitability for agriculture.
4. Land to Non-Agriculture Use (121,000 hectares):
    - This category represents land designated for non-agricultural purposes, such as urban development, industrial use, or infrastructure. The allocation of a significant portion of land to non-agricultural purposes suggests the region's diversification and urbanization.
5. Cultivable Area (644,000 hectares):

- Cultivable area signifies the land suitable for agricultural activities. This is a crucial aspect of the data, indicating the extent of land available for farming and potential agricultural productivity.

The region has a diverse landscape, including forested areas, barren land, and land allocated for non-agricultural use. The sizable cultivable area (644,000 hectares) suggests that agriculture plays a crucial role in the region's economy.

Strategically located at the heart of the country, Nagpur serves as a vital logistics hub for both domestic and international cargo movement. The "Zero Mile" point in Nagpur is not just a geographical marker but a pivotal logistics infrastructure point, connecting the nation's railway and road networks. The Container Corporation of India's (CONCOR) Inland Container Depot (ICD) at Nagpur plays a crucial role in linking east-west and north-south trunk rail routes.

With its crown as the "Orange City," Nagpur boasts the potential for establishing orange-based processing units. Additionally, the soyabean industry is on the rise, producing soy milk, soya vadi, soybean oil, soy biscuits, and other products, presenting opportunities for development in Nagpur district. Nagpur district is witnessing a surge in floriculture, with 22,742 hectares dedicated to cultivating various flowers. Fish farming covers 15,037 hectares, contributing to a production of 11,200 metric tons. Sericulture is practiced across 141.00 acres in key areas of the district. Rich in natural resources, Nagpur is recognized for its greenery, cleanliness, and manganese reserves.

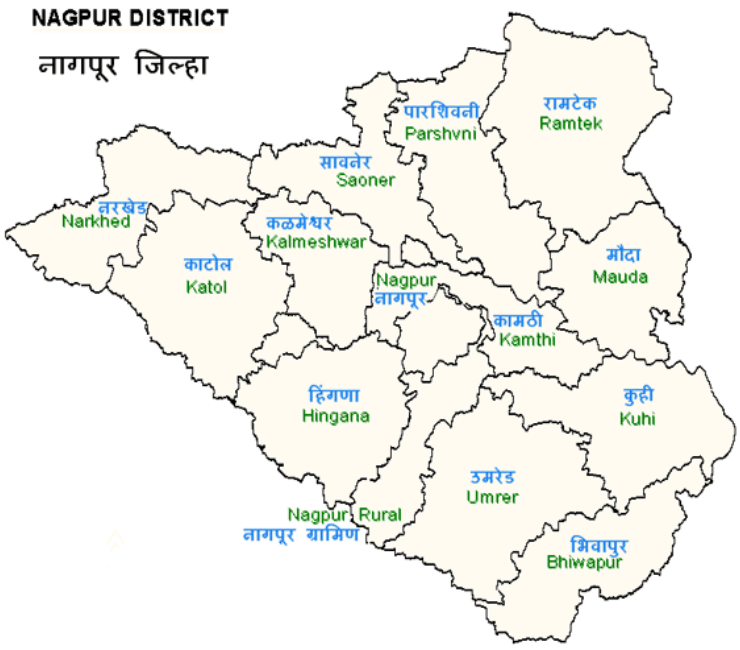


Figure 5 Map of Nagpur district

7.2.6 NASHIK:

Nashik is the fourth largest city in Maharashtra, with a population of 1,486,053 as per the 2011 Census of India. The city has an average literacy rate of 89.85%, with male literacy at 93.40% and female literacy at 85.92%. The sex ratio in Nashik city stands at 894 females per 1000 males, and the child sex ratio is 865 girls per 1000 boys. The projected population of Nashik urban agglomeration, including adjacent urban areas like Deolali, as of November 11, 2012, is estimated to be 15,62,769. After Pune and Mumbai, Nashik is third largest industrial hub of the Maharashtra state.

Nashik district has fertile land favourable for Agri and Horticulture. The total cultivable area in Nashik district is 864,000 hectares, of which the average Kharip crop area is 663,200 hectares, while the average Rabbi crop area is 136,500 hectares. The sown area is 658,763 hectares (99%) and the forest land is 340,000 hectares (21.75%). The uncultivable area is 23,000 hectares (1.48%).

Figure 6 Map of Nashik district

Nashik Region has unique climatic conditions, landforms, and soil types for development of agriculture / food processing sector along with opportunities for allied industrial sector.

Onion is one of the majorly produced crops in Nashik district. The cash crops like sugarcane and grapes, guava, pomegranate fruits and vegetables are also cultivated in various parts of the district. Rice is major crop in Trambak, Surgana and Peth tehsil whereas Nashik and Niphad both tehsils are famous for grapes.

In early 1925, the table grape revolution was started in Ojhar, a small town near Nashik, by Raosaheb Jairam Krishna Gaikwad. Today, table grapes are exported to Europe, the Middle East, and Asia. There are 22 wineries in Nashik, out of 46 wineries throughout India total. Nashik is home to several wine festivals, such as Sula Fest in the harvest season.

Maharashtra has become a leading state in the production of Grapes in the whole country because of Nashik. The variety grown includes Thompson Seedless, Sonaka, Sharad Seedless and Tas-e-Ganesh, and harvesting lasts from early February to early April. The catchment areas of grape production in Nashik district are Kalvan, Peint Igatpuri, Sinnar, Niphad, Yeola, Nandgaon, Satana, Furgana, Dindori, Melgaon, Chandvad and Nashik talukas. Niphad and Dindori are the two major grape growing talukas of the Nashik district, as around 80 percent of total production of the district comes from these two talukas.

The total area and production of grapes in Maharashtra are more than 1 lakh hectares with a production of 25 lakh MT. Nashik Valley Wine received its GI Tag in 2008 and Nashik grape received its GI Tag in 2010.

Nashik grapes contribute to around 73% of state production and 82% of export. The Jumbo Black seedless raisins are the specialty of Nashik. Nashik has a Raisin cluster with 43 Raisin processing units and contributing to 43% of exports from the State.

(Source: NHB, MOA&FW GOI)

7.2.7 AMRAVATI:

Amravati district is a district of Maharashtra state in central India. It is the administrative headquarter of Amravati division, which is one of the two divisions in Vidarbha (other being Nagpur), out of total 6 regions in state of Maharashtra.

The district is situated between 20°32' and 21°46' north latitudes and 76°37' and 78°27' east longitudes. The district occupies an area of 12,235 km^2. The district has boundaries with Betul District of Madhya Pradesh state to the north, and with the Maharashtra districts of Nagpur to the northeast, Chhindwara district of Madhya Pradesh to the northeast Wardha to the east, Yavatmal to the south, Washim to the southwest, and Akola and Buldhana districts to the west.

Historical Perspective:

The ancient name of Amravati is “Udumbravati”, prakrut form of this is “Umbravati” and “Amravati” is known for many centuries with this name. The mispronunciation form of this is Amravati and now the Amravati is known with the same. It is said that Amravati is named for its ancient Ambadevi temple.

The Amravati city came in to existence at the end of 18th century. Union state of Nizam and Bosale ruled the Amravati. They appointed the revenue officer, but defence system was worsted. Gavilgad fort was conquered by Britishers on 15th Dec’ 1803. According to the Deogaon treaty, the Warhad was presented as the token of the friendship to Nizam.

In 1722, Chhatrapati Shahoo Maharaj presented Amravati and Badnera to Shri Ranoji Bhosle, by the time Amravati was known as Bhosle ki Amravati. The city was reconstructed and prospered by Ranoji Bhosle after the treaty of Devgaon and Anjangaon Surji and victory over Gavilgad (Fort of Chikhaldara).

The British general author Wellesly camped in Amravati, particular place is still recognized as camp, by Amravati people. The Warhad had Nizam’s monopoly, thereafter. Near about 1805, Pendharies attacked Amravati city.

7.2.8 Geography:

Amravati city is situated 340 m above from the sea level. Pohara & Chirodi hills are in the east of the city. Maltekdi is one of the hills, which is inside the city. The hight of Maltekdi is around 60 m & the statue of great maratha king, Chhatrapati Shivaji Maharaj is placed on the top of the hill. There are two lakes in the eastern part of the city, namely, Chhatri Talao & Wadali Talao. The city is located in the East Maharashtra on the altitude of 20o 56′ north & 77o 47’ east. It is the main centre of west Vidarbha. It is on the Mumbai-Calcutta high way.

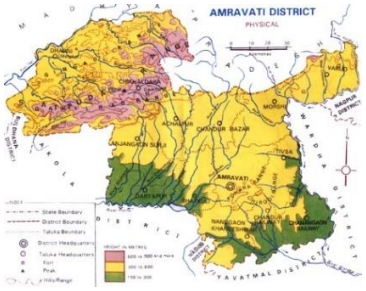


Figure 7 Map of Amravati district

Table 3 About Amravati district

Total Area: 12,235 km^2 (4,724 Sq. mi)
Population: 2011 Census
Total: 28,88,445
Density: 213/km^2 (550/sq. mi)
Official Languages: Marathi

Source: Amravati District Administration

The Climate:

The climate is tropical. In summer temperatures can go up to higher than 47 °C (117 °F). The northern part of the district is colder as compare to rest of the district due to the hilly regions of Chikhaldhara.

Rivers:

The Wardha River forms the eastern boundary of the district, and the eastern portion of the district lies within its watershed. The Purna River drains the southwestern portion of the district, while the northwest is drained by the Tapti River. Other important rivers are Shahanoor and Chandrabhaga. Musali and Cherry are successfully introduced and cultivated now in Chikhaldhara Hills. The Purna rises near Bhainsdehi in the Betul district of Madhya Pradesh in the Satpudas. After flowing for about 50 km in a general southerly and south-easterly direction enters the district.

It travels across the district in a south-westerly direction dividing it into two halves, first through the Achalpur taluka and then along the boundary between the Amravati and Daryapur talukas. Finally, it turns due westwards forming the boundary of the district and continues further to join the Tapti near Muktainagar in Jalgaon district.

Some of the other rivers in Amravati District, with their tributaries are - Burshi River, Surkhi River, Khandu River, Khapra River, Gadaga River, Vidarbha River, Bor River, Pak Nala, Bicchan etc.

Demographics:

According to the 2011 census Amravati district has a population of 28,88,445. This gives it a ranking of 131st in India out of a total of 640). The district has a population density of 237 inhabitants per square kilometre (610/sq mi). Its population growth rate over the decade 2001-2011 was 10.77%. Amravati has a sex ratio of 947 females for every 1000 males; and a literacy rate of 88.23%. 35.91% of the population lives in urban areas. Scheduled Castes and Scheduled Tribes make up 17.53% and 13.99% of the population respectively.

Languages:

Marathi is the major language followed by Hindi, Urdu, Korku, Gondi and Sindhi. At the time of the 2011 Census of India, 66.83% of the population in the district spoke Marathi, 11.86% Urdu, 8.20% Korku, 7.35% Hindi, 1.85% Gondi and 1.09% Sindhi as their first language. Marathi is the official and the most spoken language in the district. The dialect spoken here is called Varhadi dialect. Deccani Urdu is also prominent among the Muslim community. Korku and Gondi languages are also spoken by a significant number of people.

Government and Administration:

The district consists of six sub-divisions, which are further divided into 14 talukas. Amravati sub-division is divided into three talukas: Amravati, Bhatukali and Nandgaon Khandeshwar. Daryapur sub-division is further divided into two talukas: Anjangaon and Daryapur. Achalpur sub-division also consists of two talukas: Achalpur and Chandur Bazar. Morshi sub-division has also two talukas: Warud and Morshi. Dharni sub-division is also divided into two talukas: Dharni and Chikhaldara. Finally, Chandur (Railway) sub-division is divided into three talukas: Chandur (Railway), Tiosa and Dhamangaon.

There are eight Vidhan Sabha constituencies in this district. Six of these, Badnera, Amravati, Teosa, Anjangaon-Daryapur (SC), Melghat (ST) and Achalpur, are part of Amravati Lok Sabha constituency. The other two constituencies, Dhamangaon Railway and Warud-Morshi, are part of Wardha Lok Sabha constituency.

Economy:

Amravati district in Maharashtra is primarily an agrarian economy, heavily reliant on agriculture, with cotton being the major crop, making it one of the largest cotton wholesale markets in India; other key crops include food grains, sorghum, red gram, wheat, sugarcane, and citrus fruits; industries in the district are largely based on cotton processing, producing items like edible oil, textiles, footwear, wooden furniture, and processed food, while the per capita income in

Amravati is lower than the state average, indicating a relatively less developed economic profile compared to other parts of Maharashtra.

Key Points about Amravati district's Economy:

- Dominant Sector: Agriculture is the backbone of the economy, with a large portion of the population engaged in farming activities.
- Major Crops: Cotton is the primary crop, followed by other food grains like jowar, soybean, wheat, and pulses.
- Industrial Focus: Cotton-based industries are prominent, including cotton processing, textile manufacturing, and production of cotton-related products.
- Other Industries: Smaller scale industries include edible oil production, footwear manufacturing, wooden furniture making, and processed food production.
- Market Significance: Amravati holds a significant position as a major wholesale cotton market in India.
- Challenges: Despite its agricultural potential, Amravati faces challenges like dependence on monsoon rains, fluctuating market prices for cotton, and limited industrial diversification.
- Land Use: A large portion of the district land is dedicated to agriculture, with significant areas under cotton cultivation.
- Rural Economy: The majority of the population resides in rural areas, making agriculture the primary source of income.
- Infrastructure: While some infrastructure development is present, further improvements are needed to support agricultural productivity and industrial growth.
- Per Capita Income: Compared to the state average, the per capita income in Amravati is relatively lower, reflecting the dependence on agriculture and limitations in industries.

Amravati district in Maharashtra, India, is characterized by a predominantly rural population with a significant tribal presence, particularly the Korku community, making up a large portion of the Scheduled Tribes; the district also has a notable Scheduled Caste population, with a relatively high literacy rate compared to other parts of the state, and a strong agricultural economy focused on cotton production, alongside a developing industrial sector centered around cotton-based

products; major tourist attractions include the Chikaldara hill station, Melghat Wildlife Sanctuary, and the historic Gawilgarh fort.

Key Points about the Social Profile of Amravati district:

- Population Composition: A large tribal population, primarily Korkus, concentrated in the Dhami and Chikaldara areas, constituting around 45% of the district population.
- Literacy Rate: Relatively high literacy rate compared to other parts of Maharashtra, with the 2011 census recording a figure of 88.23%.
- Gender Ratio: The sex ratio of 947 females per 1000 males.
- Economic Activity: Primarily agrarian, with cotton as the major crop, also including other crops like jowar, wheat, and grams.
- Industrial Development: Growing industrial sector focused on cotton-based products like textiles, edible oils, footwear, and furniture.
- Urbanization: Around 35.91% of the population resides in urban areas.
- Caste Dynamics: A significant proportion of the population belongs to Scheduled Castes and Scheduled Tribes.

Distinctive Features:

- Cultural heritage: Rich cultural heritage with ancient temples, mosques, and forts, including the notable Gawilgarh fort.
- Tourism potential: Chikaldara hill station and Melghat Wildlife Sanctuary are major tourist attractions.

Agriculture:

Amravati is the main growing region for the cotton and pigeonpea 'Tur' in Chandur Railway, Dhamangaon, Teosa, Nandgaon Khandeshwar, Achalpur particularly. Ellachipur Sanman Chili pepper. Anjangaon Surji and Achalpur are known for growing betel leaves, piper longum, orange and banana. Warud-Orange City, Morshi, Chandur Bazaar and Achalpur are known for growing oranges. Soybean has become a popular Kharif crop.

- Major crops - The main crops in Amravati are sorghum, cotton, and soybean. Sorghum is the main crop, covering nearly 50% of the cultivable area. Cotton is a major cash crop, as

the district has large areas of black soil that are suitable for cotton cultivation. Soybean is also becoming a major crop.

- Other crops - Other crops grown in Amravati include red gram, wheat, green chickpea, sugarcane, green chilies, oranges, sweet lime, and betel leaves.
- Fruits and vegetables - Amravati is a major producer of mangoes, along with Nagpur. The Achalpur and Amravati talukas are the largest producers of mangoes. The district also produces a variety of vegetables, including chilies, brinjals, lady's fingers, and tomatoes.
- Bananas - The main centers of banana cultivation in Amravati are Jarud and Warud in Morshi tahsil.
- Winter vegetables - These include cauliflower, knol-kol, cabbage, tomato, fenugreek, carrot, green peas, and green coriander.
- Summer vegetables - These include brinjal, carrot, pumpkin, lady's fingers, kakadi, tondali, and ratali.

7.2.9 LATUR:

Latur district, located in the Marathwada region of Maharashtra, India, is situated on the Balaghat plateau, primarily characterized by its agrarian economy, with the majority of the population depending on agriculture; the district headquarters is the city of Latur. Latur is located in the Western Plateau Region of Maharashtra, on the Balaghat plateau. The district has a geographical area of 7,157 square kilometers and an average annual rainfall of 802 millimetres.

Latur district is predominantly rural with a largely agrarian economy, characterized by a significant Scheduled Caste population, moderate literacy rates, and a sex ratio slightly skewed towards females, with the majority of the population residing in villages and depending heavily on agriculture, particularly crops like soybean, tur, and sugarcane for their livelihood; the district faces challenges related to its backward industrial development, though some medium and small-scale industries like sugar factories do exist.

Table 4 Latur district at a glance:

Information	Description
Geographical location:	Between 17°52′ North to 18°50′ North and 76°18′ East to 79°12′ East in the Deccan plateau
Population (2011 census)	2,454,196

Below poverty line:	0.854 Lac
Literacy rate (2011):	77.26 %
Connectivity:	Latur is connected by air with Mumbai, trains available for Mumbai and Hyderabad and State highways and roads from the district headquarters at Latur link all 10 tehsils (subdistricts) and major towns.
Area:	Geographical Area 7157 sq. km. Cultivable area 6523 sq. km.
Major crops:	Cereals, Oilseeds, Pulses, Grapes
Major urban centres:	Ahmadpur, Ausa, Latur, Nilanga, Udgir
Major rivers:	Manjra, Terna, Rena, Manar, Tawarja, Tiru, Gharni
Total no. of Sub Divisions:	5
Total no. of Tahsils:	10
Total no. of Villages:	948 (Census 2011)
Total no. of Gram Pachayat:	786
Total no. of Panchayat Samiti:	10

Source: District Administration

Figure 8 Map of Latur district

Key points about Latur district:

- Geography: Situated between 17°52′ North to 18°50′ North and 76°18′ East to 79°12′ East, Latur district lies on the Deccan Plateau with an average elevation of 631 meters above sea level.
- Boundaries: Nanded district to the northeast, Karnataka state border to the east and southeast, Osmanabad district to the southwest, Beed district to the west, and Parbhani district to the northwest.
- Major River: The Manjara river is the main river flowing through the district, along with its tributaries like Terna, Tawarja, and Gharni.
- Economy: Primarily agrarian, with major crops including soybean, tur, urad, moong, maize, jowar (Kharif crops), and gram (Rabi crop). Sugarcane, groundnut, and safflower are also grown.
- Urban Population: Approximately 25.47% of the total population resides in urban areas.
- Important Towns: Latur (district headquarters), Udgir, Nilanga, Ausa, Ahmadpur
- Historical Significance: Latur district was carved out of Osmanabad district on August 15, 1982

Socio-economic Profile of the District:

The Latur district has a diverse economy that includes agriculture, manufacturing, trading, and services:

- Dominant Occupation: Agriculture is the primary source of income for most residents, with major crops including soybean, tur, urad, moong, maize, jowar (in Kharif season), and gram (Rabi season).
- Population Composition: According to the 2011 census, Latur district has a population of approximately 2.4 million people, with a sex ratio of 924 females per 1000 males.
- Literacy Rate: The literacy rate in Latur district stands at around 79%, with a higher literacy rate among males compared to females.
- Caste Composition: Scheduled Castes constitute a significant portion of the population, making up nearly 20% of the total.

- Urbanization: Only around 25% of the population resides in urban areas, with Latur city serving as the district headquarters.
- Key Challenges: Despite its agricultural potential, Latur faces challenges like limited irrigation facilities, dependence on monsoon rains, and a lack of substantial industrial development beyond a few sugar factories.
- Infrastructure: The district has a network of roads connecting major towns and villages, with access to railway lines linking it to other parts of Maharashtra.
- Manufacturing: The district has several medium and small-scale industries, including sugar factories, solvent extraction, and dal mills. Latur is one of India's highest sugar-producing districts, with more than 11 sugar factories.
- Trading: Latur is a major trading center for oil seeds, commodities, fruit, kardi (safflower), nutcrackers, locks, brassware, milk powder, ginning, and pressing. It's also known for the quality and quantity of pulses it produces, especially pigeon pea.
- Per capita income: In 2020-2021, the per capita income in Latur was ₹1,38,455.

- Agriculture:
  - The district's economy is primarily agrarian, with more than half of its population working in agriculture. The main crops are soybean, sunflower, pulses, tur, urad, moong, maize, jowar, sugarcane, groundnut, and safflower.
  - Major Crops: Kharif crops: Soyabean, tur, urad, moong, maize, and jowar
  - Rabi Crops: Gram
  - Other Crops: Sugarcane, groundnut, safflower, mango, grape, and banana
  - Known for: Latur is known for the quality and quantity of pulses it produces, especially pigeon pea. It is also a major trading center for urad, moong, channa, and toor.
  - Soil: The soils in Latur are slightly to strongly alkaline, calcareous, and have low to moderate organic carbon content.
  - Rivers: The major rivers in Latur are the Manjra, Terna, Rena, Manar, Tawarja, Tiru, and Gharni.

- Farmers: Around 75% of Latur's farmers own small or marginal landholdings. The average farmer in Latur owns 1.65 hectares of land, which is higher than the state average of 1.44 hectares.

7.3 The Summary of the District Profiles of the Area Under Study:

The NDKSP (PoCRA II) project area in Maharashtra encompasses a diverse and dynamic geodemographic landscape, critical to shaping interventions for sustainable agricultural development. Spanning districts such as Bhandara, Gondia, Chandrapur, Gadchiroli, Nagpur, Nashik, Latur, and Amravati, the project covers a variety of agro-climatic zones and topographies, from the Western Ghats to the Deccan Plateau. These geographical features significantly influence the agricultural practices and needs of the region.

The population distribution within the catchment area varies widely. Urbanized regions like Nashik and Nagpur are densely populated, while tribal and remote areas such as Gadchiroli and Chandrapur have lower population densities. Agriculture forms the backbone of livelihoods for a substantial portion of the population, with many small and marginal farmers grappling with economic challenges. Rural income levels are generally lower compared to urban areas, and disparities in access to education and skill development further hinder the adoption of innovative farming practices.

Agriculture in the region is characterized by diverse crop patterns, including staples like rice, wheat, cotton, soybean, and pulses, tailored to specific agro-climatic conditions. While traditional farming methods dominate, there is a growing shift toward modern, climate-resilient practices driven by initiatives under PoCRA II. This transition is essential to address the environmental conditions of the region, which range from high rainfall in coastal zones to semi-arid climates in the interior. Similarly, the soil types vary from fertile black soils to less productive sandy soils, influencing crop choices and agricultural outcomes.

Infrastructure development remains uneven, with irrigation facilities being well-established in some areas but largely absent in others, leaving many farmers dependent on rainfed agriculture. Agricultural extension services are available but inconsistently distributed, creating gaps in the adoption of advanced practices.

Community and institutional support play a vital role in the region. Farmer Producer Organizations (FPOs), Self-Help Groups (SHGs), and local NGOs are pivotal in fostering agricultural development and promoting climate resilience. Additionally, the project benefits from

robust support through state and central government schemes aimed at enhancing agricultural productivity and sustainability.

This rich and complex geodemographic profile underscores the need for tailored, region-specific interventions. By addressing these diverse challenges and leveraging local strengths, PoCRA II aims to enhance climate resilience and secure sustainable agricultural development for the farming communities of Maharashtra.

8 Chapter 8. The Survey Methodology:

The survey methodology combines both primary and secondary survey methods. Primary data is gathered from a range of stakeholders, including individual farmers, Farmer Producer Organizations (FPOs), Self-Help Groups (SHGs), Non-Governmental Organizations (NGOs), educational institutions, financial institutions, political representatives from the village to the district level, and government officers from the village to the district level. Additionally, secondary data is sourced from various platforms, such as government databases, websites, academic publications, articles etc.

8.1 Objectives of the Survey Exercise:

The agricultural sector faces increasing challenges in addressing climate variability, sustainable practices, and the integration of modern technologies. A critical component of addressing these challenges is enhancing the capacities of stakeholders involved at various levels. This survey exercise is designed to systematically assess the training needs of stakeholders, including farmers, government officials, members of Farmer Producer Companies (FPCs), Self-Help Groups (SHGs), educational and financial institutions, and local self-governance institutions.

The insights gained will help develop design capacity-building programs that empower stakeholders to effectively contribute to sustainable agricultural development and climate-resilient practices.

The Principal Objectives of the Survey Exercise are outlined herewith –

1. Identify Skill Gaps - *To identify the existing skill gaps among stakeholders in areas such as climate-resilient agriculture, sustainable practices, extension management, promotion of agricultural technologies to help address challenges being posed by climate variations.*
2. Understand Stakeholder Roles - *To understand the specific roles and responsibilities of different stakeholder groups in achieving sustainable agricultural outcomes and their related training requirements.*
3. Determine Institutional Needs - *To assess the capacity enhancement needs of institutions like Department of Agriculture, FPCs, SHGs, educational entities, and financial organizations for better support of agricultural developmental initiatives.*
4. Promote Collaboration - *To identify opportunities for collaborative efforts among various stakeholders, fostering a synergistic approach to agricultural development.*

5. Design Training Programs - *To gather data that informs the design of targeted training modules addressing the diverse needs of different groups, ensuring practical and impactful learning outcomes.*
6. Facilitate Policy Recommendations - *To generate actionable insights that aid in the formulation of policies and frameworks for strengthening agricultural extension and stakeholder capacity-building initiatives.*

With these objectives, the survey aimed to lay the groundwork for comprehensive training programs that empower stakeholders, enhance their operational efficiency.

8.2 Policy Review:

Background information in the form of policy documents, research papers on Climate Resilient Agriculture (CRA) covering a range of related aspects, highlight principles and practices, strategies and outcomes for adapting agricultural systems to climate change. Having studied the same, some of the key themes that emerge from the background information are as follows – (*In Alphabetical Order*)

1. Agroforestry and Diversified Farming Systems.
2. Climate Smart Agriculture (CSA).
3. Drought-Resistant Crop Varieties.
4. Economic and Social Impacts.
5. Policy and Institutional Support.
6. Soil Health and Conservation.
7. Water Management Techniques.

Overall, the information underscores the importance of integrated approaches that combine technological innovation, traditional knowledge, and supportive policies to build resilient agricultural systems capable of adapting to the challenges posed by climate change.

8.3 Stakeholder Mapping:

The success of any agricultural development initiative relies heavily on understanding and engaging the key stakeholders who contribute to and benefit from the project. Stakeholder

mapping is a vital process that allows us to identify, categorize, and involve these stakeholders effectively to ensure the alignment of their interests with the project's developmental objectives.

For this project, a comprehensive stakeholder analysis was conducted, focusing on groups such as DOA project functionaries, representatives of local self-government bodies, non-executive members, progressive farmers, FPC representatives, women farmers, and SHG members. This approach ensures inclusivity and representation of diverse perspectives.

Table 5 The Classification of the Stakeholders for the Survey purpose

Stakeholder Group	Members	Targeted Number of Respondents
I	Individual Farmers (*Progressive Farmers, Women Farmers, Farmers from Socio-economically Marginalized Sections etc.*)	610
II	Members of Local Governance Bodies (*GP/PS Members*)	77
III	FPO Members, Self-Help Groups Members, Nongovernmental Organizations Members, Educational Institutions Members, Financial Institutions Members	110
IV	DOA Officers and Staff Members (*AA, AS, AO, CAO, TAO, DPD/PD ATMA, SDAO*)	60
Total		857

8.4 Sampling:

To effectively engage these groups, the study employed stratified random sampling and convenience sampling techniques. Data collection was facilitated through a range of tools, including focused group discussions, personal interviews, structured questionnaires. This multi-pronged approach ensured that insights were gathered from a wide spectrum of stakeholders, providing a solid foundation for the study's findings and recommendations.

The sample size for field data collection was determined through discussions with key stakeholders.

The number of respondents from each stakeholder group is presented in the table below.

SN	District	GROUP-1 Individual Farmers	GROUP-2 Members of Local Governance Bodies (GP/PS)	GROUP-3					GROUP-4 DOA Officers and Staff Members	TOTAL
				FPO Members	Self-Help Groups Members	Nongovernmental Organizations Members	Educational Institutions Members	Financial Institutions Members		
1	Bhandara	55	10	4	4	0	2	3	7	85
2	Chandrapur	92	6	4	8	2	1	3	3	119
3	Gadchiroli	68	12	2	1	1	1	1	9	95
4	Gondia	75	8	2	2	1	1	2	5	96
5	Nagpur	95	6	2	8	3	3	1	10	128
6	Nashik	83	7	4	0	1	2	1	9	107
7	Latur	72	10	7	8	0	2	1	8	108
8	Amravati	70	18	6	10	2	2	2	9	119
TOTAL		610	77	31	41	10	14	14	60	857
				110						

8.5 Exploration of the Areas for Primary Survey:

The primary survey conducted as part of this exercise represents an important step in achieving the study's objectives. This comprehensive investigation involved on-site assessments and systematic data collection, supported by in-depth consultations with key stakeholders in Maharashtra's climate-resilient agriculture sector.

Based on insights gathered during the planning phase, eight districts were selected for detailed analysis: Bhandara, Gondia, Chandrapur, Gadchiroli, Nagpur, Nashik, Latur, and Amravati. This selection reflects a deliberate effort to capture diverse regional characteristics and agricultural dynamics, laying a robust foundation for meaningful outcomes from the study.

The detailed information of the selected districts; Area Under Study is provided in Chapter 7 of this report.

8.6 Secondary Data Collection:

The secondary survey serves as a crucial foundation for conducting a thorough primary survey and study. It offers essential knowledge needed to develop research design and plan subsequent activities. In this study, the desk survey provided valuable insights into climate-resilient

agriculture in Maharashtra, along with detailed information about the stakeholders involved and the benefits they have received.

To gain a broader perspective, secondary information from reliable sources was also collected. This included data on the profile of catchment areas and the current levels of climate-resilient agriculture in the state. Key sources of information comprised state government websites, international organizations such as the World Bank and FAO, and other authoritative platforms.

8.7 Needs Assessment Survey:

A comprehensive survey was undertaken to assess the current knowledge levels and skill gaps and identify key areas where improvements are needed. The survey design included a balance of open-ended and closed-ended questions, ensuring that diverse perspectives and experiences were captured.

Open-ended questions provided respondents with the opportunity to elaborate on their views and share unique insights, while closed-ended questions facilitated structured responses for easier analysis. This approach ensured a holistic understanding of stakeholders' needs, enabling the identification of specific gaps and priorities for targeted interventions.

8.8 Focus Group Discussions:

Focus group discussions (FGDs) were conducted to foster collaboration among stakeholders and identify common issues and challenges they face. These discussions provided a platform for open dialogue, enabling participants to share their experiences, insights, and concerns while collectively addressing key areas of focus.

This multi-faceted approach ensured a well-rounded understanding of the challenges and opportunities in sustainable and climate-resilient agriculture which in turn helped in devising suitable training programmes to enhance the capacities of the respective stakeholders.

8.9 Interviews with Key Stakeholders:

One-on-one interviews were conducted with key stakeholders to gain deeper insights into their specific training needs and priorities. These interviews provided a platform for stakeholders to share their individual experiences, challenges, and expectations in greater detail.

By fostering open and focused interactions, the process enabled the identification of perspectives and context-specific requirements, which are critical for designing a targeted and effective

training program. This approach ensured that the feedback collected was both comprehensive and actionable.

8.10 Multi-Stakeholder Consultations:

The study incorporated extensive consultations with a diverse array of stakeholders to ensure a comprehensive understanding of the issues and opportunities in the sector. Participants included individual farmers, Farmer Producer Organizations (FPOs), Self-Help Groups (SHGs), Non-Governmental Organizations (NGOs), educational and financial institutions, peoples' representatives from village panchayats to Zila Parishads, and government officers spanning from the village to the district level. These engagements ensured a holistic understanding of the challenges and opportunities in promoting climate-resilient agriculture across the state.

8.11 Data Documentation:

Following the collection and analysis of the data, the specific training needs identified were carefully documented. These needs were aligned with the overarching organizational goals as well as the specific objectives of the project to ensure relevance and impact.

9 Chapter 9. Maharashtra: A Canvas; Encompassing Diversity

9.1 Introduction:

Maharashtra, located in the western peninsular region of India, is the second-most populous and third-largest state by area. It spans approximately 307,713 square kilometres, bordered by the Arabian Sea to the west, Gujarat and Madhya Pradesh to the north, Chhattisgarh to the east, Telangana to the southeast, Karnataka to the south, and Goa to the southwest.

Maharashtra features a diverse topography, including the Sahyadri Range (Western Ghats) running parallel to the western coast, creating a rugged terrain with lush forests and rich biodiversity. The Deccan Plateau dominates the interior, characterized by semi-arid conditions and fertile black soil, ideal for cotton cultivation.

The state's climate varies from tropical in the coastal Konkan region, with high humidity and heavy monsoon rains, to dry and arid in the interior plateau. Major rivers like the Godavari and Krishna traverse the state, providing essential water resources for agriculture and human settlements.

Mumbai, the capital city, is a significant financial and cultural hub, while Pune is known for its educational institutions and IT industry. Maharashtra's diverse geography supports a wide range of agricultural activities, industrial development, and vibrant cultural heritage, making it a key state in India's socio-economic landscape.

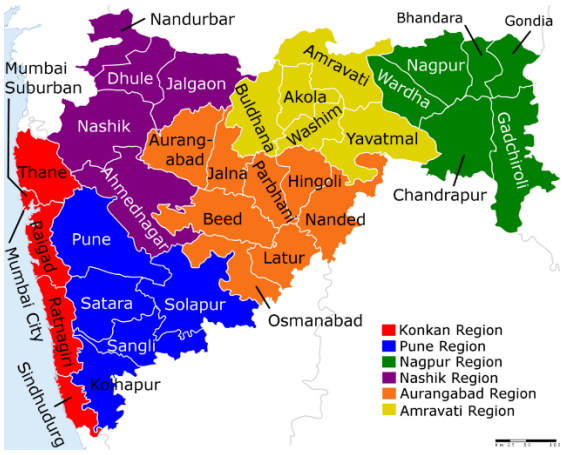


Figure 9 Map of Maharashtra

9.2 An Overview of Agriculture in Maharashtra:

Maharashtra, a prominent state in western India, boasts a diverse and vibrant agricultural sector. The state's varied topography, from the coastal Konkan region to the interior Deccan Plateau, supports a wide range of agricultural activities. Agriculture in Maharashtra is a critical component of its economy, employing a significant portion of the population and contributing substantially to the state's GDP.

The state is known for its production of cash crops like cotton, sugarcane, and soybeans, which thrive in the fertile black soils of the Deccan Plateau. Additionally, horticulture plays a vital role, with Maharashtra leading in the cultivation of fruits such as mangoes, grapes, bananas, and oranges. The Konkan region, with its favorable climate, is especially renowned for its Alphonso mangoes and cashew nuts.

Despite its agricultural richness, Maharashtra faces challenges like water scarcity, fluctuating weather patterns, and soil degradation. To address these issues, the state has embraced various sustainable and climate-resilient agricultural practices. Initiatives such as efficient water management, crop diversification, and the adoption of advanced farming technologies are being promoted to enhance productivity and ensure long-term sustainability. Overall, agriculture in Maharashtra is a dynamic and evolving sector, crucial for the state's economic stability and food security.

9.3 Status of Land Utilization:

The utilization status of land as reported for the year 2019-20 of the Maharashtra is presented in the following table 1 – (Area Thousand Ha)

Table 6 Utilization status of land of the Maharashtra (2021-22)

Geographical Area	Reporting area for land utilization statistics	Forests	Not available for cultivation			Other uncultivated land excluding Fallow Land			
			Area under non-Agri-cultural uses	Barren & unculturable land	Total	Permanent pastures & other grazing lands	Land under misc. tree crops & groves (not incl.	Culturable waste land	Total

30771	30758	5209	1744	1975	3719	1364	274	944	2582

Table 7 Fallow Lands

Fallow Lands			Net area Sown	Total Cropped Area	Area sown more than once	Agri. Land/ Cultivable land/ Culturable land/ Arable land	Cultivated land	Un-cultivable land
Fallow lands other than current fallows	Current fallows	Total						
1203	1456	2658	16590	25730	9140	20466	18046	10292

Net Irrigated Area	Gross Irrigated Area	Area Irrigated more than once	Net Un-Irrigated Area	Gross Un-Irrigated Area	Percentage of Gross Irrigated Area to Total Cropped Area	Cropping Intensity (%)
3103	5862	2759	13487	19868	24.3	145.6

Table 8 Net Area Irrigated from Canals

Net Area Irrigated from Canals			Tanks	Wells Tube-Wells	Other Wells	Other Sources	Net Irrigated Area
Government	Private	Total					
1033		1033		2070			3103

Table 9 Land Use Statistics of surveyed district (2022-23) ('00 Ha)

SN	District	Forest	Barren & uncut. Land	Land Under Non-Argil use	Culturable Waste Land	Permanent Pasture	Misc. Trees & groves	Current Fallow	Other Fallow	Net Area Sown	Area Sown more than once	Gross Cropped Area	Geographical Area	Cropping intensity (%)	Cultivable Area
1	Nasik	3106	2019	445	198	226	20	1056	294	8270	2034	10305	15634	125	9838
2	Latur	18	193	267	425	222	177	427	347	5080	2242	7321	7157	144	6456
3	Amravati	2936	191	457	93	331	60	349	183	7617	2328	9945	12217	131	8301

4	Nagpur	1539	304	999	349	555	81	239	210	5589	1346	6935	9864	124	6467
5	Bhandara	610	54	446	118	380	82	52	9	1669	775	2444	3420	146	1930
6	Gondia	2073	132	556	150	967	16	54	35	1876	861	2737	5859	146	2130
7	Chandrapur	3916	242	914	333	47	225	107	111	5023	741	5763	10918	115	5799
8	Gadchiroli	10757	153	724	235	499	32	429	65	2022	825	2847	14916	141	2782
9	Maharashtra	51988	19857	17681	9633	14119	2682	14765	11950	164907	79244	244151	307582	148	203937

Source: Department of Agriculture, Govt of Maharashtra

9.4 Status of Agricultural Production of Major Crops of Maharashtra State in 2022:

Table 10 Status of Agricultural Production of Major Crops of Maharashtra State in 2022

Crop	Area (in '000 ha)	Production (in '000 tonnes)	Yield (kg/ha)
Rice	1464	2590	1769
Wheat	900	1520	1689
Jowar (Sorghum)	2920	2450	839
Bajra (Pearl Millet)	1000	1350	1350
Maize	1060	3050	2877
Tur (Pigeon Pea)	1400	1120	800
Gram (Chickpea)	1820	2250	1236
Sugarcane	990	80500	81313
Cotton	4000	8200	2050
Soybean	4000	4350	1088
Groundnut	280	315	1125
Onion	500	6900	13800
Tomato	70	1200	17143

Source: Directorate of Economics and Statistics, DoA&FW, MoA&FW Government of India

9.5 Major Crops of Agro-Climatic Zones in Maharashtra:

Maharashtra, with its diverse agro-climatic zones, cultivates a variety of major crops suited to the specific conditions of each zone. Here's a brief overview:

1. Konkan Coastal Zone

    Major Crops: Rice, Coconut, Arecanut, Cashew, Mango

    Climate: High rainfall, humid climate

    Soil: Lateritic soil, well-drained

2. Western Maharashtra Plain Zone

    Major Crops: Sugarcane, Grapes, Pomegranate, Wheat, Bajra

    Climate: Semi-arid, moderate rainfall

    Soil: Black cotton soil, well-suited for water-intensive crops

3. Western Ghat Zone

    Major Crops: Coffee, Spices (cardamom, black pepper), Tea, Horticultural crops

    Climate: High rainfall, cooler temperatures

    Soil: Lateritic soil, fertile

4. Central Maharashtra Plateau Zone

    Major Crops: Cotton, Soybean, Jowar (Sorghum), Tur (Pigeon Pea), Chickpea

    Climate: Semi-arid, moderate to low rainfall

    Soil: Black cotton soil, well-suited for pulses and oilseeds

5. Vidarbha Zone

    Major Crops: Cotton, Soybean, Wheat, Tur (Pigeon Pea), Groundnut

    Climate: Hot and dry, variable rainfall

    Soil: Medium black soil, good for cotton and oilseeds

6. Marathwada Zone

    Major Crops: Jowar (Sorghum), Bajra, Cotton, Tur (Pigeon Pea), Sugarcane

    Climate: Semi-arid, prone to droughts

    Soil: Medium black to shallow soil, supports a variety of crops despite water scarcity

7. North Maharashtra Zone

Major Crops: Cotton, Banana, Wheat, Maize, Sugarcane

Climate: Semi-arid, with hot summers and moderate rainfall

Soil: Deep black soil, suitable for cotton and sugarcane

Key Insights:

- Rice: Predominantly grown in the high rainfall areas of the Konkan Coastal Zone.
- Sugarcane: Thrives in the Western Maharashtra Plain Zone due to the availability of irrigation.
- Cotton: Widely cultivated in the Central Maharashtra Plateau, Vidarbha, and North Maharashtra Zones due to the favorable black cotton soil.
- Pulses and Oilseeds: Significant in the Central Maharashtra Plateau and Marathwada Zones, adapting to the semi-arid conditions.
- Horticultural Crops: Prominent in the Western Ghat Zone and parts of the Western Maharashtra Plain Zone, benefiting from the varied climate and soil types.

9.6 Interventions for Strengthening Climate Resilient Agriculture in Maharashtra:

Interventions for strengthening climate-resilient agriculture in Maharashtra focus on enhancing the adaptability and sustainability of farming practices in response to climate change. Key interventions include:

1. Water Management
    a. Irrigation Efficiency: Implementing micro-irrigation systems like drip and sprinkler irrigation to optimize water use.
    b. Watershed Management: Developing and maintaining watershed areas to improve water retention and reduce soil erosion.
2. Soil Health Management
    a. Soil Conservation Practices: Adopting techniques such as contour plowing, terracing, and cover cropping to prevent soil erosion and improve soil fertility.
    b. Organic Farming: Promoting the use of organic fertilizers and compost to enhance soil health and reduce dependency on chemical inputs.
3. Climate-Resilient Crops

a. Crop Diversification: Encouraging the cultivation of drought-resistant and heat-tolerant crop varieties to reduce risk and increase productivity.
b. Hybrid and Improved Varieties: Introducing high-yield and climate-adaptive crop varieties to improve resilience and productivity.

4. Technology Adoption
    a. Weather Forecasting: Utilizing advanced weather forecasting tools to provide timely and accurate weather information to farmers.
    b. Agricultural Extension Services: Providing training and support to farmers on best practices for climate-resilient agriculture and new technologies.
5. Policy and Institutional Support
    a. Government Schemes: Implementing state and national policies such as the Pradhan Mantri Krishi Sinchai Yojana (PMKSY) and National Mission for Sustainable Agriculture (NMSA) to support climate-resilient practices.
    b. Financial Assistance: Offering subsidies, crop insurance, and credit facilities to mitigate financial risks associated with climate change.
6. Community-Based Initiatives
    a. Farmer Producer Organizations (FPOs): Strengthening FPOs to facilitate collective action, knowledge sharing, and resource pooling among farmers.
    b. Self-Help Groups (SHGs): Supporting SHGs to promote sustainable practices and provide a platform for women and marginalized groups.
7. Research and Development
    a. Climate Research: Investing in research to develop and promote climate-resilient agricultural practices and technologies.
    b. Extension Programs: Conducting outreach programs to disseminate research findings and practical solutions to farmers.
8. Capacity Building and Training
    a. Skill Development: Providing training programs for farmers, extension workers, and local institutions on climate-smart agriculture techniques and practices.
    b. Knowledge Sharing: Facilitating workshops, seminars, and field demonstrations to share knowledge and experiences among stakeholders.

10 Chapter 10. Flagship Programmes to Address Climate Change in Maharashtra

10.1 Strategic Interventions:

Climate-Resilient Agriculture (CRA) in Maharashtra represents a targeted strategy to mitigate the impacts of climate change on the agricultural sector. Given the state's diverse agro-climatic zones, which are increasingly vulnerable to erratic weather patterns, prolonged droughts, and uneven rainfall, CRA is essential for ensuring sustainable agricultural productivity and livelihood security for farmers.

A critical component of CRA is the adoption of drought-resistant and short-duration crop varieties that are better suited to withstand water stress and reduce the risk of crop failure. Efficient water management practices, such as drip and sprinkler irrigation systems, optimize water use while improving crop yields. Soil conservation measures, including contour bunding, mulching, and cover cropping, are promoted to maintain soil health and reduce erosion, thus contributing to long-term agricultural sustainability.

Community engagement forms the backbone of CRA in Maharashtra. Farmer Producer Organizations (FPOs) and Self-Help Groups (SHGs) play a pivotal role in facilitating knowledge dissemination and collective action. Additionally, digital tools and mobile applications are employed to provide farmers with real-time weather forecasts, crop advisory services, and market information, empowering them to make data-driven decisions.

Overall, the implementation of CRA in Maharashtra exemplifies a comprehensive approach to building a robust agricultural system capable of withstanding the challenges posed by climate change. By integrating traditional knowledge, modern technology, and sustainable practices, these initiatives aim to secure farmers' livelihoods and enhance food security for the state's population.

10.2 Flagship Programme to address Climate Change in Maharashtra:

One of the flagship programs supporting CRA in Maharashtra is the NANAJI DESHMUKH KRISHI SANJIVANEE PRAKALP (Project on Climate Resilient Agriculture, PoCRA). This initiative focuses on bolstering the resilience of small and marginal farmers through a range of interventions. These include the promotion of sustainable agricultural practices such as integrated nutrient management, integrated pest management, and organic farming. Furthermore,

agroforestry and mixed cropping systems are encouraged to diversify income sources while enhancing ecosystem services.

The Nanaji Deshmukh Krishi Sanjeevani Prakalp Phase II (PoCRA-II) provides substantial support for climate-resilient agriculture in Maharashtra through a range of targeted initiatives.

The project, backed by the Government of Maharashtra and various development partners, aims to enhance the resilience of the state's agricultural sector against climate change impacts.

The broad overview of the NDSKP (POCRA – II) is already provided in Chapter 5 of this report. The summary of the key aspects is presented here for ready reference.

If we carefully study the underlying concepts and proposed interventions of the project for Phase II, one most important component that emerges out is, “Promoting Sustainable and Climate-Resilient Agriculture”

Efforts to foster sustainable farming practices are centred around water conservation and soil health management. By promoting efficient irrigation techniques such as drip and sprinkler systems, the focus is on optimizing water use and minimizing wastage. Simultaneously, practices like organic farming, composting, and integrated nutrient management are encouraged to improve soil fertility and overall health.

To address climate variability, the introduction of drought-resistant and heat-tolerant crop varieties are recommended along with encouraging crop diversification. This strategy allows farmers to spread risk and enhance resilience against unpredictable climatic conditions.

Capacity building plays a vital role in equipping various stakeholders including farmers with the knowledge and skills needed for climate-smart agriculture. Training programs on soil and water conservation, pest management, and crop management etc. are proposed.

Leveraging technology and innovation further strengthens these initiatives. Advanced weather forecasting tools are proposed to be provided for timely and accurate information, helping farmers make informed decisions.

Access to modern agricultural technologies to enhance productivity while bolstering resilience against climatic challenges is to be ensured.

Institutional support is integral to implementing these practices effectively. Strengthening agricultural institutions and fostering collaborations with national and international organizations for ensuring alignment of strategies and resource optimization is considered.

Financial assistance is also prioritized, with subsidies, grants, and low-interest loans encouraging the adoption of climate-resilient technologies. Crop insurance and risk mitigation measures provide an additional safety net to protect farmers from climate-induced losses.

Monitoring and evaluation mechanisms are in place to ensure the success of these interventions. Regular impact assessments focus on agricultural productivity, farmer incomes, and environmental sustainability, while feedback mechanisms allow for continuous adaptation and improvement of strategies. A structured Grievance Redressal Mechanism is also proposed to address the stakeholders' issues if any; swiftly.

Through this multi-pronged approach, sustainable and climate-resilient agriculture is promoted, addressing immediate challenges while ensuring long-term environmental and economic benefits for farmers and communities.

By focusing on these areas, the project aims to build a resilient agricultural sector in Maharashtra, capable of withstanding climate challenges while ensuring sustainable and productive farming practices.

10.3 Expected Impacts:

The empowerment of farmers through the adoption of sustainable agricultural practices is a cornerstone for building resilience at the grassroots level. This project approach focuses on equipping farmers with the tools, knowledge, and resources necessary to adapt to changing environmental and economic conditions.

Digital tools and platforms are at the heart of this transformation, offering real-time weather forecasting, crop advisory services, and precision agriculture insights. These technologies enable farmers to make informed decisions regarding irrigation, planting schedules, pest management, and resource allocation. By leveraging such innovations, farmers can optimize productivity, reduce input costs, and minimize losses caused by climatic uncertainties.

The impact of these measures is expected to be far-reaching. Improved agricultural productivity will contribute to enhanced food security and stability in rural economies. At the same time, reduced vulnerability to climatic shocks will foster greater resilience among farming communities, ensuring their livelihoods remain sustainable even in the face of environmental challenges.

Additionally, the integration of sustainable practices will promote soil health, conserve water resources, and reduce the carbon footprint of agricultural activities, aligning with broader

environmental and policy goals. These efforts aim not only to support individual farmers but also to create a robust and adaptive agricultural system for Maharashtra as a whole.

Through this comprehensive and multi-dimensional strategy, Maharashtra is poised to strengthen its agricultural sector, ensuring long-term resilience, sustainability, and prosperity for its farmers and rural communities.

10.4Climate-Resilient Agriculture in India:

India's agricultural sector is at the forefront of the nation’s battle against climate change, facing challenges such as erratic weather patterns, prolonged droughts, frequent floods, and rising temperatures. Climate-Resilient Agriculture (CRA) has emerged as a key strategy to address these issues, focusing on enhancing the adaptive capacity of agricultural systems to ensure sustainable productivity and improve the resilience of farmers.

At the policy level, the National Action Plan on Climate Change (NAPCC) prioritizes sustainable agriculture through the National Mission for Sustainable Agriculture (NMSA). This mission advocates for practices like integrated nutrient management, efficient water-use strategies, soil health improvement, and agroforestry. Additionally, state governments, in collaboration with the central government, have rolled out region-specific CRA initiatives to address localized climate challenges.

Water management is a cornerstone of CRA in India. Techniques such as micro-irrigation, rainwater harvesting, and watershed management are widely promoted to optimize water use and enhance irrigation efficiency. The Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), a flagship initiative, plays a pivotal role in expanding the area under assured irrigation and ensuring efficient water resource utilization.

Crop diversification is another critical component of CRA, encouraging farmers to adopt climate-resilient and drought-tolerant crop varieties. By integrating traditional agricultural knowledge with modern technologies, CRA fosters robust and adaptive farming systems. Practices such as agroforestry and mixed farming not only enhance biodiversity but also provide farmers with alternative income sources, contributing to greater livelihood security.

Programs like the Pradhan Mantri Fasal Bima Yojana (PMFBY) offer crop insurance to mitigate financial risks caused by climate uncertainties. Furthermore, the role of digital technologies and extension services in advancing CRA is increasingly significant. digital platforms provide real-time weather forecasts, pest management advice, and market insights, enabling farmers to make informed decisions and improve their resilience.

11 Chapter 11. Comprehensive Analysis of the Primary Data Collected as a part of CENA Exercise

11.1 Introduction:

Survey of multiple stakeholders was conducted in order to get insights from the NDKSP (PoCRA II) perspective. The survey was conducted across 79 villages in 55 talukas of the 8 districts identified as Area Under Study. The district wise breakup of the area under study can be seen in the table below.

Table 11 The district wise breakup of the area under study

Sr. No	District	Number of Taluka	Number of Villages
1	Bhandara	5	8
2	Chandrapur	6	10
3	Gadchiroli	5	10
4	Gondia	7	8
5	Nagpur	8	12
6	Nashik	8	11
7	Latur	8	10
8	Amravati	8	10
	Total	**55**	**79**

The Classification of the Stakeholders for the Survey purpose –

Classification of the Stakeholders

Stakeholder Group	Members	Targeted Number of Respondents
I	Individual Farmers (*Progressive Farmers, Women Farmers, Farmers from Socio-economically Marginalized Sections etc.*)	610
II	Members of Local Governance Bodies (*GP/PS Members*)	77
III	FPO Members, Self-Help Groups Members, Nongovernmental Organizations Members, Educational Institutions Members, Financial Institutions Members	110
IV	DOA Officers and Staff Members (*AA, AS, AO, CAO, TAO, DPD/PD ATMA, SDAO*)	60
Total		857

In order to effectively engage these groups, the study employed stratified random sampling and convenience sampling techniques. Data collection was facilitated through a range of tools, including focused group discussions, personal interviews, structured questionnaires etc.

This multi-pronged approach ensured that insights were gathered from a wide spectrum of stakeholders, providing a solid foundation for the study's findings and recommendations.

The sample size for field data collection was determined through discussions with key stakeholders. The number of respondents proposed from each stakeholder group is presented in the table below.

Number of respondents proposed from each stakeholder group

SN	District	GROUP-1 Individual Farmers	GROUP-2 Members of Local Governance Bodies (GP/PS)	GROUP-3					GROUP-4 DOA Officers and Staff Members	TOTAL
				FPO Members	Self-Help Groups Members	Nongovernmental Organizations Members	Educational Institutions Members	Financial Institutions Members		
1	Bhandara	55	10	4	4	0	2	3	7	85
2	Chandrapur	92	6	4	8	2	1	3	3	119
3	Gadchiroli	68	12	2	1	1	1	1	9	95
4	Gondia	75	8	2	2	1	1	2	5	96
5	Nagpur	95	6	2	8	3	3	1	10	128
6	Nashik	83	7	4	0	1	2	1	9	107
7	Latur	72	10	7	8	0	2	1	8	108
8	Amravati	70	18	6	10	2	2	2	9	119
TOTAL		610	77	31	41	10	14	14	60	857
				110						

the data reflects a comprehensive, multi-stakeholder approach aimed at building resilience against climate change in the agricultural sector, ensuring that all relevant voices, from farmers to policymakers, are included in the process. This diversity also underscores the importance of designing context-specific, inclusive solutions that can be effectively implemented across different levels of governance and sectors.

11.2 Composition Stakeholders Groups:

1. Farmers: The survey of farmers was conducted in form of FGD and at individual level also. Individual farmers were also divided in subcategories such as female farmers, young farmers and farmers belonging to SC / ST communities. Analysis of the responses of each subcategory of farmers has been given separately in this report. Total number of farmers covered in the survey was 610. For the purpose of FGD groups of approximately 6 - 8 farmers were created. Total 95 groups were created for the purpose of FGD during this survey. During the FGD the group of farmers were asked a question and time was given

to the group to discuss amongst each other and respond to the question. The responses were scaled in 5 points as:

a. Most of Us (if more than 60% of the farmers in the group agreed)
b. Some of Us (if 25% - 60% of the farmers in the group agreed)
c. Few of Us (if 10% - 25% of the farmers in the group agreed)
d. Very Few of Us (if less than 10% of the farmers in the group agreed)
e. None of Us (if no members of the group agreed)

2. Gram Panchayat Committee Members: This was the second group of stakeholders for which the survey activity was conducted. This group included Sarpanch, Deputy Sarpanch, Gram Sevak, Talathi and members of VCMRC committee. Total number of respondents from this group was 77. The responses from this this group of respondents were also obtained with the help of group discussions and individual interviews.
3. Institutional Members: The third category of stakeholders in this survey consisted of members of FPO (31 respondents), SHG (41 respondents), NGO (10 respondents), Financial Institutions (14 respondents) and Educational Institutions (14 respondents).
4. Staff Members & DOA Officers: Fourth group of survey respondents was of officers of the DOA (56 respondents) and other village level staff members (4 respondents)

11.3 Focussed Group Discussions (FGD) with Farmers

Table 12 Crops grown by farmers in the area.

S.No	Crop	Response Count	S.No	Crop	Response Count
1	Tur/Arhar	57	18	Groundnut	8
2	Rice	45	19	Oranges	7
3	Soybean	37	20	Okra	7
4	Chana	36	21	Guava	5
5	Wheat	32	22	Finger Millet	4
6	Cotton	30	23	Bajara	3
7	Moong	29	24	Pomegranate	2
8	Tomato	27	25	Turmeric	2
9	Urad	24	26	Garlic	2
10	Brinjal	20	27	Ginger	2
11	Onion	17	28	Sunflower	1
12	Jowar	15	29	Banana	1
13	Maize	11	30	Papaya	1
14	Sugarcane	10	31	Foxtail Millet	1
15	Sesame	9	32	Barley	1
16	Mango	8	33	Other	148
17	Grapes	8			

The survey conducted with 610 farmers in the PoCRA (Project on Climate Resilient Agriculture) area provides insights into the variety of crops grown. Here's a brief interpretation:

- Top Crops: The most commonly grown crop is Tur/Arhar (57 responses), followed by Rice (45), and Soybean (37). These crops indicate the preference for staples and legumes among farmers.
- Moderately Grown Crops:
  Crops like Chana (36), Wheat (32), and Cotton (30) are also prominent, reflecting diverse agricultural practices in the area.
- Vegetables and Fruits:
  Vegetables such as Tomato (27) and Brinjal (20) and fruits like Mango (8) and Oranges (7) show some farmers engaging in horticulture.
- Millets and Other Crops:
  Minor cereal crops like Jowar (15), Finger Millet (4), and Bajara (3) are grown in smaller quantities, indicating limited adoption of millets.
- Diverse Options:
  The "Other" category, with 148 responses, suggests a wide range of additional crops grown by farmers, emphasizing crop diversity.
- Least Grown Crops:
  Crops like Sunflower, Banana, Papaya, and Foxtail Millet each received only one response, highlighting their minimal cultivation.

The survey highlights the predominance of staple food grains and legumes in the cropping pattern. A significant number of farmers grow diverse crops, including vegetables, fruits, and millets, but adoption of less common crops remains limited. This crop diversity is crucial for climate resilience and food security in the region.

2. Mixed / Intercropping practice adopted by farmers in the area.

This question was asked in FGD to the groups of farmers and the responses were as below:

Table 13 Groups of farmers and the responses

Option	FGD - Group Responses
Most of us	42
Some of us	11
Very few of us	27
None of us	15
Total	**95**

The responses from the Farmers Group Discussions (FGDs) indicate varying levels of adoption of mixed/intercropping practices among farmers in the PoCRA area. A significant proportion of groups reported that "most of us" adopt these practices, reflecting widespread acceptance of mixed/intercropping as a beneficial farming method to enhance crop diversity, improve soil health, and reduce risks. However, some groups mentioned that only "some of us" follow these practices, suggesting partial acceptance due to varying levels of awareness or access to resources.

A notable number of groups indicated that "very few of us" engage in mixed/intercropping, highlighting potential barriers such as lack of knowledge or practical challenges in implementing this method. Additionally, a smaller segment of groups reported that "none of us" adopt mixed/intercropping practices, which may point to regions where traditional farming methods dominate or where mixed/intercropping is less feasible. These findings underscore the importance of targeted interventions, such as farmer training and awareness programs, to encourage broader adoption of sustainable farming practices in the region.

3. Total dependence of farmers on rainfall.

The data from the Focus Group Discussions (FGDs) reveals varying levels of dependence on rainfall among farmers in the PoCRA area. A majority of groups (54 responses) indicated that "most of us" depend heavily on rainfall, underscoring the critical role of rainfall in sustaining agricultural activities in the region. Another 22 groups stated that "some of us" rely on rainfall, suggesting that alternative sources of irrigation or water management strategies may be in place

Table 14 Levels of dependence on rainfall among farmers

Option	FGD - Group Responses
Most of us	54
Some of us	22
Very few of us	8
None of us	11
Total	**95**

for a portion of the farming community. In contrast, 8 groups reported that "very few of us" depend on rainfall, indicating the presence of farmers who may have access to reliable irrigation facilities. However, 11 groups noted that "none of us" depend on rainfall, pointing to regions or communities where irrigation infrastructure or other water management systems have likely reduced reliance on rainfall. These findings highlight the need for strengthening irrigation systems, promoting water conservation practices, and building resilience to mitigate the risks associated with rainfall dependency in agriculture.

4. Availability of efficient sources of Irrigation? (drip, sprinkler, micro irrigation).

Table 15 Efficient Sources of Irrigation

Option	FGD - Group Responses
Most of us	12
Some of us	11
Few of us	19
Very few of us	30
None of us	23
Total	**95**

The responses from the Farmers Group Discussions (FGDs) on the availability of efficient irrigation systems, such as drip, sprinkler, and micro-irrigation, indicate varying levels of accessibility among farming communities in the PoCRA area. Only a small portion of groups (12 responses) reported that "most of us" have access to these advanced irrigation methods, reflecting limited widespread usage. Another 11 groups stated that "some of us" use such systems, indicating moderate adoption among certain farming communities.

A considerable number of groups (19) mentioned that "few of us" have access, while the largest share (30 groups) indicated that "very few of us" benefit from these technologies, pointing to significant challenges in access and adoption. Additionally, 23 groups reported "none of us" have

access to these efficient irrigation sources, emphasizing the absence of such systems in some areas.

This data underscores the urgent need to enhance the availability and affordability of efficient irrigation solutions. Providing financial assistance, improving infrastructure, and creating awareness about the benefits of these systems can help bridge the gap and support farmers in adopting sustainable water management practices.

Table 16 Application of Bio-pesticides and Bio-weedicides in the survey area.

Option	FGD - Group Responses
Most of us	5
Some of us	8
Few of us	8
Very few of us	39
None of us	35
Total	**95**

The Farmers Group Discussions (FGDs) reveal limited adoption of bio-pesticides and bio-weedicides in the survey area. Only 5 groups reported that "most of us" use these eco-friendly solutions, indicating very low widespread adoption. Another 8 groups stated that "some of us" utilize these practices, suggesting moderate awareness and usage in a few farming communities.

Similarly, 8 groups mentioned that "few of us" apply bio-pesticides and bio-weedicides, highlighting a minimal presence of these practices in certain areas. A significant number of groups (39) reported that "very few of us" use such methods, while 35 groups stated "none of us" rely on bio-pesticides and bio-weedicides, pointing to their overall unavailability or lack of acceptance in many parts of the region.

These findings reflect a critical need to promote the adoption of bio-pesticides and bio-weedicides through awareness programs, farmer training, and subsidies. Such initiatives can help farmers transition to sustainable and environmentally friendly pest and weed management practices while reducing the dependency on chemical alternatives.

Table 17 Practice of natural farming among farmers in survey area

Option	FGD - Group Responses
Most of us	4
Some of us	5
Few of us	11
Very few of us	20
None of us	55
Total	**95**

The Farmers Group Discussions (FGDs) indicate that the practice of natural farming is limited among farmers in the survey area. Only 4 groups reported that "most of us" engage in natural farming, suggesting very low widespread adoption. Another 5 groups indicated that "some of us" practice it, reflecting moderate acceptance in a small segment of the farming community.

Additionally, 11 groups mentioned that "few of us" adopt natural farming practices, while 20 groups stated "very few of us" follow such methods, indicating a gradual but limited interest in this approach. Notably, a majority of the groups (55) reported that "none of us" practice natural farming, highlighting its minimal adoption across the region.

These findings suggest a strong need to promote natural farming practices by educating farmers about its benefits, providing training sessions, and offering incentives. Such efforts can help overcome barriers to adoption and encourage a transition toward sustainable and eco-friendly agricultural practices.

7. Practice of organic farming among farmers in survey area

Table 18 Practice of organic farming among farmers in survey area

Option	FGD - Group Responses
Most of us	1
Some of us	8
Few of us	9
Very few of us	42
None of us	35
Total	**95**

The Farmers Group Discussions (FGDs) reveal that the practice of organic farming is highly limited among farmers in the survey area. Only 1 group reported that "most of us" practice organic farming, indicating extremely low widespread adoption. A slightly higher number, 8 groups, stated that "some of us" are engaged in organic farming, suggesting moderate interest in certain pockets of the community. Nine groups mentioned that "few of us" adopt organic

farming, while 42 groups reported that "very few of us" follow these practices, pointing to significant barriers in adoption. Additionally, 35 groups stated that "none of us" practice organic farming, highlighting its minimal prevalence in the region.

These findings emphasize the need to encourage organic farming through farmer education, demonstration projects, financial incentives, and support for organic certification. Addressing

challenges such as knowledge gaps, market access, and cost barriers can play a crucial role in increasing the adoption of organic farming practices in the area.

8. Practice of natural / organic + chemical farming among farmers in survey area.

Table 19 Practice of natural / organic + chemical farming

Option	FGD - Group Responses
Most of us	50
Some of us	14
Few of us	14
Very few of us	10
None of us	7
Total	**95**

The Farmers Group Discussions (FGDs) highlight that the majority of farmers in the survey area practice a combination of natural or organic farming along with chemical farming. Fifty groups reported that "most of us" follow this mixed approach, indicating its widespread adoption. Another 14 groups mentioned that "some of us" adopt this practice, showing moderate acceptance within certain farming communities. An additional 14 groups stated that "few of us" follow this method, while 10 groups reported that "very few of us" practice it. Only 7 groups indicated that "none of us" rely on this combination, suggesting that most farmers are inclined toward integrating natural or organic practices with chemical inputs to some extent.

This widespread use of mixed farming methods reflects farmers' attempts to balance sustainability with productivity. However, efforts should be made to educate farmers on optimizing this approach by minimizing chemical usage and enhancing natural or organic inputs to promote long-term soil health and environmental sustainability.

9. Free soil testing done by farmers & Paid soil testing done by farmers.

Table 20 Soil testing done by farmers

Free Testing

Option	FGD - Group Responses
Most of us	30
Some of us	17
Few of us	15
Very few of us	23
None of us	10
Total	**95**

Paid Testing

Option	FGD - Group Responses
Most of us	6
Some of us	5
Few of us	9
Very few of us	20
None of us	55
Total	**95**

The survey results on soil testing practices among farmers reveal some interesting trends. Regarding free soil testing, most farmers (30) have benefited from this service, while a significant number (17) report that only some of them used it. However, a portion of farmers (15) have had limited access, and a considerable group (23) state that very few of them had access to free soil testing. Ten farmers report that none of them have availed of free soil testing services. This shows that while free soil testing is available to some, its accessibility seems inconsistent across different farmer groups.

In contrast, paid soil testing services are much less commonly utilized. Only a small number of farmers (6) report that most of them use paid soil testing, while 5 say that some of them have used this service. A slightly higher number (9) indicate that only a few farmers have used paid testing. A larger group (20) report very few farmers opting for paid services, while a substantial majority (55) state that none of them have used paid soil testing. This suggests a significant barrier to the adoption of paid soil testing, likely due to affordability or lack of awareness.

Overall, the data highlights a higher reliance on free soil testing compared to paid testing, with many farmers either not using either service or only using free services to a limited extent.

Table 21 Application of fertilizers and pesticide based on soil health report card

Option	FGD - Group Responses
Most of us	8
Some of us	12
Few of us	9
Very few of us	29
None of us	37
Total	**95**

The survey results regarding the application of fertilizers and pesticides based on soil health report cards reveal a low level of adoption among farmers. Only a small group (8) of farmers report that most of them apply fertilizers and pesticides according to the recommendations in the soil health report cards. A slightly larger group (12) indicate that some farmers follow these recommendations, while 9 report that only a few farmers do so.

However, a significant portion of the farmers (29) state that very few of them base their application of fertilizers and pesticides on soil health reports, and the majority (37) report that none of them use soil health reports for such applications. This suggests that, despite the availability of soil health report cards, many farmers either do not have access to these reports or choose not to rely on them when making decisions about fertilizers and pesticides.

The data indicates a potential gap in awareness or trust in soil health reports, which could hinder the widespread adoption of this more sustainable agricultural practice.

11. Noticing any change in climate pattern (e.g., rainfall, temperature) over the past few years?

The survey results on the perception of climate change among farmers show that a vast majority (93) of respondents have noticed changes in climate patterns, such as rainfall and temperature, over the past few years. Only 2 farmers reported not noticing any changes. This indicates a strong awareness among the farmers of shifts in the climate, which could be attributed to observable changes in weather patterns affecting agricultural practices.

The high percentage of farmers acknowledging these changes suggests that climate resilience is becoming an increasingly important concern for the farming community, potentially influencing their strategies for coping with altered environmental conditions.

Table 22 Specific changes observed in climate change.

Specific change observed in climate change	Response count
Irregular Rainfall	72
Increased Pest Attacks	69
Delayed Monsoon	68
Temperature Fluctuations	52
Excessive Rainfall	46
Drought	41
Increased Hailstorms	35
Extreme Weather Events	32
Flood	30
Increased Dry Spells	30
Increased Salinity	14
Increased Dew	13
Other	4

The survey results on specific climate changes observed by farmers highlight several key trends. The most commonly observed change is irregular rainfall, noted by 72 farmers, followed by increased pest attacks (69 farmers) and delayed monsoon (68 farmers). These changes are significant as they directly impact crop growth and agricultural productivity, leading to uncertainty in planting and harvesting schedules.

Farmers also reported experiencing temperature fluctuations (52 farmers) and excessive rainfall (46 farmers), both of which can disrupt optimal growing conditions for crops. Drought conditions (41 farmers) were also observed, further exacerbating challenges in water availability for irrigation. Other climate-related changes mentioned include increased hailstorms (35 farmers), extreme weather events (32 farmers), and flooding (30 farmers). These severe weather phenomena

can cause immediate and widespread damage to crops and infrastructure. Additionally, some farmers reported increased dry spells and increased salinity (30 and 14 farmers, respectively), which could affect soil health and crop yields over time. A smaller group noted increased dew (13 farmers), with only a few reporting other unspecified changes (4 farmers).

Overall, the data indicates that farmers are experiencing a variety of climate-related disruptions, which could significantly impact agricultural productivity and the need for climate-resilient farming practices.

13. Measures adopted to address the climate challenge.

The survey results on the measures adopted by farmers to address climate challenges reveal a variety of strategies, with crop diversification being the most common approach, adopted by 26 farmers. This practice helps reduce dependency on a single crop and can improve resilience to varying weather conditions.

Table 23 Measures adopted to address the climate challenge.

Measures adopted to address the climate challenge	Response count
Crop diversification	26
Farm ponds	23
Rain water harvesting	20
Don't know never thought of it	19
Thought about it but don't have adequate information	18
Change in the irrigation pattern	18
Change in cropping pattern	17
Have information but not resources	15
Natural/organic farming	12
Other	6

Other measures include the construction of farm ponds (23 farmers) and the practice of rainwater harvesting (20 farmers), both of which aim to address water scarcity and ensure a more reliable water supply during dry spells. However, a notable group of farmers (19) reported that they either don't know of any measures or have never considered them, suggesting a lack of awareness or proactive planning in some areas.

Additionally, 18 farmers have thought about addressing climate challenges but lack adequate information, while 18 others have modified their irrigation patterns to adapt to changing climate conditions. Changes in cropping patterns (17 farmers) were also considered to align with new climate realities, although it appears that not all farmers have the resources or information needed for these changes—15 farmers noted having the knowledge but not the resources.

Some farmers (12) have adopted natural or organic farming practices, possibly as a way to improve soil health and reduce vulnerability to pests and diseases exacerbated by climate change. A small group (6 farmers) indicated they have implemented other measures, though these were not specified in the survey.

Overall, while many farmers are taking proactive steps to address climate change, there remains a gap in awareness, information, and resources that may hinder broader adoption of these measures.

Table 24 Constraints / challenges faced by farmers to adopt climate resilient practices.

Constraints/challenges faced by farmers to adopt climate resilient practices	Response count
Lack of resources	75
Financial constraints	72
Inadequate information	61
Technological challenges/Technical knowhow	59
Other	12

The survey results on the constraints faced by farmers in adopting climate-resilient practices highlight significant barriers. The most common challenges include lack of resources (75 farmers) and financial constraints (72 farmers). These issues suggest that many farmers may be aware of climate-resilient practices but are unable to implement them due to a shortage of funds or necessary materials, such as equipment or infrastructure.

In addition, inadequate information (61 farmers) and technological challenges/technical know-how (59 farmers) also pose significant hurdles. Many farmers may lack access to the latest climate information or technical skills required to adopt new agricultural practices that are more resilient to climate change.

A smaller group of farmers (12) identified other unspecified challenges, which may include factors like market access, government policies, or environmental conditions specific to their region.

Overall, the data suggests that while farmers may recognize the importance of adopting climate-resilient practices, significant financial, informational, and technical barriers prevent widespread adoption. Addressing these constraints could help facilitate more effective climate adaptation in agriculture.

Table 25 Medium to receive weather forecast information

Medium to receive weather forecast information	Response count
Mobile apps- whatsaapp, sms, youtube	88
TV	47
Agricultural Officers	45
Internet/ Social media	44
Word of mouth	31
Other	5
Radio	0
None	0

The survey results on the preferred mediums for receiving weather forecast information show a strong reliance on digital platforms. The most popular medium is mobile apps, including WhatsApp, SMS, and YouTube, with 88 farmers relying on these platforms for weather updates. This suggests that mobile-based communication is a key tool for farmers to stay informed about weather conditions.

Other significant sources include TV (47 farmers) and agricultural officers (45 farmers), indicating that traditional and expert-driven sources of information still play an important role. Internet and social media are also used by 44 farmers, reflecting a growing trend towards online platforms for weather-related information.

Word of mouth remains a relevant source for 31 farmers, showing that interpersonal communication within communities still plays a role in information dissemination. Interestingly, radio and none were both marked as sources by no farmers, indicating a decline in the use of these traditional mediums for weather forecasting.

Overall, the data highlights the increasing reliance on mobile technology and digital platforms for weather information, with a secondary reliance on traditional media and agricultural officers. This suggests that enhancing digital access and training could further improve the effectiveness of climate and weather-related communications for farmers.

15. Agriculture related

Table 26 Decision by farmers based on weather forecast.

Agriculture related decision by farmers based on weather forecast	Response count
Timing of planting	84
Timing of harvesting	60
Input management- Pest management, Fertilizer application	42
Other	21
Post harvest/ Marketing	19

The survey results on agriculture-related decisions made by farmers based on weather forecasts reveal that timing of planting is the most common decision influenced by weather information, with 84 farmers reporting that they rely on forecasts to determine the best time to plant crops.

This is crucial for optimizing growth conditions and minimizing the risk of crop failure due to unexpected weather patterns.

The timing of harvesting is also a significant decision for farmers, with 60 farmers adjusting their harvest schedules based on weather predictions. This helps ensure that crops are harvested at the right time to avoid damage from extreme weather conditions.

A smaller group of farmers (42) base their input management decisions, such as pest management and fertilizer application, on weather forecasts. This suggests that weather patterns influence decisions related to crop protection and nutrition, which are critical for maintaining healthy crops in varying climates.

Other decisions related to post-harvest activities and marketing are influenced by weather forecasts for 19 farmers, while 21 farmers indicated making other unspecified decisions based on weather predictions.

Overall, the data highlights the significant role weather forecasts play in shaping key agricultural decisions, particularly in planting and harvesting, which are critical for ensuring crop success and resilience in changing climate conditions.

Table 27 Support Received from NGO in Agricultural activities.

Support Received from NGO in Agricultural activties	Response count
Training in agricultural technology,capacity building, Organic Farming etc.	16
Water Management Solutions	15
Infrastructure Development	12
Access to Advanced Agricultural Technologies	10
Access to Quality Inputs (seeds, fertilizers, etc.)	8
Soil Health Improvement Programs	8
Crop Diversification Support	8
Other	8
Financial Assistance	7
Awareness Programs on Climate-Resilient Practices	7
Marketing and Sales Support	3

The survey results on the support received by farmers from NGOs in agricultural activities reveal a variety of assistance provided. The most common forms of support include training in agricultural technology, capacity building, and organic farming, with 16 farmers reporting that

they have benefited from such programs. This highlights the role of NGOs in enhancing farmers' knowledge and skills, particularly in sustainable farming practices.

Water management solutions were provided to 15 farmers, reflecting a focus on addressing water-related challenges that many farmers face. Infrastructure development support was received by 12 farmers, suggesting efforts to improve physical resources that are essential for agricultural productivity.

A smaller number of farmers (10) received support in accessing advanced agricultural technologies, while 8 farmers each reported receiving help in areas such as access to quality inputs (seeds, fertilizers, etc.), soil health improvement programs, crop diversification support, and other unspecified types of assistance.

Financial assistance was provided to 7 farmers, along with awareness programs on climate-resilient practices, indicating a focus on financial support and education to help farmers cope with climate challenges. Lastly, marketing and sales support was provided to 3 farmers, showing that NGOs are also helping farmers access markets for their produce.

Overall, the data reveals that NGOs are actively supporting farmers across various dimensions, with a strong emphasis on training, water management, and infrastructure development. However, the need for further financial and market-related support remains apparent.

Table 28 Challenge faced by farmers to market their produce.

Challenge faced by farmers to market their produce	Response count
Lack of Storage facilities	79
Market access and pricing	64
Poor infrastructure (Transportation issues)	49
High post-harvest losses	41
Lack of Cold storage	38
Inadequate market information	33
Others	8

The survey results on the challenges faced by farmers in marketing their produce reveal several significant barriers. The most prominent challenge is the lack of storage facilities, reported by 79 farmers, which limits their ability to store produce for later sale or use, leading to potential wastage or forced sale at low prices immediately after harvest.

The lack of cold storage is also a key issue, affecting 38 farmers, especially for perishable goods that need to be kept fresh to maintain their market value. This issue, combined with poor infrastructure and transportation issues (49 farmers), further exacerbates the difficulty of getting produce to markets in a timely and cost-effective manner.

Market access and pricing is another major challenge, reported by 64 farmers, indicating that farmers often struggle to reach profitable markets or face unfair pricing for their goods. High post-harvest losses, noted by 41 farmers, suggest that inadequate handling, storage, or transportation methods contribute to significant waste of crops.

Inadequate market information was reported by 33 farmers, indicating a lack of timely or accurate data about market demand, prices, or trends, which could help farmers make better decisions about when and where to sell their produce. A small number (8 farmers) mentioned other unspecified challenges.

Overall, the data highlights significant constraints in the marketing chain, including storage, infrastructure, access to markets, and information, all of which hinder farmers' ability to effectively sell their produce and achieve fair prices. Addressing these issues could improve farmers' market participation and reduce post-harvest losses.

19. Value addition processes available in village?

The survey results on value addition processes available in the village show that 81 groups of farmers do not have access to any value addition processes, indicating a lack of opportunities to enhance the value of their produce through processing or other means. This suggests that farmers are primarily engaged in selling raw products, which may limit their ability to maximize income from their crops.

On the other hand, 14 groups of farmers reported having access to value addition processes, such as processing, packaging, or other forms of enhancement that could increase the market value of their produce. This indicates that, while some farmers are able to add value to their products, the majority still lack these opportunities, potentially missing out on higher profits and better market positioning.

Overall, the data suggests that there is a significant gap in access to value addition processes, which could be a key area for development to help farmers increase the profitability and sustainability of their agricultural practices.

20. Engagement in Agri-allied practices (Animal husbandry, poultry, fisheries etc)

Table 29 Engagement in Agri-allied practices

Engagement in agri-allied practices(Animal husbandary, poultry, fisheries etc)	Response count
Most of us (more than 60%)	13
Some of us (more than 25% -60%)	20
Few of us (10% - 25%)	44
Very few of us (0% to 10%)	13
None of us	5
Total	**95**

The survey results on farmers' engagement in agri-allied practices, such as animal husbandry, poultry, and fisheries, show varying levels of involvement. The largest group of farmers (44) are involved in agri-allied practices to a limited extent, with 10% to 25% of them engaged in such activities.

A smaller number (20) report that 25% to 60% of their group is engaged in agri-allied practices, while only 13 farmers indicate that more than 60% of their group is involved in these practices, suggesting that a significant portion of these farmers is actively engaged in diverse agricultural activities.

Additionally, 13 farmers report that very few of them (0% to 10%) are involved in agri-allied practices, and 5 farmers state that none of them engage in such activities.

Overall, while a portion of farmers are diversifying into agri-allied practices, the majority are only marginally involved or not engaged at all, pointing to the need for further encouragement and support to expand these practices for added income and resilience.

21. Agricultural allied practices farmers are involved in

The survey results on the specific agricultural allied practices farmers are involved in show a strong engagement in animal husbandry, with 73 farmers participating in this practice. This suggests that raising livestock is a common supplementary activity for farmers, likely providing an additional source of income and resources.

Poultry farming is also quite common, with 30 farmers engaged in this practice, which may offer a more accessible and less resource-intensive alternative to other forms of animal husbandry.

A smaller number of farmers are involved in fisheries (11 farmers), indicating that aquaculture may not be as widespread in the surveyed area, possibly due to geographical or resource limitations.

Some farmers (6) are involved in small-scale industries, which could include activities like processing or local manufacturing that complement their agricultural work. Additionally, 29 farmers indicated being engaged in other unspecified allied practices, which could involve a variety of activities such as beekeeping, agroforestry, or handicrafts.

Overall, animal husbandry is the most common allied practice, followed by poultry, while other activities like fisheries and small-scale industries are less prevalent. Expanding support for these practices could provide farmers with more diverse income sources and increase resilience to climate change.

22. Support required by farmers to adopt climate resilient agriculture practices.

The survey results on the support required by farmers to adopt climate-resilient agricultural practices indicate several areas where assistance is needed. The most significant support needed is basic infrastructure, with 87 farmers indicating that improved infrastructure is essential for implementing climate-resilient practices. This likely includes access to water systems, storage facilities, and transportation networks that are critical for adapting to changing climate conditions.

Training is another critical area, with 83 farmers expressing the need for education and capacity-building on climate-resilient agricultural practices. This underscores the importance of providing farmers with the knowledge and skills to adapt to changing weather patterns and implement sustainable farming techniques.

Financial support is also a key requirement, reported by 85 farmers. Financial resources are necessary to invest in climate-resilient technologies, inputs, and infrastructure, and to offset the costs associated with transitioning to more sustainable farming practices.

Additionally, exposure visits to farms where best practices are being successfully implemented were requested by 76 farmers. These visits would allow farmers to learn directly from others who have effectively adopted climate-resilient practices, providing practical insights and inspiration for their own farming operations.

Overall, the data highlights the need for a combination of infrastructure, training, financial support, and opportunities for hands-on learning to help farmers adopt and sustain climate-resilient agricultural practices.

23. Suggestion from farmers to improve farmers income.

The survey results on farmers' suggestions to improve their income reveal several key areas where support could enhance agricultural livelihoods. The most commonly suggested improvement is

implementing policies and schemes (70 farmers), indicating a need for better government support and effective implementation of existing agricultural policies.

Strengthening market linkages and access (61 farmers) is another priority, with farmers recognizing the importance of improved market access for better pricing and sales opportunities. Alongside this, providing access to credit and finance (62 farmers) was emphasized, pointing to the need for financial support to invest in modern practices and overcome financial barriers.

Many farmers (53) suggested modern agricultural practices as a way to improve productivity and sustainability, while diversifying income sources (57 farmers) was also recommended, likely to reduce dependency on a single crop or activity.

Facilitating agricultural training and capacity building (60 farmers) was another common suggestion, highlighting the need for education on new techniques and technologies. Village-level coordination (40 farmers) and supporting farmer producer organizations (34 farmers) were also suggested as ways to improve collective action and resources at the community level.

Overall, the data suggests that improving access to resources, training, markets, and financial support, along with strengthening organizational and policy frameworks, is key to enhancing farmers' income and sustainability in the long term.

23. List of areas, where farmers need training.

list of areas where farmers need training, ranked by the response count:

1. Water management and conservation – 72
2. Soil health improvement – 70
3. Crop diversification – 56
4. Climate Resilient Crop Varieties – 49
5. Integrated Pest Management – 53
6. Sustainable Livestock Management – 44
7. Post Harvest Management and Value Addition – 42
8. Financial Literacy and Access to Credit – 45
9. Renewable Energy in Agriculture – 43
10. Community-Based Approach – 15
11. Others – 8

This ranking reflects the areas where farmers perceive the greatest need for training to enhance their agricultural practices and improve sustainability. Water management and soil health improvement top the list, indicating a strong focus on essential resource management.

11.4 Women Farmers' Responses:

1. What challenges do you face as a female farmer in your community?

The survey results on the challenges faced by female farmers in their community highlight several key barriers to their involvement in agriculture. The most significant challenge reported is balancing household responsibilities and farming, with 100 responses indicating that many women struggle to manage both domestic duties and agricultural work, which can limit their productivity and opportunities for advancement.

Difficulty accessing resources such as land and credit was reported by 70 female farmers, suggesting that limited access to essential resources is a major constraint on their ability to expand or improve their farming operations.

A smaller number of female farmers (27) indicated lack of support from family or community as a challenge, which points to the social and cultural factors that may hinder their active participation in farming.

Only 5 respondents mentioned other unspecified challenges.

Overall, these results emphasize the need for targeted support to address the dual burdens women face, including better access to resources, more equitable family and community support, and interventions to help them balance their domestic and farming roles.

2. Do you find it difficult to participate in training programs or meetings due to being a woman?

The survey results indicate that most female farmers (87 out of 124) do not find it difficult to participate in training programs or meetings, suggesting that gender does not pose a significant barrier for the majority of women in accessing agricultural education and support. However, 37 women reported that they do face difficulties, which may be due to factors such as social norms, household responsibilities, or lack of family support.

These findings suggest that while many women have access to training and meetings, there is still a portion of the female farming community that may require additional support to fully participate, highlighting the need for targeted interventions to address gender-specific challenges.

The survey results on the reasons why some female farmers face difficulties in participating in training programs or meetings reveal several key factors. The most common reason is household

responsibilities, reported by 27 women, highlighting that domestic duties often take precedence, limiting their ability to attend training or meetings.

Lack of transportation was a challenge for 18 women, suggesting that logistical barriers, such as difficulty accessing venues, may prevent their participation. Additionally, social norms or restrictions and lack of child care support indicate cultural or family-related obstacles that discourage or prevent women from attending such programs.

Inadequate timing of programs was also reported by 13 women, suggesting that the scheduling of training or meetings may conflict with other essential tasks, such as farming or household work. A small number of women cited other unspecified reasons.

These results underscore the need to address the specific challenges women face, such as providing more flexible timing, improved transportation options, and support for child care, in order to increase their participation in agricultural training and development programs.

3. What support do you need to overcome these gender-specific challenges?

The survey results highlight several forms of support that female farmers feel are essential to overcome gender-specific challenges. The most frequently identified needs include:

1. Flexible training schedules (119 responses) – Many women need training programs that fit around their other responsibilities, particularly household duties.
2. Financial support (119 responses) – Access to financial resources is critical for women to invest in their farming activities and participate in training or capacity-building programs.
3. Transportation facilities (117 responses) – Improved access to transportation is a key barrier for many women, and providing this support would help them attend training sessions and meetings more easily.
4. Increased awareness and sensitivity towards gender issues (114 responses) – There is a need for greater awareness and understanding of the unique challenges women face in agriculture, which could help foster more inclusive environments in training programs and community support structures.
5. Support groups for women farmers (110 responses) – Female farmers expressed the need for networks or groups where they can share experiences, receive guidance, and support one another.

6. Childcare facilities during training (109 responses) – The lack of child care was identified as a major barrier to participation, and providing childcare services during training would help alleviate this issue.

These results suggest that a combination of logistical, financial, and social support is essential to enable female farmers to fully engage in agricultural development and training opportunities.

4. How can training programs be improved to better support female farmers?

The survey results on how training programs can be improved to better support female farmers suggest several key areas for improvement:

1. More female trainers (119 responses) – Many female farmers feel that having more women trainers could create a more comfortable and relatable learning environment, fostering greater participation and confidence.
2. Women-only training sessions (114 responses) – There is a preference for women-only sessions, which may help reduce gender-related barriers, ensuring that female farmers feel more at ease and can openly engage in the training.
3. On-site training at farms (118 responses) – Providing training directly at the farms where female farmers work would make it more convenient and accessible, allowing them to learn in a practical, hands-on setting.
4. Involvement of local women's groups (117 responses) – Female farmers see value in involving local women's groups in the training process, which could offer additional support, create peer networks, and enhance community participation.
5. Tailored content to address women's specific needs (115 responses) – There is a strong desire for training that is specifically designed to address the unique challenges and needs of women farmers, such as balancing household and farming responsibilities or accessing resources.

These suggestions indicate that training programs should be more inclusive, practical, and sensitive to the unique challenges faced by female farmers, incorporating gender-specific approaches and support systems to enhance their effectiveness.

11.5 Young Farmers' Responses:

1. How can training programs be improved to better support young farmers?

The survey results on how training programs can be improved to better support young farmers highlight several important areas:

1. On-site training at farms (112 responses) – Providing training directly at farms would make learning more practical and relevant for young farmers, allowing them to immediately apply new skills in their work environment.
2. More young trainers (91 responses) – Having young trainers could make the training environment more relatable and appealing to young farmers, encouraging better engagement and participation.
3. Youth-focused training sessions (91 responses) – There is a strong demand for training programs specifically designed for young farmers, which would address their unique challenges and aspirations in the agricultural sector.
4. Involvement of local youth groups (76 responses) – Incorporating local youth groups in the training process could help build a sense of community, encourage peer learning, and provide additional support networks.
5. Tailored content to address youth-specific needs (49 responses) – Young farmers feel the need for training content that is customized to their specific challenges, such as access to land, technology, and financial resources, as well as the transition to modern farming practices.

These suggestions indicate that young farmers would benefit from more targeted, hands-on, and peer-supported training programs that address their unique needs and provide opportunities for engagement with their peers and mentors.

2. What motivates you to pursue farming?

Table 30 Motivation to pursue farming

What motivates you to pursue farming?	Response Count
Family Tradition	128
Passion for Agriculture	93
Economic Opportunities	59
Technological Advancement	27
Learning and Development	24
Entrepreneurial Spirit	22
Government Support and Incentives	16
Sustainability and Environment	14
Community and Social Impact	13
Market Demand for Fresh and Local Produce	12
Innovation in Agribusiness	12
Innovation and Experimentation	11
Other	10
Peer Influence and Networks	5
Resilience to Climate Change	3
Recognition and Awards	3

The survey results reveal that the primary motivation for pursuing farming is family tradition (128 responses), indicating that many farmers continue the practice as part of their heritage. Passion for agriculture (93 responses) is also a strong motivator, showing a genuine interest in farming. Economic opportunities (59 responses) highlight financial incentives as a key driver, while technological advancement (27 responses) and learning and development (24 responses) suggest that some farmers are drawn by the potential for growth and innovation in agriculture.

Other motivations include entrepreneurial spirit, government support, sustainability, and community impact, though they were less frequently mentioned.

3. What type of training or educational programs would you find most useful?

The survey results indicate that farmers find the following types of training or educational programs most useful:

1. Modern farming techniques (147 responses) – This is the most sought-after type of training, highlighting a strong desire to learn new, innovative practices that can improve productivity and efficiency.
2. Business management (146 responses) – Many farmers are interested in improving their skills in managing the business aspects of farming, including financial planning and market strategies.
3. Sustainable farming practices (143 responses) – There is a significant interest in learning about environmentally friendly and resource-efficient farming methods.
4. Other (98 responses) – This category suggests that farmers have additional specific needs or interests that could not be fully captured in the predefined options.

These findings show that farmers are keen to enhance both the technical and managerial aspects of their farming operations, with a particular focus on modern and sustainable practices.

11.6 Scheduled Casts and Scheduled Tribe Farmers' Responses:

1. What challenges do you face in accessing financial support for farming?

The survey results highlight several key challenges faced by farmers in accessing financial support for farming. The most significant barrier is high interest rates (179 responses), which makes it difficult for farmers to afford loans. Limited knowledge of available schemes (155 responses) indicates that many farmers are unaware of the financial support options available to them. Additionally, lack of collateral (120 responses) poses a major hurdle for farmers seeking loans or

credit. These challenges suggest the need for better access to information, lower interest rates, and alternative collateral options to support farmers financially.

2. What type of financial support would be most beneficial for you?

The survey results reveal that the most beneficial types of financial support for farmers are grants and subsidies (232 responses), followed closely by low-interest loans and crop insurance (both 230 responses). These forms of financial aid are seen as critical for reducing financial stress and managing risks associated with farming. The other category (146 responses) suggests that farmers may have additional financial support needs that were not covered by the predefined options. These findings emphasize the importance of accessible, affordable financial resources to support farmers' sustainability and growth.

3. What type of training programs would you find most useful in the future?

The survey results indicate that farmers would find modern farming techniques (188 responses) most useful in the future, highlighting a strong interest in learning innovative and efficient methods. Sustainable farming practices (165 responses) also ranks highly, suggesting a growing concern for environmentally friendly and resource-efficient practices. Additionally, business management and marketing (120 responses) is seen as essential for enhancing the financial and commercial aspects of farming. The other category (7 responses) indicates some additional, unspecified training needs. These findings suggest that farmers are eager to enhance both their technical skills and business acumen to improve their farming operations.

4. What challenges do you face in accessing modern farming tools and technology?

The survey results show that the main challenges farmers face in accessing modern farming tools and technology are high cost (201 responses), making it difficult for many to afford new tools. Lack of availability (142 responses) suggests that modern farming technologies are not easily accessible in some areas. Additionally, lack of training (149 responses) indicates that even when tools are available, farmers may struggle to use them effectively without proper guidance. The other category (4 responses) reflects minor or unspecified challenges. These results highlight the need for affordable, accessible, and well-supported technology to enhance farming practices.

5. Are you aware of government schemes available for SC and ST farmers?

The survey results show that a majority of farmers are not aware of government schemes available for SC and ST farmers, with 183 responses indicating a lack of awareness. Only 56 responses confirm awareness of these schemes.

This suggests a need for increased outreach and information dissemination to ensure that SC and ST farmers are aware of the government support available to them.

6. What specific recommendations do you have for government policies to support SC/ST farmers?

The most common suggestion is increased financial aid (227 responses), highlighting the need for more accessible financial resources. More inclusive training programs (223 responses) is another significant recommendation, emphasizing the importance of tailored educational opportunities for SC/ST farmers. Better implementation of existing schemes (225 responses) also ranks highly, indicating that while schemes may exist, their execution and accessibility need improvement.

11.7 Government Officers' Responses (Other than DOA):

1. In what categories do you (government officers) need training the most?

Table 31 Categories; Government Officers need training the most

In what categories do you(government officers) need training the most?	Response Count
Value Addition and Processing	16
Postharvest Management	14
Promotion and Development of AGRI-Start-ups	13
Agricultural Marketing	13
Agribusiness Management	13
Agricultural Finance	13
Women Empowerment in Agriculture	13
Market-led Extension in Agriculture	12
Agricultural Export Procedure and Documentation	11
Soil Health Management	11
Agricultural Mechanization	11
Agricultural Supply Chain Management	11
Climate-Smart Agriculture	10
Capacity Building of CBO	10
Farmer Producer Organization - Formation and	9
Good Agricultural Practices	9
Agricultural Extension Management	9
Contract Farming and Public-Private Partnerships	8
Precision Farming	8
Participatory Training Management	8
Agricultural Input Management and Quality Control	6
ICT in Agriculture	6
Agricultural Project Management	6
RS & GIS Applications in Agriculture	6
Traceability	5

The survey results indicate that government officers most need training in Value Addition and Processing (16 responses) and Postharvest Management (14 responses). Other key areas include Promotion and Development of AGRI-Start-ups, Agricultural Marketing, and Agribusiness Management, all with 13 responses each. Training in Agricultural Finance, Women Empowerment in Agriculture, and Market-led Extension in Agriculture also ranked highly. These results suggest a strong need for capacity building in diverse agricultural sectors, particularly those that enhance farm productivity, market access, and inclusive development.

2. What kind of support and training have you received under the POCRA scheme?

The survey results show that under the POCRA scheme, government officers and stakeholders have received limited support and training. Training in agricultural technology (1 response), soil health improvement (1 response), and organic farming (2 responses) were some of the areas covered. Financial assistance (2 responses) and water management solutions (2 responses) were also provided. Additionally, there was access to quality inputs like seeds and fertilizers (3 responses), and some indicated receiving other unspecified support (4 responses). These results suggest that while there is some support under the POCRA scheme, it may not be widespread or fully accessed by all intended beneficiaries.

Table 32 Support and Training Received under POCRA Scheme

What kind of support and training have you received under the POCRA scheme?	Response Count
Training in agricultural technology	1
Organic Farming	2
Financial Assistance	2
Access to Quality Inputs (seeds, fertilisers, etc.)	3
Water Management Solutions	2
Soil health improvement	1
Other	4

11.8 FPO Farmers' Responses:

1. In what categories do you need training the most?

Table 33 Categories of Training; Mostly Needed by FPOs

In what categories do you need training the most?	Response Count
Water use efficiency	20
Soil Health Improvement measures	19
Integrated Pest Management	15
Storage / Packaging / Branding / Marketing /	15
Postharvest Management	14
Governance / Management of FPO / FPC	14
Organic Production	13
Micro irrigation	12
Bio-fertilizers	12
Protected Cultivation Technologies	11
Government Policies and Schemes	11
Banking (Access to Finance)	11
Input Management and Quality	10
Agricultural Waste Management	9
Good Agricultural Practices	9
Plant Health	8
Natural Farming Principles and Practices	8
Integrated Nutrition Management	7
Contract Farming	6
Accounting / Costing / Pricing	5

The survey results indicate that FPO farmers most need training in water use efficiency (20 responses) and soil health improvement measures (19 responses). Integrated pest management, storage/packaging/branding/marketing, and postharvest management are also key areas, with 15 responses each. Other important training needs include governance/management of FPO/FPC (14 responses), organic production (13 responses), and micro irrigation (12 responses). There is also a notable demand for training in bio-fertilizers, protected cultivation technologies, and government policies and schemes (11 responses each). These findings highlight the broad range of skills that FPO farmers seek to enhance their productivity and business management.

11.9 DOA Officers' Responses:

1. What specific climate change impacts have you observed affecting agriculture in your area of jurisdiction?

Table 34 Climate change impacts observed by DOA Officers affecting agriculture in area of jurisdiction

What specific climate change impacts have you observed affecting agriculture in your area of jurisdiction?	Response Count
Erratic rainfall patterns	30
Pests and diseases	23
Increased temperature	18
Reduced water availability	17
Soil degradation	16
Drought	13
Flooding	13
Changes in growing seasons	10
Heatwaves	9
Other	5

The data reveals that the most commonly observed climate change impact on agriculture is erratic rainfall patterns (30 responses), followed by pests and diseases (23 responses) and increased temperature (18 responses). Other significant impacts include reduced water availability (17 responses), soil degradation (16 responses), and drought and flooding (13 responses each). Changes in growing seasons (10 responses) and heatwaves (9 responses) were also noted. These findings indicate that climate variability is causing diverse and significant challenges to agricultural sustainability in the surveyed areas.

2. What are the climate resilient agricultural practices currently promoted in your district/taluka?

The data shows that the most promoted climate-resilient agricultural practices in the surveyed districts/talukas are crop diversification and soil conservation techniques (25 responses each), followed closely by organic farming (24 responses). Water-saving irrigation methods (18 responses) and drought-resistant crop varieties (16 responses) are also significant practices being encouraged. Agroforestry (8 responses) and other practices (5 responses) are less commonly promoted. These practices aim to enhance agricultural sustainability and resilience against climate-related challenges.

Table 35 Climate resilient agricultural practices currently promoted in district/taluka

What are the climate resilient agricultural practices are currently promoted in your district/taluka	Response Count
Crop diversification	**25**
Soil conservation techniques	**25**
Organic farming	**24**
Water Saving irrigation methods	**18**
Drought Resistant crop varieties	**16**
Agroforestry	**8**
Other	**5**

3. What challenges do administrative officers face in implementing Climate-Resilient Agriculture (CRA)?

Table 36 Challenges being faced in CRA

What challenges do administrative officers face in implementing Climate-Resilient Agriculture (CRA)?	Response Count
Insufficient training and awareness among farmers	31
Limited funding and financial resources	27
Inadequate infrastructure and technology	27
Resistance to change from traditional farming practices	23
Lack of coordination between government departments	11
Other	4
Monitoring and evaluation difficulties	3

Administrative officers face significant challenges in implementing Climate-Resilient Agriculture (CRA). The most reported issues include insufficient training and awareness among farmers (31 responses) and limited funding and financial resources (27 responses), along with inadequate infrastructure and technology (27 responses). Resistance to change from traditional farming practices (23 responses) also poses a barrier. Additional challenges, such as a lack of coordination between government departments (11 responses) and monitoring and evaluation difficulties (3 responses), highlight the complexity of implementing CRA effectively.

4. How does your office address these challenges?

To address challenges in implementing Climate-Resilient Agriculture (CRA), offices primarily rely on awareness campaigns (33 responses) and technical training and workshops (28 responses). Other key measures include providing government subsidies (23 responses) and collaboration with NGOs (10 responses). Financial assistance programs (6 responses) and other strategies (4

responses) are used less frequently, reflecting a focus on capacity-building and resource allocation to overcome barriers effectively.

5. Has your office recently undertaken any initiatives to support local farmers or enhance agricultural practices? How is the participation of the farmers in these initiatives or programs?

A majority of offices (50 responses) have recently undertaken initiatives to support local farmers or enhance agricultural practices, while only 6 reported no such efforts.

Regarding farmer participation, most of them (more than 60%) actively engage in these programs (20 responses). Some farmers (25%-50%) participate in 14 cases, while few (10%-25%) or very few (0%-10%) engage in 7 and 3 cases, respectively. However, none of them participated in 12 instances, indicating varying levels of farmer involvement depending on the context and outreach effectiveness.

Table 37 Forums available for farmers to obtain information about climate resilient practices

What platforms or forums are available for farmers to obtain information about climate resilient practices?	Response Count
Mobile apps	34
Agricultural extension services	25
Online forums	20
Government helplines	16
Local workshops	16
Farmer cooperatives	5
Radio programs	4
Other	3

5. What Platforms or forums are available for farmers to obtain information about climate resilient practices?

The data reveals that mobile apps (34 responses) and agricultural extension services (25 responses) are the most frequently used platforms for farmers to access information on climate-resilient practices. Online forums (20 responses) and government helplines (16 responses), along with local workshops (16 responses), are moderately utilized. However, platforms like farmer cooperatives (5 responses), radio programs (4 responses), and other sources (3 responses) are less commonly accessed. This highlights the growing reliance on digital tools and extension services for disseminating agricultural information.

6. What support schemes are available for small farmers related to CRA?

Table 38 Support schemes available for small farmers related to CRA

What support schemes are available for small farmers in your area related to CRA ?	Response Count
Crop insurance schemes	32
Loans for solar irrigation systems	22
Subsidies for climate-resilient seeds	21
Grants for organic farming practices	21
Training programs on sustainable agriculture	14
Schemes for integrated pest management	11
Other	3

The most accessible support schemes for small farmers related to climate-resilient agriculture (CRA) are crop insurance schemes (32 responses), followed by loans for solar irrigation systems (22 responses), and subsidies for climate-resilient seeds (21 responses). Grants for organic farming practices (21 responses) also play a significant role. Less emphasis is given to training programs on sustainable agriculture (14 responses) and schemes for integrated pest management (11 responses), while a minimal number of respondents mentioned other support options (3 responses). This indicates a focus on financial and input-related support with room to expand training initiatives.

7. How do you engage with farmers to understand their needs and challenges? What feedback mechanisms are in place to incorporate farmers' input and experiences into policymaking and program development?

The most common methods for engaging with farmers to understand their needs and challenges are regular meetings (34 responses) and focus groups (19 responses). Surveys (11 responses) and community forums (10 responses) are also used but to a lesser extent. Feedback forms (7 responses) and other methods (1 response) are minimally employed. This suggests that in-person and group-based interactions are the primary mechanisms, while formal written feedback systems are less emphasized.

8. Are there any specific technologies being used to enhance climate resilience in agriculture? Provide examples.

A majority of responses (45) indicate that specific technologies are being used to enhance climate resilience in agriculture, while 11 respondents reported no such technologies.

Among the examples provided, weather forecasting tools (18 responses) and irrigation management systems like drip irrigation (17 responses) are the most commonly utilized technologies. Renewable energy systems such as solar pumps (15 responses) are also popular. Other notable technologies include pest and disease management systems (8 responses), drought-resistant crop varieties (5 responses), and precision agriculture tools like GPS-guided tractors or drones (5 responses). Additionally, soil moisture sensors (3 responses) and other unspecified technologies (11 responses) contribute to resilience efforts.

This highlights the emphasis on resource-efficient and technology-driven solutions to address climate challenges.

The adoption rate of climate-resilient agricultural technologies among small farmers is predominantly low, with 35 responses indicating adoption below 40%. A moderate adoption rate (40-70%) was reported by 10 respondents, while a high adoption rate (above 70%) was observed in only 5 cases. Additionally, 6 respondents were uncertain about the adoption rate.

Factors likely influencing adoption include high initial costs, lack of awareness, insufficient training, and limited access to financial resources and infrastructure.

These barriers highlight the need for targeted interventions to promote the adoption of such technologies among small farmers.

9. What initiatives are in place to improve market access for small farmers? How do these initiatives impact farmers' income?

Table 39 Initiatives in place to improve market access for small farmers

What initiatives are in place to improve market access for small farmers	Response Count
Farmer markets	15
Direct to consumer sales platforms	15
Cooperative marketing efforts	12
Other	9
Online marketplace integration	5

Initiatives to improve market access for small farmers focus primarily on farmer markets and direct-to-consumer sales platforms, each reported by 15 respondents. Cooperative marketing efforts were identified by 12 respondents, while online marketplace integration was less common, with only 5 responses. Additionally, 9 respondents highlighted other initiatives, which could include localized or region-specific efforts. These strategies aim to reduce intermediaries and improve profitability for small farmers.

The impact of these initiatives on the income levels of small farmers appears mixed. 20 respondents reported an increase in income, suggesting that some farmers benefit from improved market access. However, 26 respondents noted no significant change, indicating limited effectiveness in many cases. Surprisingly, 8 respondents observed a decrease in income, possibly due to challenges in implementation or unforeseen market dynamics. 2 respondents mentioned other impacts, which might include indirect or longer-term effects.

This highlights the need for more effective and targeted measures.

10. What infrastructure facilities are available to support CRA in your jurisdiction?

The available infrastructure facilities to support Climate-Resilient Agriculture (CRA) in the jurisdiction include:

- Warehouses (23): The most commonly reported facility, aiding in storage and reducing post-harvest losses.
- Electricity availability (19): Ensures operational efficiency for irrigation systems, processing, and storage.
- Transport facilities (19): Facilitates timely movement of goods and market access.
- Primary processing centres (14): Adds value to produce, enhancing income opportunities.
- Market infrastructure (14): Supports selling produce directly to consumers or through markets.
- Seed manufacturing companies (11): Contribute to access to quality seeds, including climate-resilient varieties.
- Solar systems (11): Provide sustainable energy solutions for irrigation and other needs.
- Sorting & gathering centres (6): Aid in preparing produce for the market, improving efficiency.

This mix of facilities demonstrates progress but also highlights gaps in sorting and gathering centres, suggesting a need for improvement in post-harvest management.

11. How is the government investing in infrastructure to enhance climate resilience for farmers?

Table 40 Government investing in infrastructure to enhance climate resilience for farmers

How is the government investing in infrastructure to enhance climate resilience for farmers?	Response Count
Installing solar systems	21
Upgrading transport networks	18
Developing more warehouses	17
Improving market infrastructure	17
Funding primary processing centers	16
Other	4

The government's investment in infrastructure to enhance climate resilience for farmers includes:

- Installing solar systems (21): Providing sustainable energy solutions for irrigation and other agricultural needs.
- Upgrading transport networks (18): Enhancing connectivity for timely delivery of inputs and market access for produce.
- Developing more warehouses (17): Increasing storage capacity to reduce post-harvest losses.
- Improving market infrastructure (17): Facilitating better market access and direct farmer-to-consumer interactions.
- Funding primary processing centers (16): Supporting value addition and improving farmers' income opportunities.
- Other (4): Suggests additional initiatives such as local solutions or innovations specific to the region.

This reflects a focused effort to build infrastructure that supports climate-resilient practices and addresses the challenges faced by farmers.

12. How does the government monitor and evaluate the effectiveness of CRA programs? What metrics or indicators are used to assess the impact of these programs?

Table 41 Government Monitoring and Evaluation of Effectiveness of CRA

How does the government monitor and evaluate the effectiveness of CRA programs?	Response Count
Regular field assessments	27
Feedback from stakeholders	20
Impact studies	15
Data analytics on program outcomes	4
Other	3

Table 42 Indicators to Assess the Impact of CRA Programmes

What metrics or indicators are used to assess the impact of these programs ?	Response Count
Yield per hectare	24
Income increase percentage	19
Adoption of climatesmart practices	9
Farmer satisfaction surveys	8
Other	4

The government monitors and evaluates the effectiveness of Climate-Resilient Agriculture (CRA) programs primarily through regular field assessments, which are the most common method, followed by gathering feedback from stakeholders and conducting impact studies. Metrics used to assess the impact focus on yield per hectare and income increase percentages, which are the top indicators, alongside tracking the adoption of climate-smart practices and farmer satisfaction surveys. These approaches ensure a data-driven and participatory evaluation of CRA program effectiveness.

13. Based on your experience, what policy changes would you recommend to enhance climate resilience, capacity building, and profitability for small farmers?

Policy recommendations to enhance climate resilience, capacity building, and profitability for small farmers include increasing subsidies for climate-resilient seeds and promoting crop diversification, which received the most support. Other significant suggestions include implementing integrated pest management policies, developing insurance schemes to mitigate climate risks, and improving access to agricultural credit. Additional measures like mandatory training on sustainable farming and tax incentives for green infrastructure also highlight the need for comprehensive support systems for farmers.

Table 43 Recommendations for Policy Change

Based on your experience, what policy changes would you recommend to enhance climate resilience, capacity building, and profitability for small farmers?	Response Count
Subsidies for climate resilient seeds	32
Promoting crop diversification	28
Integrated pest management policies	20
Developing insurance schemes for climate risks	20
Enhancing access to agricultural credit	18
Mandatory training on sustainable farming	16
Tax incentives for green infrastructure	12
Other	7

14. What emerging trends or technologies should be considered for future programs?

Table 44 Emerging trends and technologies for future programs

What emerging trends or technologies should be considered for future programs ?	Response Count
Soil health management techniques	30
Use of renewable energy in agriculture	26
Climatesmart farming practices	19
Precision agriculture technologies (e.g., IoT, drones)	18
Adoption of biotechnology in crop improvement	16
Blockchain for transparent supply chains	11
Artificial Intelligence for crop monitoring and yield	10
Other	3

Interpretation of the survey responses:

- Soil health management techniques (30 responses): A significant number of respondents highlight the importance of improving soil health for sustainable farming. This suggests a growing recognition of the need for practices that enhance soil fertility and reduce degradation.
- Use of renewable energy in agriculture (26 responses): A strong interest in incorporating renewable energy, such as solar or wind power, indicates a push toward more sustainable and cost-effective farming practices.
- Climate smart farming practices (19 responses): Respondents emphasize the importance of adapting farming techniques to address climate change, including water-efficient practices and crop resilience to changing weather patterns.

- Precision agriculture technologies (18 responses): Technologies like IoT and drones are gaining traction, with farmers interested in optimizing resources, improving crop yields, and reducing costs through data-driven decision-making.
- Adoption of biotechnology in crop improvement (16 responses): There's a notable interest in using biotechnology to enhance crop varieties, improve resistance to pests and diseases, and increase yield potential.
- Blockchain for transparent supply chains (11 responses): A moderate number of respondents support blockchain to increase transparency and traceability in the agricultural supply chain, ensuring food safety and fair trade.
- Artificial Intelligence for crop monitoring and yield prediction (10 responses): AI's role in monitoring crop health and predicting yields shows potential for increasing efficiency and reducing losses.
- Other (3 responses): A small portion of respondents mention other technologies or practices not covered in the options provided, which could be worth exploring further.

Overall, the results suggest a strong focus on sustainability, technology integration, and efficiency in agriculture for future programs.

11.10 Responses of Financial Institutions:

Total 14 financial institutions were a part of the survey and these included 7 banks, 5 Cooperative societies and 2 other financial institutions. All the institutions which took part in the survey had been involved in providing financial services for more than 20 years.

1. What types of agricultural financing services does your institution offer?

Table 45 Types of agricultural financing services offered by FI

What types of agricultural financing services does your institution offer?	Response count
Equipment financing	11
Crop loans	9
Microloans	8
Other (Please specify)	6
Weather insurance	3

The survey responses indicate that agricultural financing services primarily focus on equipment financing (11 responses), crop loans (9 responses), and microloans (8 responses), which are

crucial for supporting farmers' operational and short-term financial needs. A few institutions also offer additional services (6 responses), suggesting some diversity in the types of financial support available. Weather insurance is less common, with only 3 responses, highlighting its more limited availability despite its potential importance in mitigating climate risks. Overall, institutions provide a range of financing options, with a focus on equipment and crop-related loans.

2. How does your institution perceive the importance of climate resilience in agriculture?

The responses suggest that climate resilience in agriculture is seen as a priority by most institutions. Eight institutions view it as very important, emphasizing a strong commitment to addressing climate-related challenges. Four institutions consider it important, indicating a recognition of its significance, though perhaps with less urgency. Only two institutions do not consider it important, suggesting that some may still overlook the need for climate resilience in agricultural practices. Overall, there is a general consensus on the importance of climate resilience.

3. What specific climate-related risks do you consider most significant for agricultural borrowers in the region?

The survey results highlight key climate-related risks faced by agricultural borrowers in the region. Drought emerged as the most significant concern, with 8 respondents identifying it as a critical issue. Flooding was a close second, noted by 7 participants, underscoring the dual challenges of water scarcity and excess. Extreme temperatures were highlighted by 6 respondents, reflecting growing concerns about the impact of temperature extremes on agricultural productivity. Pest and disease outbreaks received 5 mentions, indicating notable but slightly lower concern compared to climatic factors. Lastly, 4 respondents specified other risks, suggesting additional localized or less common concerns. Overall, the findings emphasize that water-related challenges—both drought and flooding—are the most pressing issues, indicating a need for targeted risk mitigation and adaptive strategies to ensure agricultural sustainability.

4. Does your institution have specific initiatives to support climate-resilient agriculture?

The survey results indicate that a majority of respondents (9) reported that their institutions have specific initiatives to support climate-resilient agriculture. However, 5 respondents stated that their institutions do not have such initiatives. This suggests that while there is a notable effort by some institutions to address climate resilience in agriculture, a significant proportion still lacks dedicated programs. This gap highlights an opportunity to expand and promote climate-resilient

practices across more institutions to better address the challenges posed by climate change in agriculture.

Among the institutions with initiatives to support climate-resilient agriculture, the most commonly reported measure is insurance, mentioned by 5 respondents, indicating its prominence as a strategy to protect farmers from climate-related losses. Subsidies were cited by 4 respondents, reflecting efforts to make climate-resilient practices more accessible. Risk mitigation funds were mentioned by 2 respondents, highlighting a focus on proactive financial planning for climate risks. Interest subvention, noted by just 1 respondent, appears to be a less common approach. Additionally, 3 respondents indicated other initiatives, suggesting the presence of varied or innovative strategies beyond the main categories. These findings show a range of financial and risk management tools being employed, though some measures appear underutilized, leaving room for broader adoption and innovation.

5. Do you have integrated climate risk assessment into your lending practices for agricultural loans? If yes, then what are they?

Nine out of the sample of 14 institutions have included climate risk assessment in their lending practices.

Table 46 Risk Assessment by FI

Climate Risk Assessment by FIs	Response count
Use of Climate Data for Loan Risk Analysis	4
Inclusion of Climate Risk Indicators in Credit Scoring Models	3
Regular Monitoring of Borrowers' Climate Vulnerability	2
Requirement of Climate-Resilient Practices for Loan Approval	0
Mandatory Crop Insurance for Climate-Related Risks	1
Integration of Weather Forecast Tools in Loan Assessment	1
Risk Sharing Mechanisms with Government or NGOs	0
Training for Loan Officers on Climate Risk Management	0
Other (Please specify)	3

The survey results reveal that financial institutions (FIs) are taking some steps toward integrating climate risk assessment into their operations, though the adoption of specific measures remains limited. The most commonly reported initiative is the use of climate data for loan risk analysis, mentioned by 4 respondents, indicating a growing recognition of its importance. Inclusion of climate risk indicators in credit scoring models was noted by 3 respondents, reflecting initial efforts to incorporate climate considerations into credit evaluation. However, other practices, such

as regular monitoring of borrowers' climate vulnerability (2 responses) and mandatory crop insurance for climate-related risks (1 response), are less frequently implemented. Notably, there were no responses for measures such as requiring climate-resilient practices for loan approval, risk-sharing mechanisms with governments or NGOs, or training for loan officers on climate risk management, suggesting significant gaps in these areas. Additionally, 3 respondents mentioned other initiatives, pointing to potential alternative strategies not captured by the predefined categories. These results indicate that while some progress has been made, there is substantial room for expanding and institutionalizing climate risk assessment practices within financial institutions.

6. What are your institution's main challenges in promoting financial support for climate-resilient agriculture?

The survey results indicate that the primary challenge faced by institutions in promoting financial support for climate-resilient agriculture is a lack of awareness, cited by 9 respondents. This highlights the need for increased education and outreach to build understanding of the importance of climate resilience. Limited resources were noted by 4 respondents, suggesting constraints in funding or capacity to implement climate-resilient initiatives. Regulatory hurdles, mentioned by 3 respondents, indicate that policy or compliance issues may also pose barriers. Interestingly, high cost was identified as a challenge by only 1 respondent, suggesting that financial feasibility may not be as significant a concern as other factors. Additionally, 4 respondents indicated other challenges, which may reflect unique or context-specific issues not captured by the predefined categories. These findings emphasize the importance of addressing awareness gaps and resource limitations to enhance institutional support for climate-resilient agriculture.

7. Are there opportunities or innovations your institution is exploring to enhance support for climate resilience in agriculture?

Table 47 Institutional Innovations to Support CRA

Are there opportunities or innovations your institution is exploring to enhance support for climate resilience in agriculture?	Response Count
Climate-smart credit products	3
Partnerships with tech companies	3
Digital financing platforms	4
Mobile banking	4
Other (Please specify)	7

The survey results reveal a variety of opportunities and innovations that institutions are exploring to enhance support for climate resilience in agriculture. Digital financing platforms and mobile banking were each mentioned by 4 respondents, indicating a strong interest in leveraging technology to improve access to financial services for farmers. Climate-smart credit products and partnerships with tech companies were both cited by 3 respondents, highlighting efforts to develop tailored financial solutions and collaborate with technology providers to address climate challenges. Additionally, 7 respondents mentioned other opportunities, suggesting a diverse range of innovative approaches beyond the predefined categories. These findings underscore the growing role of technology and innovation in strengthening climate resilience in agriculture while also pointing to untapped potential in exploring more tailored and collaborative strategies.

8. How can policymakers or support agencies facilitate the role of financial institutions in promoting climate-resilient agriculture practices?

Table 48 Role of Policy Makers / Support System Agencies to Support FI for CRA

How can policymakers or support agencies facilitate the role of financial institutions in promoting climate-resilient agriculture practices?	Response Count
Capacity building	7
Funding support	7
Policy incentives	6
Regulatory support	4
Other	3

The survey highlights key ways policymakers and support agencies can aid financial institutions in promoting climate-resilient agriculture. Capacity building and funding support, each cited by 7 respondents, are the most significant enablers. Policy incentives (6 responses) and regulatory support (4 responses) also play important roles. Additionally, 3 respondents mentioned other measures, indicating room for alternative approaches. These findings emphasize the need for training, financial backing, and supportive policies to enhance institutional efforts.

11.11 Responses of Educational Institutions:

Total 14 educational institutions were a part of the survey and these included 1 university, 6 colleges, 4 vocational training centres and 3 other institutions.

1. Do you have any specific courses focused on climate-resilient agriculture?

A total of 8 institutions offer specific courses on climate-resilient agriculture, indicating a growing recognition of its importance in academic programs. However, 6 institutions do not

currently offer such courses, which may reflect the need for broader integration of climate-resilient practices into educational curricula.

2. If yes, then please select from below one:

- Extension and Outreach Programs: 3 institutions offer this as part of their courses.
- Undergraduate Programs: 4 institutions offer undergraduate courses on climate-resilient agriculture.
- Certificate Courses: 1 institution offers certificate courses.
- Workshops and Seminars: 1 institution offers workshops and seminars.
- Research Programs: 2 institutions include research programs.
- Field Training and Internships: 2 institutions provide field training and internships.
- Collaborative Programs: 1 institution offers collaborative programs.

3. How do you integrate climate-resilient agriculture into your curriculum?

Institutions adopt different strategies to incorporate climate-resilient agriculture into their curriculum. Eight institutions embed modules within existing courses, suggesting an integration of climate resilience across multiple disciplines. Seven institutions emphasize field trips and practical training to provide hands-on experience, while six also offer workshops and seminars. Two institutions provide dedicated courses specifically focused on climate-resilient agriculture, underscoring the commitment to specialized education in this field.

4. What are the main areas of research related to climate-resilient agriculture at your institution?

- Crop breeding and genetics: 5 institutions focus on crop improvement for resilience.
- Soil health and management: 6 institutions prioritize soil health.
- Water management: 5 institutions research water management practices.
- Integrated Pest Management: 6 institutions focus on pest management techniques.
- Sustainable farming practices: 4 institutions engage in sustainable farming practices research.
- Other: 2 institutions cover other areas.

5. Do you collaborate with other institutions or organisations on climate-resilient agriculture research?

A large majority of institutions (13 out of 14) collaborate with other institutions or organizations in climate-resilient agriculture research. This high level of collaboration indicates a shared understanding of the need for collective action in addressing climate change challenges. Only 1 institution does not engage in such partnerships, which may suggest either a lack of resources or opportunities for collaboration.

6. Do you offer extension services to farmers?

All 14 institutions surveyed offer extension services to farmers, showing a strong commitment to bridging the gap between academic research and practical, on-the-ground solutions. Extension services are essential for disseminating knowledge and technologies to farmers, particularly those related to climate resilience.

7. What types of extension services do you provide?

- Technical Assistance and Training: 8 institutions offer this service.
- Soil Testing and Fertility Management: 7 institutions provide this service.
- Community Development Programs: 5 institutions include these programs.
- Farm Mechanization and Technology Transfer: 7 institutions provide this service.
- Other: 1 institution offers other types of services.

8. Do you collaborate with government agencies, NGOs, or the private sector in your extension activities?

- Yes: 12 institutions collaborate with various organizations.
- No: 2 institutions do not collaborate.

9. How do you engage the local farming community in your educational and research activities?

- Community workshops: 9 institutions use workshops for engagement.
- Field demonstrations: 7 institutions engage farmers through field demonstrations.
- Farmer participatory research: 5 institutions involve farmers in research.
- Other: 2 institutions use other methods.

10. Have you implemented any programs related to CRA (Climate-Resilient Agriculture)?

A significant majority of institutions (11 out of 14) have implemented programs related to climate-resilient agriculture. These programs are designed to equip farmers with the tools and knowledge needed to adapt to climate change, while 3 institutions have yet to launch such programs.

11. If yes, what impact have these programs had on local agriculture and farmer livelihoods?

The impact of climate-resilient agriculture programs has been multifaceted. Improvements in crop yield, soil health, and drought resistance have been noted by several institutions, indicating the effectiveness of these programs in enhancing agricultural productivity. Other reported benefits include better planning with weather forecasts, mitigation of financial losses, and improved water usage, demonstrating a positive influence on both farm productivity and farmer livelihoods.

12. What support do you need to enhance your educational and research activities in climate-resilient agriculture?

Institutions recognize the need for various forms of support to further their climate-resilient agriculture efforts. Eight institutions require more technical expertise, while six seek financial support to fund research and educational activities. Four institutions expressed a desire for greater collaboration with other organizations, and six institutions highlighted the need for better infrastructure. Only one institution mentioned other specific needs, emphasizing the importance of strengthening both the research and practical capacities in this area.

13. Do you have any suggestions for improving agricultural education and promoting climate-resilient practices?

Institutions provided several key suggestions for improving agricultural education. Eight institutions called for increased funding for agricultural research, while another eight advocated for the development of climate-resilient crop varieties. Regular workshops and field demonstrations (8), enhanced training programs for farmers (6), and better access to climate-related information (7) were also highlighted. Other suggestions included the implementation of digital tools for education (6) and increased collaboration with local universities and research institutions (7), underscoring the importance of comprehensive and collaborative efforts in promoting climate-resilient agricultural practices.

12 Chapter 12 Collection of Inspiring Stories from the Field and Educational Videos

12.1 Preface:

Agriculture stands as the backbone of India's economy, intricately linked to the lives and livelihoods of millions across the nation. In the face of mounting challenges such as climate change, evolving market dynamics, and limited natural resources, the urgency for sustainable practices and innovative solutions has never been greater. VANAMATI, as a dedicated agricultural extension institution, acknowledges the pivotal role of empowering farmers with knowledge and practical insights to seamlessly blend traditional wisdom with modern technology.

This report embodies VANAMATI's unwavering commitment to fostering growth, resilience, and transformation in agriculture. Through an array of educational videos and compelling farmer success stories, we aim to provide actionable guidance on contemporary farming techniques, present on-ground examples of positive change, and promote the spirit of peer learning.

The narratives showcased in this report underscore the perseverance, solidarity, and adaptability of our farmers. These individuals are not merely responding to change but are at the forefront of creating a sustainable agricultural ecosystem and nurturing entrepreneurial spirit. Their success stories stand as powerful testaments to the fact that innovation, when coupled with determination, yields extraordinary outcomes.

We trust that this compilation will serve not only as an educational resource but also as a source of inspiration for stakeholders across the agricultural spectrum to pursue excellence relentlessly. It is with great pride that we present these stories and practices, which exemplify the transformative potential of knowledge and collaboration.

12.2 List of Inspiring Stories and Educational Videos:

1. Cultivating Prosperity with Intercropping and SHG Leadership.
2. Adapting To Climate Change with Floriculture.
3. KRUSHAK SWARAJ FPO: Driving Collective Growth Through Agricultural Innovation.
4. Saguna Rice Technology: Revolutionizing Paddy Cultivation with Zero Tillage.
5. Kanchani FPO: Empowering Farmers to Become Agri-Preuners.
6. Automation And Scheduling Through Frugal Innovation.
7. Educational Video on Pink Bollworm Identification and Pheromone Trap Installation.
8. A Young Engineer's High-Tech Revolution in Gerbera and Orchid Farming.
9. Decentralized Convergence: Integrated Pest Management with Home-Made TRICHOCARDS.
10. Silk Farming: A Profitable Alternative to Traditional Crops.
11. Circular Economy: Using Livestock Waste for Sustainability and Entrepreneurship.
12. Azolla Farming to Enhancing Livestock Nutrition.
13. Educational Video Series on Polyhouse and Shade Net House.
14. Educational Video on Nursery Plantation.
15. De-Topping in HDPS Cotton: A Proven Method for Enhanced Yield and Quality.
16. Transforming Agriculture with Biofertilizers and Sustainable Farming Practices – Mahendra Thakur.
17. A Journey from Soil Erosion to Organic Farming Excellence.
18. Building Climate Resilience Through Integrated Farming and Sustainable Animal Husbandry.
19. Transforming Organic Farming Through Innovation and Value Addition.
20. SEEDOGREEN: Redefining Rural Prosperity Through Farmer-Led Innovations.

12.2.1 Cultivating Prosperity with Intercropping and SHG Leadership

Farmer Name: Smt. Lata Gaikwad

Region: Hingna, District Nagpur

Link: https://youtu.be/CmISxTt4-z4?si=b4K7_D1idyF__bXS

The Transformative Journey of Lata Gaikwad: Pioneering Organic Farming

Lata Gaikwad's story highlights the challenges and potential of adopting organic farming. In her village, the excessive use of chemical fertilizers and pesticides had led to soil infertility, reduced agricultural productivity, and health issues caused by chemical residues in farm produce. The lack of availability of organic inputs in the region further complicated the situation. Recognizing these issues, Lata decided to explore organic farming as a solution.

The Challenge:

Lata's farm had been suffering from deteriorating soil fertility and increased salinity due to the prolonged use of chemicals. The health concerns associated with chemical residues in food added to the urgency for change. Additionally, the unavailability of organic inputs in her area meant that Lata had to find ways to produce her own inputs.

The Response:

Lata, with the support of community initiatives and government programs, adopted organic farming practices. Key actions included:

- Training Programs: Lata attended training sessions on sustainable agriculture and soil health management to learn about organic farming practices.
- Soil Testing: Regular soil testing was conducted on her farm to monitor soil health and make informed decisions.
- Intercropping and Integrated Farming: Lata implemented intercropping and integrated farming on her two-acre plot, using organic fertilizers to improve productivity.
- Empowering Women: She encouraged women in her community to form self-help groups (SHGs) to participate in sustainable farming practices and achieve financial independence.

These steps helped Smt. Lata transition to organic farming and inspired others in her community to follow suit.

The Results:

The shift to organic farming brought noticeable improvements:

- Improved Soil Health: The fertility of her soil increased, salinity issues were reduced, and carbon content improved.
- Healthier Environment: The use of organic methods eliminated harmful chemicals, creating a safer agricultural ecosystem.
- Economic Benefits: Lata's organic produce, such as turmeric ("Haldi") and pigeon pea ("Toor Dal"), gained popularity in the market. She earned ₹30,000 from Toor Dal at a recent Krushi Samellan and secured regular buyers for her organic products.
- Leadership Role: Lata became a role model for women in agriculture, showing how they can lead efforts in sustainable farming and community development.

Future Plans:

Lata plans to establish an input store to market her bio-inputs, including Dashparni, Neem Oil, and Vermicompost, making these resources accessible to other farmers in her region.

Conclusion:

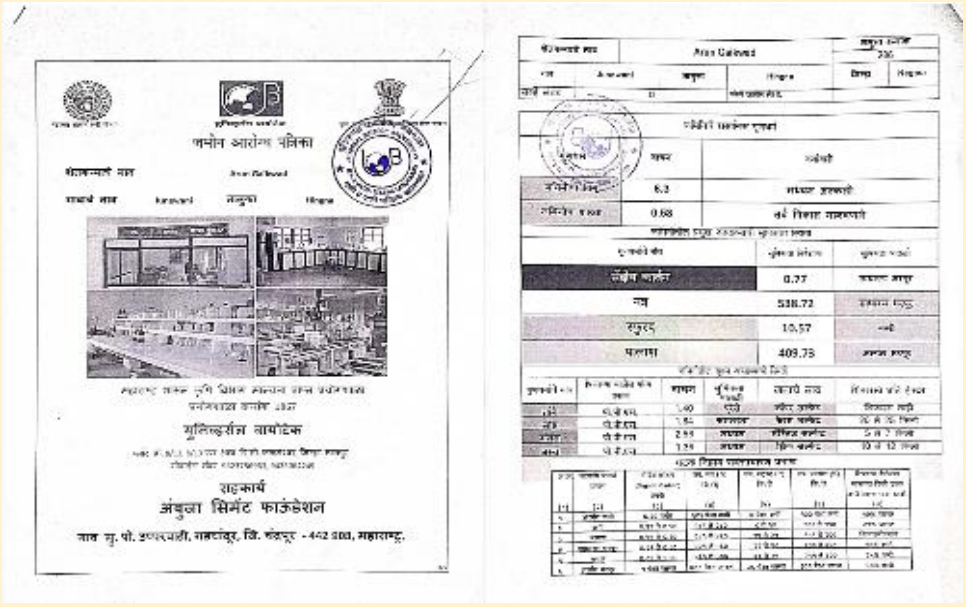
Lata Gaikwad's journey illustrates the benefits of organic farming in improving soil health, reducing environmental harm, and enhancing livelihoods. Her efforts also highlight the important role of women in driving sustainable agricultural practices. This case serves as a practical example for farmers seeking to adopt sustainable methods and contribute to inclusive agricultural growth.

Smt. Lata Gaikwad with her Fellows

Vermicompost Production Unit

Lata Gaikwad demonstrating the process of making bio-input

Demonstration



Soil testing report shows organic carbon 0.77

12.2.2 Silk Farming: A Profitable Alternative to Traditional Crops

Farmer Name: Narendra Mahalle

Region: Saoner Taluka (Vidarbha)

Link: https://youtu.be/NvoW5b629oc

The Journey of Narendra Mahalle: Transitioning to Floriculture

Narendra Mahalle, a farmer from Saoner taluka, faced the limitations of traditional farming with crops like cotton, sorghum, and pigeon pea, which offered limited financial returns. Unpredictable rainfall and pest infestations, exacerbated by increasing climate variability, further reduced the reliability of these crops. To ensure a stable monthly income, Mahalle sought alternatives that could adapt to these challenges and offer better financial prospects.

The Challenge:

Mahalle's traditional farming methods were no longer sustainable. The profitability of conventional crops was inconsistent, and climate-related issues like erratic rainfall and pest attacks worsened the situation. He needed a solution that could provide a steady income while addressing these challenges.

The Response:

Under the Integrated Horticulture Development Campaign (2022-23) by the Agriculture Department, Mahalle received financial and technical support to shift to floriculture. Key measures included:

- Establishment of a Packhouse: With government assistance, Mahalle set up a packhouse to store flowers and facilitate agricultural training for local farmers.
- Adoption of Modern Techniques: Guided by the agriculture department and local advisors, he adopted drip irrigation for precise nutrient delivery to crops, reducing the risk of fungal infections and pest infestations like thrips.
- Innovative Practices: Mahalle became the first farmer in the district to use drip irrigation for tuberose ("Nishigandha"), demonstrating his willingness to experiment with advanced methods.

These initiatives allowed him to transition successfully to floriculture while maintaining vegetable farming on a portion of his land.

The Results:

The adoption of floriculture brought significant benefits:

- Monthly Income Stability: Cultivating tuberose on three acres, alongside vegetable farming on two acres, generates a steady income of ₹50,000 to ₹60,000 per month.

- Recognition: Mahalle's dedication and innovative approach earned him the Progressive Farmer and Agriculture Enthusiast Award from the Agriculture Department of Nagpur district.
- Community Impact: The packhouse established on his farm became a hub for agricultural education, hosting training sessions and farmer schools to disseminate knowledge.
- Climate Adaptation: Regular farm inspections and timely interventions, such as pest control measures, minimized losses from climate variability.

Evidence of Success:

- Economic Transformation: The shift from traditional farming to floriculture ensured a stable monthly income, enhancing Mahalle's financial security.
- Technical Leadership: His successful use of drip irrigation for tuberose highlighted his role as a pioneer in adopting modern techniques.
- Community Contribution: The training sessions held at his packhouse empowered other farmers, promoting collective growth and innovation.
- Recognition: The Progressive Farmer award validated his efforts and set an example for others in the district

Conclusion:

Narendra Mahalle's journey underscores the potential of targeted support, innovative practices, and resilience in transforming agriculture into a sustainable enterprise. His consistent income, adaptation to climate challenges, and role as a mentor to other farmers make him a role model for adopting floriculture as a viable livelihood strategy in similar regions. This case demonstrates how determined individuals can drive change and contribute to the broader goals of sustainable and inclusive agricultural development.

Packhouse built at Mahalle's Farm by the Agriculture Department, Saoner

12.2.3 KRUSHAK SWARAJ FPO: Driving Collective Growth through Agricultural Innovation

FPO Name: Krushak Swaraj Farmer FPO

Region: Rajura (Chandrapur)

Link: https://youtu.be/k2eLkMcxE_Y?si=lGEMoC__SZ1TjKId

The Transformation of Chandrapur Farmers: Empowerment through the Krushak Swaraj Initiative

The Challenge:

Chandrapur district, located in Maharashtra's Vidarbha region, has long grappled with issues such as farmer suicides, debt, and unsustainable agricultural practices. With 69.5% of farmers being small landholders, the cultivation of low-return crops like cotton and rice left them economically vulnerable. Despite being a significant chilli-producing region, the district's potential for chilli cultivation was underutilized.

Erratic weather patterns further aggravated the situation, reducing yields and increasing reliance on expensive external inputs. Farmers also faced difficulties accessing markets, fluctuating chilli prices (with no Minimum Support Price), and high transportation costs to distant markets like Nagpur, which compounded their struggles.

The Response:

To address these challenges, the Krushak Swaraj Farmer Producer Organization (FPO) launched an initiative aimed at fostering "Prosperous Farmers, Sustainable Environment & Healthy Consumers." Key actions included:

- Agri-Input Advisory Services: Providing farmers with expert guidance on cost-effective and sustainable farming practices.
- Weather Forecasting: Sharing timely weather updates through WhatsApp channels to help farmers plan their activities effectively.
- Capacity-Building Training: Equipping farmers with knowledge about crop management, market linkages, and sustainable practices.
- Market Support: Establishing direct market linkages to reduce dependency on intermediaries and increase farmers' profits.

Additionally, the FPO facilitated access to government schemes, including crop insurance and incentives for chilli cultivation, through platforms like MahaDBT and NABARD. Integrated and organic farming practices were promoted to lower input costs using local bio-pesticides and fertilizers.

The Results:

The initiative led to substantial improvements in the lives of Chandrapur farmers:

- Economic Gains: Chilli growers reported a net profit increase to ₹3.35 lakh per acre.
- Market Accessibility: Direct market linkages enabled farmers to secure better prices for green and dried chilli while reducing transportation costs.
- Production Efficiency: Quality Agri-inputs and improved crop management practices enhanced productivity and crop quality.

Farmers adopted innovative practices such as using nursery plants and Tricho-compost for chilli cultivation. Residue-free chilli production opened opportunities in premium markets, including ITC, further boosting incomes.

Evidence of Success:

- Statistics:
    - Over 2,974 farmers engaged with the FPO across 90+ villages.

- Total chilli sales in 2024 amounted to ₹8 crore, significantly contributing to the district's economy.
- Approximately 81,000 kg of low-grade chilli was sold at a ₹15 higher price per kg than the market rate, benefiting farmers by ₹12.81 lakh.

- Anecdotal Evidence:
  - Farmers from Rajura taluka earned an average of ₹2 extra per kg compared to traditional sales methods.
  - Timely interventions by the FPO helped 500 farmers secure free crop insurance.
- Recognition:
  - Awards such as "Krushithon Adarsh FPO" and Agrostar's "Most Promising FPO" recognized the initiative's success and impact.

Conclusion:

The Krushak Swaraj initiative exemplifies how empowering farmers through comprehensive agricultural services and value-chain integration can drive economic upliftment and sustainability. By addressing systemic challenges, the FPO has transformed Chandrapur's agricultural landscape, offering a replicable model for other regions. This initiative highlights the power of collective action, innovation, and support in creating a resilient and prosperous farming community.

Krushak Swaraj's Bio-Input store and crop nursery

 Krushak Swaraj's Nursery and Drone on Farm	

12.2.4 Saguna Rice Technology: Revolutionizing Paddy Cultivation with Zero Tillage

Farmer Name: Vinod Rayse

Region: Zharap (Kamptee)

Link: https://youtu.be/iDkd7ci4QKo?si=sTw4UZ-49EYHDawJ

The Transformative Journey of Vinod Rayse: Pioneering Sustainable Farming Practices

Situation:

In the semi-arid region of Kamptee tehsil, Zharap village farmer Vinod Rayse emerged as a trailblazer in adopting Saguna Rice Technology (SRT) under the Agricultural Technology Management Agency (ATMA) scheme. Traditional rice farming methods in the area were expensive, labor-intensive, and reliant on extensive tillage, which progressively degraded soil fertility. Coupled with the climatic challenges of the region, maintaining soil health and achieving consistent productivity were significant hurdles for farmers.

Vinod, managing 17 acres of farmland, sought sustainable farming solutions that would reduce input costs while improving yields. Having already established a practice of producing vermicompost from cattle manure, he was well-positioned to transition into organic farming practices.

Response:

To address these challenges, Vinod adopted Saguna Rice Technology, a zero-tillage farming method emphasizing soil conservation and cost reduction. Support from the ATMA scheme facilitated this transition through:

- Training and Assistance: Vinod received training on SRT bed preparation and free inputs such as seeds, Trichoderma, and iron frames essential for implementing the technology.
- Integrated Farming Expansion: Leveraging his expertise in vermicompost production, Vinod diversified his farming to include sugarcane, soybean, gram, and vegetables, adopting organic methods across all crops.
- Community Engagement: Vinod formed a natural organic farming group comprising 50 farmers. Under ATMA's guidance and mentorship from Nashik's Jambhulkar, the group received comprehensive training in organic and integrated farming techniques.

Results:

Vinod's innovative approach yielded transformative outcomes:

- SRT Implementation: By adopting SRT, Vinod achieved year-round cropping with zero tillage, significantly enhancing soil fertility and productivity.
- Higher Yields: The premium-quality rice produced using SRT garnered market demand, and low input costs further increased profitability.
- Increased Income:
    - Sugarcane cultivation alone generates an annual income of ₹6 lakh.
    - Additional crops, including vegetables and pulses, contribute an extra ₹5–6 lakh annually.
- Community Impact: Through his organic farming group, Vinod has inspired other farmers in the region to adopt integrated and organic farming practices, promoting sustainability at scale.

Evidence:

- Statistics:
    - 17 acres of farmland are now managed using organic and integrated farming methods.
    - Annual revenue from sugarcane alone is ₹6 lakh, with total earnings from other crops adding ₹11–12 lakh.
- Community Engagement:
    - 50 farmers actively participate in the organic farming group, receiving ongoing training and mentorship.
    - Regular workshops facilitated by agricultural experts under the ATMA scheme strengthen community knowledge and capacity.
- Anecdotal Evidence:
    - Vinod's success story highlights the practical benefits of SRT and organic farming, particularly for large-scale farmers traditionally resistant to change.

Conclusion:

Vinod Rayse's pioneering adoption of Saguna Rice Technology and his commitment to organic farming practices demonstrate the potential of sustainable agriculture to address the limitations of conventional methods. His leadership in forming a farmer group and promoting integrated farming has created a positive ripple effect in the region, making him a model for progressive and sustainable agricultural practices.

Sowing the rice seeds using SRT

सकाळ

शून्य खर्चाने शेतात धान पिकाची लागवड

मजुरीचा वाढता खर्च, मजुरांची टंचाई यावर मात करण्याचा प्रयोग

शेतकरी विनोद रयसे यांचा पुढाकार

12.2.5 Kanchani FPO: Empowering Farmers to Become Agripreneurs

FPO Name: Kanchani Farmer Producer Company Ltd.

Region: Warora (Chandrapur)

Link: https://youtu.be/yrGjSzX9Kac?si=GtIEjyYjadkEUD0r

The Kanchani Farmer Producer Company (FPC), founded in 2017 in Warora, Chandrapur, was established to tackle the challenges faced by farmers in traditional agriculture. These included low returns due to middlemen, low market prices, high input costs, and inadequate infrastructure. The company aimed to improve marketing and processing while offering sustainable solutions for farmers.

The region's climate, with its jungle cover, helped reduce crop damage from wildlife and adverse weather, especially as farmers shifted from cotton to turmeric. However, erratic weather still impacted crop productivity. Farmers in the area also faced labor shortages due to the industrial nature of the district, increasing their reliance on mechanization. Many experienced losses from cotton farming, highlighting the need for alternative, high-value crops like turmeric.

In response, agricultural extension services focused on infrastructure development and crop diversification. Agricultural service centres and equipment banks were set up, providing tools such as brush cutters, tractors, power tillers, and turmeric boilers to reduce labour dependency. Partnerships with the Maharashtra State Warehousing Corporation enabled farmers to store their produce and sell it at better prices. Turmeric was introduced as an alternative to cotton, with higher yields, lower input costs, and better resistance to wildlife and climatic conditions. High-yield, disease-resistant turmeric seeds (ACC Pragati 148) from Kerala were distributed, leading to an increase in turmeric cultivation to 1,300 acres.

The company also eliminated middlemen by establishing local collection centers and ensuring direct sales, which improved pricing transparency and allowed farmers to receive timely payments. Over 80 buyers across India were engaged, which helped increase profits from produce sold outside Maharashtra.

The results were significant. In 2023, the company collected 65,000 quintals of produce, benefiting 8,000 farmers and increasing their earnings. The business turnover for the year reached ₹84 crore. Farmers also saved on transportation costs, with savings of ₹4–5 per 100 kg by using local centers. The system's weight accuracy and cash payments strengthened

farmer trust. The transition from cotton to turmeric reduced labor and input costs, while increasing profitability. Certified seed production was promoted, ensuring better quality and yields.

The company's success was evident in the figures: 95% of the collected produce was sold outside Maharashtra, reaching high-demand markets in Bengal, Odisha, and Assam. Mechanization, with access to 12 tractors and other equipment, reduced labor burdens. The company collaborated with PDKV Akola for turmeric processing technology and became a certified vendor for ITC, providing access to higher-value markets. Additionally, farmers across 250 villages participated in capacity-building programs, and information about market rates, weather forecasts, and agricultural advisories was shared with 8,500 farmers through WhatsApp groups and voice messages.

The Kanchani Farmer Producer Company has successfully addressed agricultural challenges by promoting crop diversification, mechanization, and direct market access. Its model has led to improved farmer incomes and reduced inefficiencies, offering a sustainable approach that could be replicated across India.

Cotton Ginning Workshop of the Kanchani FPO

Dr. Pravin Gedam (IAS), Commissioner, Dept. Of Agriculture, Maharashtra State

12.2.6 Automation and Scheduling through Frugal Innovation

Farmer Name: Mr. Verma

Region: Devburdi, Kalmeshwar

Link: https://youtu.be/gzbWKp3UKzg?si=-vjlj2M9nTAbz7lP

In January 2023, Mr. Verma, an orange farmer from Devburdi, Kalmeshwar, faced significant challenges managing irrigation and fertigation in his orchard. Manual operations led to inconsistent water distribution, with some plots receiving too much water while others had insufficient supply. Additionally, soil-applied fertilizers were not effectively absorbed by the trees due to fixation in the soil, leading to inefficient nutrient management.

The farm was located in a region where precise water management was critical due to fluctuating weather and varying soil moisture needs. Managing irrigation and fertigation manually was labor-intensive, time-consuming, and inconsistent. Mr. Verma needed a more efficient, cost-effective solution to improve operations and productivity.

To address these issues, Mr. Verma turned to automation technology and opted for a cost-effective solution using the Irricare system from Jain Irrigation. The system was designed to improve water distribution, fertigation precision, and overall farm efficiency.

The implementation involved the following steps:

1. Irrigation Scheduling: Mr. Verma installed the Irricare board and automatic valves to ensure precise scheduling of drip irrigation. Technical issues were resolved within two months to ensure reliable operation.
2. Fertigation System: Two 1000-liter tanks for sulfate and nitrate fertilizers were installed, connected to controlled Venturi units from Netafim. A 3HP booster pump was integrated with the Irricare board to automate fertigation timing. Fertilizer was applied in the final 25 minutes of the irrigation schedule, allowing thorough nutrient application without clogging the drip lines.
3. Cost Efficiency: Instead of opting for high-end automation systems costing ₹4.5–12 lakh, Mr. Verma customized a solution for just ₹1.5 lakh by purchasing and installing essential components independently.

The results were highly positive:

- Efficiency: The automated system now manages irrigation and fertigation across five plots, ensuring timely and precise operations.
- Increased Production: The orange yield increased from 10–12 tons to 22 tons during the Ambiya season, and an additional 10 tons were harvested in the Mrug season.
- Labor Savings: The system eliminated the need for manual monitoring, significantly reducing labor dependency.

The automated fertigation system minimized soil fixation of fertilizers, improving nutrient uptake by the trees and leading to healthier crops and higher yields.

Key statistics include:

- Total automation cost: ₹1.5 lakh.
- Yield improvement: From 10–12 tons to 22 tons during the Ambiya season, plus an additional 10 tons in the Kharif season.

The system saved time, labor, and resources while improving productivity. Mr. Verma noted that consistent water and nutrient application throughout the year boosted production and eliminated fertilizer wastage concerns.

In conclusion, this cost-effective automation approach demonstrates how progressive farmers like Mr. Verma can overcome irrigation and fertigation challenges without incurring high costs. It not only improved yields but also served as an example of how technology can enable precision agriculture, driving better profits and sustainability.

Assembly of automated drip irrigation at Verma's farm, automated scheduling control panel and Venturi system

Drip Irrigation at Verma's farm

12.2.7 Educational Video on Pink Bollworm Identification and Pheromone Trap Installation

Expert: Dr. Babasaheb Fand, Scientist, ICAR, Nagpur

Empowering Cotton Farmers: Effective Management of Pink Bollworm Through Education and Innovation

Background:

The pink bollworm (Pectinophora gossypiella) is a major pest in cotton farming, causing severe yield losses. Farmers often struggle to identify the pest in its early stages, resulting in delayed interventions and significant crop damage. Early detection and preventive measures, such as pheromone traps, are crucial for minimizing the pest's impact on cotton crops.

Climatic Condition:

Cotton-growing regions provide favorable conditions for the pink bollworm, with warm temperatures and extended crop cycles. Early pest detection is critical to prevent widespread damage.

Farmer Condition:

Many farmers lacked the knowledge and practical skills required to identify the pink bollworm and effectively install and use pheromone traps.

Response: Educational Initiative:

To address these issues, VANAMATI partnered with ICAR to create an educational video featuring Dr. Balaji Fand, an expert scientist from ICAR. The video was designed to educate farmers on:

- Visual identification of the pink bollworm at various life stages.
- Proper installation and maintenance of pheromone traps for effective pest monitoring.

Content Highlights:

- Clear, step-by-step guidance on identifying the pest, including its eggs, larvae, and adult moths.
- A demonstration of pheromone trap setup and placement strategies to maximize efficacy.

- Expert advice from Dr. Fand on integrated pest management practices to complement pheromone traps.

Results: Knowledge Dissemination:

The video became an accessible, practical guide for farmers, encouraging the adoption of pheromone traps and improving pest management practices in cotton farming.

Reach:

With subtitles in English and clear visuals, the video was accessible to a broad audience beyond just Marathi-speaking regions.

Evidence-Expert Support:

Farmers reported a significant improvement in their ability to identify the pink bollworm and use pheromone traps effectively. Dr. Balaji Fand's involvement lent credibility and scientific rigor to the content, ensuring its accuracy and relevance.

Conclusion:

The educational video has effectively addressed the knowledge gap in pink bollworm management, providing cotton farmers with the tools to protect their crops. Featuring a renowned scientist and offering practical demonstrations, the video has laid a strong foundation for sustainable pest control practices, empowering farmers and boosting cotton productivity.

Location: ICAR, Nagpur - A still from the YouTube video, with expert informing on installation of Pheromone Trap

12.2.8 A Young Engineer's High-Tech Revolution in Gerbera and Orchid Farming

Farmer Name: Ankit Lande

Region: Katol

Link: https://youtu.be/tCVUPHIUC3U

Ankit's Journey: Transforming Floriculture with Polyhouse Farming

Situation Background:

In recent decades, Indian farmers have been adopting innovative farming techniques to achieve more sustainable and profitable agricultural practices. Among them, Ankit, a young and ambitious farmer, recognized the potential in high-tech floriculture. With the rising demand for flowers such as Gerbera and Orchids, which offer higher profits compared to traditional crops, he decided to diversify his farm and focus on these high-value crops

Climatic Condition:

Ankit's farm is located in a region that experiences fluctuating temperatures, which poses significant challenges for traditional open farming, especially for crops like Gerbera and Orchids that require specific environmental conditions for optimal growth. These flowers are highly sensitive to temperature fluctuations and pests, making them difficult to cultivate using conventional farming methods. Moreover, the region's weather conditions—characterized by periods of extreme heat and occasional heavy rainfall—further complicate crop cultivation. These climatic challenges meant that Ankit needed a way to control and stabilize the environment for his flowers to thrive, which led him to explore protected cultivation solutions.

Farmer Condition:

Ankit's decision to pursue floriculture was driven by his ambition to overcome the limitations of traditional farming practices. While many farmers in his community were hesitant to invest in modern agricultural technologies due to high initial costs and uncertain returns, Ankit recognized that adopting innovative solutions was crucial for maximizing his farm's potential. He also noted that traditional farming methods often led to poor yields and unstable incomes, particularly when weather conditions were unfavorable. Ankit was determined to

break this cycle and explore more sustainable, profitable farming techniques, especially as he understood the rising market demand for high-quality flowers like Gerbera and Orchids.

Agriculture Extension Response:

With support from agricultural extension services, Ankit decided to implement a polyhouse for controlled environment farming. Agricultural extension played a crucial role in guiding him through the process, providing information on the necessary technologies, and connecting him with experts and financial support programs. Polyhouses are designed to protect crops from extreme weather conditions, maintain consistent temperature and humidity, and ensure year-round production, which was essential for Ankit's flower cultivation.

Implementation of Policy:

The Indian government's support for protected cultivation through subsidies and schemes also played an important role in making this venture financially viable for Ankit. These government policies were aimed at encouraging farmers to adopt modern, sustainable farming practices. Ankit received a subsidy of ₹8.9 lakh for establishing a 20 Guntha polyhouse, which significantly reduced the initial capital investment required for the project. The financial assistance, combined with the expertise offered by agricultural extension services, made it easier for Ankit to set up the polyhouse and begin cultivating his flowers under controlled conditions.

Results - Key Outcomes:

- Profitability: Focusing on high-value flowers like Gerbera and Orchids led to a significant increase in Ankit's profits. By having control over the environmental conditions, he was able to produce flowers of better quality and consistency, commanding higher prices in the market.
- Sustainable Farming: The polyhouse allowed Ankit to cultivate flowers year-round, providing a steady income stream. Unlike traditional crops, which may suffer from seasonal fluctuations, his flowers could be sold consistently, ensuring a stable financial outlook.
- Inspiration for Others: Ankit's success with floriculture and polyhouse farming became an inspiration for other young farmers in Maharashtra. His journey showed

them that innovation and modern agricultural techniques could lead to greater profitability and sustainability in farming.

Community Impact:

Ankit's success not only impacted his farm but also contributed to a shift in the agricultural mindset within his community. His achievements have inspired local youth to explore high-tech farming methods, creating a ripple effect that has encouraged others to break away from traditional farming practices. Many of Ankit's peers now see the potential of modern farming technologies, and more farmers are considering polyhouse cultivation for crops beyond just flowers, such as vegetables and herbs.

Evidence Statistics:

- Ankit's profits from floriculture have consistently increased since the polyhouse installation, with a noticeable rise in earnings from Gerbera and Orchids.
- He has created employment opportunities for skilled labor in polyhouse management and flower cultivation, helping to support the local economy.
- Ankit now earns between ₹6 to ₹7 lakh annually from his polyhouse floriculture venture, a significant improvement over the income he earned through conventional farming.

Conclusion:

Ankit's success in floriculture with the use of a polyhouse is a powerful example of how modern agricultural practices can significantly impact farm profitability and sustainability. Through the support of agricultural extension services and government subsidies, Ankit was able to overcome the challenges of his region's fluctuating climate and the limitations of traditional farming. His journey serves as an example for other young farmers, proving that innovation, hard work, and the adoption of modern technologies can lead to substantial agricultural success. His story has been widely shared through local media and agricultural extension platforms, inspiring farmers not only in Maharashtra but across India, to explore high-tech farming solutions.

 Ankit Lande's Polyhouse for Gerbera Cultivation	

12.2.9 Decentralized Convergence: Integrated Pest Management with home-made Trichocards

SHG Name: SARASWATI SWAYAM SAHAYATA SAMUH

Region: Khari-Pannase (Hingna), Nagpur

Link: https://youtu.be/LyEd93dSGzI

Empowering Rural Women: The Journey of SARASWATI SWAYAM SAHAYATA SAMUH in Sustainable Farming and Entrepreneurship

Situation - Background:

The SARASWATI SWAYAM SAHAYATA SAMUH (SHG), located in Khairi Pannase village, Hingna, Nagpur, has a legacy of 15 years. Originally focused on savings and financial management, the group lacked exposure to business activities and entrepreneurial opportunities. In 2019, the collaboration with the Ambuja Cement Foundation (ACF) marked a significant turning point for the group. This partnership encouraged the SHG to explore entrepreneurship and adopt sustainable farming practices, shifting the group's focus toward economic empowerment and environmental sustainability.

Climatic Conditions:

The region where the SHG operates is faced with climatic challenges, particularly pest infestations in cotton and vegetable farming. These infestations led to decreased yields and an increased dependence on chemical pesticides, raising concerns about both profitability and the environmental impact of conventional pest control methods.

Farmer Condition:

The farmers in the SHG had limited knowledge of effective pest management and sustainable farming practices. This lack of awareness, combined with high input costs for cultivation, restricted their ability to maximize profits and achieve growth in their farming ventures.

Response - Agriculture Extension Response:

- Training and Guidance: The Ambuja Cement Foundation (ACF) played a pivotal role in providing training and guidance on modern pest control measures and sustainable farming techniques. SHG members learned about alternative pest control methods, including the use of Neem Oil, sticky traps, and the production of Trichoderma, a biocontrol agent.
- Entrepreneurial Skill Building: ACF also facilitated workshops that focused on developing key entrepreneurial skills, including marketing strategies, product development, and financial management. These workshops empowered the SHG members, particularly women, to take on leadership roles in both agriculture and business.

Policy Implementation:

- Trichocard Labs: ACF helped establish Trichocard labs within the community. These labs are used to produce Trichocard, a biological pest control method that targets pests like pink bollworm and fruit borers, reducing the need for chemical pesticides.
- Supplementary Businesses: The group also started supplementary businesses, such as producing and selling Neem Oil and sticky traps. Additionally, the SHG began offering catering services during community events, diversifying their income streams and enhancing the group's economic sustainability.

Results - Economic Impact:

- The SHG's profits from selling Neem Oil and sticky traps saw a significant increase from ₹9,000 in 2022–2023 to ₹36,000 in 2023–2024. The group also ventured into producing Trichocard, which generated additional income, and began offering catering services at community events, generating ₹85,000 in profits in 2023–2024.

Social Impact:

- The involvement of women in decision-making and entrepreneurship played a crucial role in enhancing gender equality within the community. Women took on

leadership roles in both farming and business activities, building their confidence and independence.

- There was a noticeable increase in skill enhancement in areas like pest management, product marketing, and agricultural best practices, contributing to the overall empowerment of the SHG members.

Environmental Impact:

- The adoption of biological control measures, such as the use of Trichocard and Neem Oil, led to a significant reduction in the use of chemical pesticides. This shift contributed to more eco-friendly farming practices, supporting environmental sustainability.
- The community's adoption of sustainable farming techniques further promoted the preservation of soil health and local biodiversity.

Evidence - Financial Data:

- Neem Oil Sales: The SHG generated ₹45,000 in profit from Neem Oil sales over the last two years.
- Sticky Trap Sales: The production of sticky traps increased from 158 to 150 units annually, with consistent profitability in the sales.
- Refreshment Services: The group earned ₹85,000 in profit from catering services provided during community events in the year 2023–2024.

Farmer Testimonials:

- Sandip Admane from Monda village shared that the use of Trichocard for pest control significantly reduced pest infestation in his cotton and vegetable crops, lowering costs and increasing yields.
- Sitaram Allam noted that the application of Trichocard led to a marked reduction in pest problems and a noticeable improvement in the overall health and yield of his cotton and vegetable crops.

Recognition:

- Awards: The Saraswati SHG received the Embrace Equity Award in 2023 for its outstanding contribution to empowering women and promoting sustainable farming practices.

- Exposure Visits: The SHG members also participated in exposure visits to organic farms and Trichocard labs, gaining valuable insights into sustainable agricultural practices.

Community Feedback:

- Members of the SHG reported a positive impact on their personal confidence. Many women within the group have taken on leadership roles, becoming role models for other farmers in the community. The success of the SHG has encouraged other women to participate in farming and business ventures, enhancing overall community development.

Conclusion:

The interventions by ACF and the Saraswati SHG are a testament to the power of community-driven initiatives that integrate sustainable farming practices with entrepreneurship. By empowering women and introducing environmentally friendly pest control methods, the SHG has achieved impressive economic, social, and environmental outcomes. Their success serves as a benchmark for rural development, demonstrating how sustainable practices and entrepreneurial skills can lead to significant improvements in agricultural productivity, income generation, and gender equality in rural India. The journey of the Saraswati SHG highlights the potential for growth, not only for individual farmers but for entire communities, when they embrace innovative, sustainable, and empowering solutions.

Women engaged in packaging of the Yellow Sticky Traps

12.2.10 Silk Farming: A Profitable Alternative to Traditional Crops

Farmer Name: Giridhar and Revati Shinde

Region: Butibori (Wardha)

Link: https://youtu.be/kujIspXhNvY

Empowering Women through Sericulture: A Story of Dedication, Success, and Community Impact

Situation - Background:

Sericulture, the traditional cultivation of silk through silkworm farming, has long been a key agricultural activity in many parts of India. For one woman farmer, it became a way to supplement her family income. Despite the potential, sericulture requires careful attention to hygiene and organization in order to achieve high-quality silk. Initially, the farmer struggled to maintain the cleanliness and proper management of her sericulture operations, which are crucial to silkworm health and productivity.

Climatic Conditions:

The region where the farmer operates has a favorable climate for sericulture. The moderate temperatures are ideal for growing mulberry plants, the primary food source for silkworms. These conditions also support the optimal growth cycle of silkworms, making the region well-suited for sericulture.

Farmer Condition:

While the farmer was determined to succeed, she faced challenges in maintaining a clean and organized workspace. Sericulture requires meticulous care in managing both the silkworms and the mulberry leaves, as even small lapses in cleanliness can result in disease and reduced silk production. Despite these obstacles, she was committed to learning and improving her practices.

Response - Agriculture Extension Response:

With the help of agricultural extension services, the farmer received critical guidance on best practices for maintaining a clean and efficient workspace. The extension workers advised her on how to properly store mulberry leaves to avoid contamination and how to ensure the

right conditions for silkworms to thrive. These practices helped her address the cleanliness challenges, ensuring a healthier environment for both the silkworms and their food source.

Policy Implementation:

Government schemes and policies aimed at supporting women farmers in sericulture provided the farmer with both financial support and access to training. These initiatives focused on providing the farmer with modern equipment and knowledge that helped improve productivity. The policies also encouraged women to take on leadership roles in this traditionally male-dominated sector, empowering them to contribute to economic growth in their communities.

Results - Key Outcomes:

- Increased Productivity: By maintaining a cleaner, more organized workspace and following the best practices recommended by extension services, the farmer saw significant improvements in silkworm health. This led to an increase in both the quality and quantity of silk produced, making her sericulture operations more profitable.
- Empowerment: As a woman succeeding in a traditionally male-dominated field, the farmer became a role model for other women in her community. Her success demonstrated that women, too, could thrive in sericulture and other agricultural sectors.
- Sustainability: With enhanced efficiency in managing her silkworms and mulberry cultivation, the farmer was able to establish a steady source of income for her family. This made sericulture a sustainable livelihood option, providing long-term financial stability.

Community Impact:

Her success in sericulture has had a ripple effect in her village. Other women, inspired by her story, have started pursuing sericulture as a viable source of income. This has not only broken traditional gender stereotypes but also contributed to the economic development of the local community.

Evidence - Statistics:

- The farmer has experienced a significant increase in silk production, directly attributed to better workspace management and improved silkworm care.

- The cleaner workspace has also led to a reduction in diseases that affect silkworms, decreasing losses and further improving productivity.

Feedback and Reach:

The story of this woman's success in sericulture has been widely shared, particularly within her community. It has inspired many other women, especially those seeking additional income opportunities, to explore silkworm farming. The extension service's role in her journey has been crucial, as their support provided the knowledge and resources she needed to succeed.

Conclusion:

This success story underscores the importance of organization, cleanliness, and dedication in sericulture. The woman's hard work, commitment to improving her practices, and the support she received from agricultural extension services transformed her livelihood. Her achievements have not only improved her family's income but have also empowered other women in her village to take up sericulture. Through this success, she has contributed to changing attitudes toward women in agriculture and has opened new avenues for income generation and personal growth.

Revati and Giridhar feeding Mulberry leaves to the worm

12.2.11 Circular Economy: Using Livestock Waste for Sustainability and Entrepreneurship

Farmer Name: Sudhakar and Pramila Kohale

Region: Saoner

Link: https://youtu.be/CeSsc9olxS8

Sudhakar and Pramila Kohale: A Story of Success in Organic Farming

Introduction:

Sudhakar Kohale, a dairy farmer from Saoner Taluka in Maharashtra, has been running Vrindavan Dairy in Nagpur for over a decade. In addition to selling milk, curd, buttermilk, and ghee, Sudhakar has ventured into vermiculture, producing high-quality organic compost using cow dung from his dairy farm. This initiative has not only boosted his business but also promoted sustainable farming in his community.

Challenges and Motivation:

The Kohale family realized the negative impact of chemical fertilizers on soil health and crop yields. They were determined to find an alternative. Sudhakar's wife, Pramila, who recovered from throat cancer, became a strong advocate for organic farming. Her experience inspired the family to focus on sustainable agriculture and create a healthier environment for themselves and their community.

Support and Implementation:

With the help of Regenagri and Solidaridad, two NGOs promoting sustainable farming, Sudhakar learned the process of converting dairy waste into vermicompost. The training provided him with technical knowledge and marketing strategies to distribute his organic fertilizer. In recognition of their efforts, the couple received awards like "Best Quality Vermicompost" and "Progressive Farmer" in 2022, which further encouraged their work.

Achievements:

- Improved Farming Practices: Many local farmers have adopted vermicompost after seeing its benefits, such as healthier soil and better crop yields.
- Business Expansion: Sudhakar's compost, branded as "Krushi Amruta," has become popular in the local farming community. The business has grown steadily, adding to the family's income.
- Empowerment: Pramila plays a vital role in the venture, making it a true family effort. Together, they have inspired other farmers, especially women, to explore organic alternatives.

Community Impact:

Sudhakar and Pramila's efforts have had a ripple effect in their village, encouraging a shift toward organic farming. Their success demonstrates how sustainable practices can transform farming into a profitable and environmentally friendly activity.

Conclusion:

The Kohales' journey is a shining example of how determination and support can drive positive change in agriculture. By turning dairy waste into organic compost, they have created a sustainable business that benefits the environment and the farming community. Their story is an inspiration for farmers seeking to transition to organic and sustainable practices.

Sudhakar Kohle's Diary 'Vrindavan' at Shreenagar, Nagpur

Sudhakar and Pramila Kohle at their Vermicompost unit

12.2.12 Azolla Farming to Enhance Livestock Nutrition and Sustainability

Farmer Name: Sheshrao Randai

Region: Salaimendha, (Hingna)

Video Production in process

Azolla Farming: Transforming Livestock Feed Practices

Introduction:

Azolla, a fast-growing aquatic fern, is a game-changer for livestock farmers. Rich in protein and nutrients, it offers an affordable alternative to commercial feed, especially for small-scale farmers struggling with high costs. Despite its benefits, many farmers are unaware of how to cultivate Azolla or integrate it into their livestock feed practices.

Challenges and Motivation:

Farmers often face rising feed costs, fluctuating weather conditions, and limited resources to maintain profitability in livestock farming. The lack of awareness about low-cost and sustainable feed options like Azolla further exacerbates their challenges. However, Azolla's

ability to thrive in varied climates and its nutritional benefits make it an ideal solution for these issues.

Response and Educational Initiative:

To address this gap, an educational video was created to guide farmers step by step in adopting Azolla farming. The video covered:

- Introduction to Azolla: Explaining its nutritional value and benefits.
- Setting Up Azolla Units: Demonstrating how to build affordable setups using locally available materials.
- Cultivation Process: Providing tips on maintaining water levels, sunlight, and nutrients for optimal growth.
- Harvesting and Feeding: Showing how to harvest and feed Azolla to livestock.
- Economic Benefits: Highlighting cost savings compared to traditional feeds.

This video was aligned with government policies promoting sustainable livestock farming, helping farmers connect the knowledge to available support schemes.

Results and Impact:

- Cost Savings: Farmers reported a 25–30% reduction in feed costs after incorporating Azolla.
- Better Livestock Health: Cattle showed a 10–15% increase in milk production and improved overall health due to Azolla's high protein content.
- Widespread Adoption: The simplicity and affordability of Azolla farming encouraged many small-scale farmers to adopt it.

The initiative also created a ripple effect, inspiring rural communities to embrace sustainable livestock management practices.

Evidence of Success:

- Statistics: The educational video helped hundreds of farmers adopt Azolla, leading to tangible benefits like higher milk yields and lower feed expenses.
- Feedback: Farmers praised the video for its practical demonstrations and clear instructions.

- Case Studies: Success stories shared by farmers highlighted increased profits and healthier livestock after adopting Azolla farming.

Conclusion:

The Azolla farming educational video has become a powerful tool for promoting sustainable livestock practices. By bridging the knowledge gap, it has empowered farmers to reduce costs, enhance livestock productivity, and embrace eco-friendly solutions. This initiative stands as a model for using accessible, practical education to drive positive change in rural agriculture.

Azolla Pond at Sheshrao Randai's Farm

Azolla fed to the livestock in their cattle

12.2.13 Educational Videos on Polyhouse and Shade Net House for Sustainable Agriculture

Expert: Mr. Hemant Jagtap, Master Trainer, MCDC, Pune

Location: VANAMATI, Nagpur

Playlist Link: https://youtube.com/playlist?list=PLZzQyYjWuQvPQBPD_ul-O0RBMWBvgnhip&si=u2RnhHY_oaLAVlRc

Transforming Agriculture with Polyhouse and Shade Net Farming

Introduction:

In recent years, controlled-environment farming, such as using polyhouses and Shade Net houses, has gained popularity among farmers looking to improve crop yields and sustainability. These structures protect crops from extreme weather and pests, creating optimal conditions for growth. However, many farmers face challenges in understanding how to set up, manage, and maintain these systems effectively.

Challenges Faced by Farmers:

The region's unpredictable weather—fluctuating temperatures, intense sunlight, and sudden rainfall—makes traditional farming difficult, particularly for high-value crops like tomatoes, cucumbers, and flowers. While farmers recognize the potential of controlled-environment farming, they often lack the technical knowledge to implement it successfully.

Educational Response: A Video Series for Farmers:

To bridge this knowledge gap, a 25-video educational series, guided by Mr. Hemant Jagtap, Master Trainer at MCDC Pune, was created. These videos provide step-by-step instructions on adopting polyhouse and Shade Net house farming. Key topics covered include:

- Introduction: Benefits of polyhouse and Shade Net farming.
- Construction: How to design and build these structures, including material selection and layout planning.
- Climate Management: Techniques to control temperature, humidity, and light for optimal growth.
- Pest and Disease Control: Preventive and management strategies within controlled environments.
- Efficient Irrigation: Implementing drip irrigation for water conservation and effectiveness.
- Crop Management: Best practices for selecting and managing crops suited for these systems.

These videos align with government initiatives promoting sustainable farming and provide insights into accessing subsidies and training programs for polyhouse construction.

Results and Impact:

- Wider Adoption: Over 1,000 farmers have accessed the video series, leading to a rise in the adoption of polyhouse and Shade Net house techniques.
- Improved Knowledge: Farmers are now equipped with the technical skills needed to manage controlled-environment farming efficiently.
- Economic Benefits: Many farmers have reported a 30% increase in crop yields and higher incomes due to the improved quality and quantity of their produce.

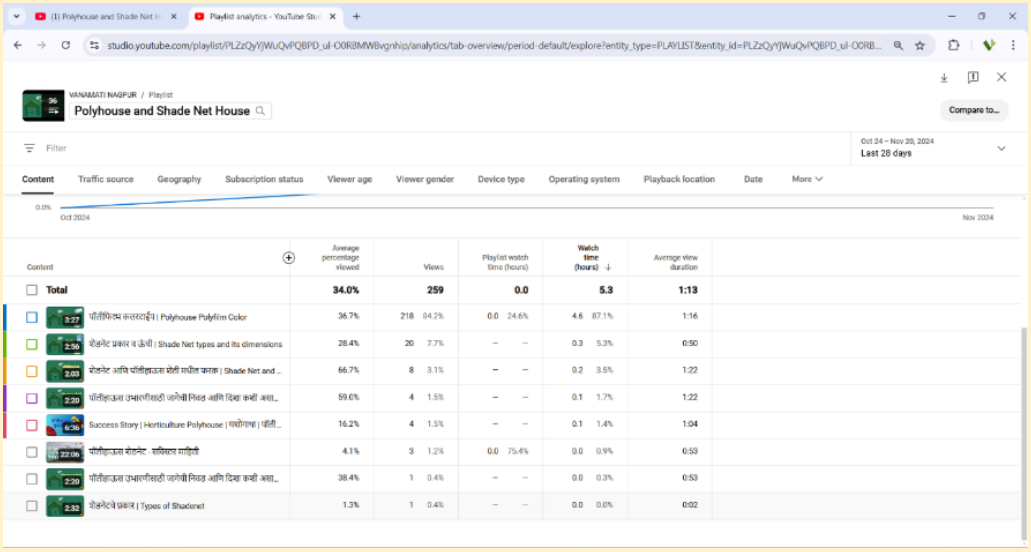
- Sustainable Practices: Farmers have adopted drip irrigation and other resource-efficient methods, reducing their dependency on chemical inputs.
- Community Influence: Farmers are sharing their newfound knowledge with neighbors, creating a ripple effect that has expanded awareness and adoption of these practices.

Evidence of Success:

- Statistics: Over 500 farmers have integrated drip irrigation into their setups, while many report substantial yield improvements.
- Feedback: The video series has received positive reviews for its clear, practical guidance. Agricultural extension officers also use it as a training tool in outreach programs.

Conclusion:

The 25-video educational series has empowered farmers to overcome challenges in controlled-environment agriculture. By offering practical and accessible guidance, the series has helped farmers increase productivity, adopt sustainable practices, and thrive in difficult climatic conditions. This initiative stands as a model for agricultural education, driving transformation in farming communities across the region.



YouTube Video analysis of each video of the Polyhouse and Shade Net series

12.2.14 Educational Video Series on Nursery Plantation

Expert: Hemant Jagptap, Master Trainer, MCDC, Pune

Location: Matoshree Nursery, Wardha

Situation:

Shade Net nurseries have become an essential part of modern agriculture, providing controlled conditions for the propagation of high-quality seedlings and saplings. However, many farmers and nursery operators lack the technical know-how to set up and manage Shade Net nurseries effectively. This gap often results in suboptimal growth, higher mortality rates of seedlings, and economic losses.

Climatic Condition:

Regions with fluctuating weather conditions, excessive heat, or unpredictable rainfall greatly benefit from Shade Net nurseries. These structures protect young plants from environmental stress and ensure better survival rates.

Farmer Condition:

Farmers are eager to adopt nursery-based farming for consistent, high-quality plant production. However, they often face challenges due to limited knowledge about constructing and maintaining shadenet nurseries, selecting suitable crops, and managing resources efficiently.

Response - Agriculture Extension Response:

To address these challenges, an educational video series was created in collaboration with Mr. Hemant Jagtap, a master trainer from MCDC, Pune. The series provides step-by-step guidance on nursery plantation in shadenet, covering:

- Introduction to Shadenet Nurseries: Explaining the benefits of shadenet structures and their role in modern agriculture.
- Design and Construction: Practical tips on constructing cost-effective and durable shadenet nurseries.
- Seedling Management: Techniques for propagating healthy seedlings, including watering, nutrient management, and pest control.

- Crop Selection: Recommendations for crops that thrive under shadenet conditions, ensuring maximum profitability.
- Sustainability Practices: Emphasis on resource optimization, including water-saving techniques and integrated pest management.

Results - Key Outcomes:

- The video series equips farmers with actionable knowledge on setting up and managing shadenet nurseries effectively.
- It provides practical insights directly from an experienced trainer, bridging the gap between theory and application.
- The focus on sustainable practices encourages environmentally friendly farming while enhancing productivity

Impact:

This initiative fosters an understanding of Shade Net nursery farming, inspiring farmers to adopt advanced techniques for better quality sapling production and higher economic returns.

Evidence - Expert Contributions:

- The video series features Mr. Hemant Jagtap, whose expertise ensures reliable and scientifically backed guidance.
- Comprehensive Content: The step-by-step format of the series, paired with real-life demonstrations, makes it a valuable resource for farmers aiming to implement Shade Net t nursery practices effectively.

Conclusion:

The educational video series on nursery plantation in Shade Net is a significant step toward empowering farmers with the knowledge to improve their practices. Featuring expert guidance, the series promotes the adoption of advanced and sustainable nursery techniques, paving the way for better productivity and profitability in agriculture.

 A Still from the nursery plantation video	 Mr. Jagtap explaining the logistics the nursery saplings

12.2.15 Instructional Video on De-topping in HDPS Cotton Plantation

Expert: Dr. Vineeta Gotmare, Sr. Scientist ICAR, Nagpur

Location: ICAR, Nagpur

Link: https://youtu.be/wqxqG-GC0Sg

Transforming Cotton Farming with De-topping in HDPS

Introduction:

Cotton, known as "white gold," is a key cash crop in India, contributing significantly to farmers' livelihoods and the economy. High-Density Planting Systems (HDPS) are becoming popular as they maximize plant population and improve productivity. However, challenges like excessive vegetative growth in HDPS can divert resources from boll development, reducing yields and profitability. Detopping has emerged as a vital agronomic practice to address these challenges.

Challenges Faced by Farmers:

The sensitivity of cotton to erratic rainfall, prolonged dry spells, and high temperatures exacerbates the competition for nutrients and water in HDPS. Farmers adopting this system often struggle with managing crop canopy, which can hinder boll development. The lack of awareness about techniques like detopping prevents many from fully realizing the potential of HDPS.

Educational Response: The De-topping Video:

To support farmers, an educational video was developed under the guidance of Dr. Vineeta Gotmare, Sr. Scientist, ICAR, Nagpur. This video provides a step-by-step guide to de-topping, covering:

- Purpose: How removing the apical bud helps control vegetative growth and redirects resources to boll development.
- Timing and Method: Detailed instructions on when (during flowering, with 8–10 nodes above the first boll-bearing branch) and how to perform de-topping.
- Benefits: Improved boll retention, synchronized maturity, higher yields, and better fibre quality.

The video aligns with government policies promoting sustainable and high-yield cotton farming techniques. It has been integrated into extension programs to encourage adoption.

Results and Benefits

1. Improved Yields: Farmers reported a 10–15% increase in cotton yields due to better boll development and uniform boll size.
2. Enhanced Quality: Detopping improved fiber quality and reduced pest infestations, thanks to better crop aeration.
3. Economic Gains: Reduced costs for pest and disease management, coupled with higher market value for the produce, improved farmers' profitability.

Wider Impact and Adoption:

The educational video has been instrumental in encouraging farmers to adopt detopping. Its clear demonstrations and testimonials have built trust in the practice, leading to widespread adoption as a standard practice in HDPS cotton cultivation.

Evidence of Success

- Statistics: Farmers practicing detopping consistently observed increased yields and better resource utilization.
- Feedback: Positive testimonials highlighted the simplicity and effectiveness of the technique in reducing crop management stress.
- Expert Endorsements: Validation by agricultural scientists and field demonstrations reinforced the credibility of detopping.

Conclusion

Detopping in HDPS cotton is transforming farming by addressing the challenges of excessive vegetative growth and resource competition. This simple yet effective practice helps farmers achieve higher yields, improved cotton quality, and better economic returns.

The educational video has been a game-changer, bridging the knowledge gap and empowering farmers to adopt sustainable agronomic practices. Through such initiatives, the future of cotton farming in India is becoming more productive and resilient.

Dr. Gotmare demonstrating how to cut the top of the cotton crop

12.2.16 Transforming Agriculture with Biofertilizers and Sustainable Farming Practices

Farmer Name: Mahendra Thakur

Region: Gondia

Video Production under process

Revolutionizing Agriculture in Gondia: The Ruchi Biochemicals Story

Introduction:

Ruchi Biochemicals, founded in 2001 by microbiologist Mahendra Thakur in Gondia, Maharashtra, has been a trailblazer in promoting sustainable agriculture. With an unwavering focus on eco-friendly innovations, the company has empowered farmers with biofertilizers, biopesticides, and organic farming solutions. Its mission: to combat soil degradation, reduce reliance on chemical inputs, and foster sustainable farming practices in challenging semi-arid conditions.

Challenges Faced by Farmers:

1. Soil Health Degradation: The overuse of chemical fertilizers led to declining fertility and biodiversity in the monocropping systems of Gondia.
2. Knowledge Gap: Farmers lacked awareness of sustainable practices and access to quality biofertilizers and organic farming inputs.
3. Economic Disincentives: High subsidies for chemical inputs and poor market infrastructure for organic produce made the transition to organic farming less attractive.

The Ruchi Biochemicals Approach:

Ruchi Biochemicals addressed these challenges through a holistic, farmer-centric approach:

1. Product Innovation:
    - Development of biofertilizers, biopesticides, and botanical extracts compliant with FCO and CIB standards.
    - Field-tested, high-potency products tailored for diverse crops, ensuring efficacy and farmer trust.
2. Farmer Training and Engagement:
    - Conducted residential training programs for farmers, students, and agri-entrepreneurs on soil preparation, crop management, and marketing strategies.
    - Set up trial plots on a 120-acre research farm to demonstrate the benefits of biofertilizers and practices like yogic agriculture.
3. Community Collaboration:
    - Promoted crop diversification, organic residue management, and water recharge techniques through farmer partnerships.
    - Conducted extensive field demonstrations and market surveys to establish trust and create demand for their products.
4. Policy Alignment:
    - While benefiting minimally from government schemes, the company aligned its goals with national initiatives on organic farming, focusing on grassroots farmer engagement.

Achievements and Impact:

1. Economic Growth:
    - Ruchi Biochemicals grew into a ₹20 crore turnover enterprise, maintaining a 15–20% profit margin while offering eco-friendly alternatives to chemical inputs.
2. Farmer Adoption:
    - Farmers reported increased yields, enhanced soil health, and reduced dependency on chemical fertilizers, encouraging a shift to diversified cropping systems.
3. Knowledge Dissemination:
    - Thousands of farmers have been trained in sustainable practices, leading to a regional transformation from paddy monocropping to diversified agriculture, including fruits and vegetables.
4. Global Recognition:
    - Ruchi Biochemicals' participation in international conferences, such as the 2016 Nairobi event, highlighted its leadership in sustainable farming innovations.

Evidence of Success:

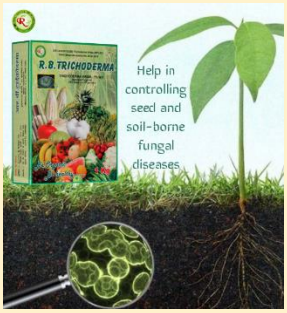
- Testimonials: Farmers credited Ruchi Biochemicals with improving soil fertility, crop resilience, and overall farm profitability.
- Training Feedback: Students and agri-entrepreneurs praised the practical, hands-on approach of training sessions.
- Adoption Metrics: Increased farmer participation in organic farming and growing market demand for Ruchi’s products underscore the initiative’s success.

Conclusion:

Ruchi Biochemicals exemplifies the transformative power of innovation and grassroots engagement in agriculture. By addressing soil health challenges, bridging knowledge gaps, and empowering farmers with practical solutions, the company has created a model for sustainable farming. Its commitment to community upliftment and science-backed practices

continues to inspire farmers in Gondia and beyond, paving the way for a resilient and profitable agricultural future.

Photographs of trainings conducted by Ruchi Biofertilizers



12.2.17 Sunil Thokale: A Journey from Soil Erosion to Organic Farming Excellence

Farmer Name: Sudhir Thokale

Region: Dhamangaon Railway, Amravati

Video Production under process

In the serene yet challenging landscapes of Dabhada village in Maharashtra's Dhamangaon Railway Taluka, a young farmer named Sudhir Thokale embarked on a journey that would inspire an entire community. The year was 2018, and Sudhir had taken up farming on 4 acres of hilly, eroded land—a plot deemed unsuitable for cultivation by many in the village. With

persistent water runoff, poor soil conditions, and damage from animals, the odds were stacked against him.

To add to his challenges, Sudhir faced skepticism from his own community. The villagers openly doubted his decision, convinced that agriculture on such terrain would be a futile effort. His first harvest seemed to confirm their doubts—yielding just one quintal of cotton and a mere two kilograms of tur. But Sudhir, driven by a vision for sustainable farming and a deep connection to the land, refused to give up.

Overcoming the Odds:

Sudhir realized early on that conventional farming methods would not work on his land. Determined to address the challenges head-on, he began experimenting with innovative solutions.

Soil and Water Conservation:

In 2019, with no external guidance, Sudhir initiated bunding on his farm. This simple yet effective technique involved creating embankments to slow water runoff, allowing it to percolate into the soil. The results were almost immediate. The bunding not only reduced soil erosion but also retained moisture, setting the stage for better crop growth.

Recognizing the need for a more permanent solution to water scarcity, Sudhir sought external support. In 2021, with assistance from the agricultural organization Solidaridad, he installed a farm pond. This farm pond became a game-changer, boosting groundwater recharge and benefiting not just his farm but also nearby wells.

Embracing Technology:

As Sudhir's efforts gained momentum, Solidaridad further supported him in establishing an automated weather station in 2022. This advanced tool provided real-time data on soil moisture, weather patterns, and water availability. The information proved invaluable, enabling Sudhir to make precise farming decisions while also benefiting farmers within a 35-kilometer radius.

Leading by Example:

Sudhir's growing expertise did not go unnoticed. Solidaridad appointed him as the cluster supervisor for Dhamangaon Railway Taluka, a role that allowed him to mentor other farmers. In 2022, he took his leadership a step further by founding the Jay Kisan Farmer Savings

Group. This initiative provided low-interest loans during the kharif season, empowering farmers to invest in their fields without financial strain.

A New Chapter of Farming:

Sudhir's innovative approach didn't stop at soil and water management. He began exploring ways to diversify his crops and income streams. In 2023, he ventured into cultivating high-demand leafy vegetables such as spinach, fenugreek, and dill, which not only fetched higher market prices but also enriched his crop rotation. A year later, he introduced sericulture on one acre of his land, adding another source of income.

Through it all, Sudhir remained committed to organic farming. He adopted sustainable practices like using homemade organic inputs such as Ghanjivamrit, Dashparni, and Agniastra. These natural solutions improved soil health, reduced dependency on chemical fertilizers, and enhanced the resilience of his crops.

Transforming Challenges into Opportunities:

Sudhir's efforts began to yield remarkable results. His cotton yield soared from a mere one quintal to an impressive 14 quintals after implementing bunding. Similarly, his tur yield increased from two kilograms to two quintals.

The farm pond not only ensured consistent water availability for his crops but also contributed to a measurable rise in groundwater levels, benefiting the community at large. Meanwhile, the savings group he established flourished, growing from ₹1.5 lakhs in loans in 2022 to ₹3 lakhs in 2023, with a projected ₹6 lakhs in 2024.

His story also inspired other farmers to adopt similar practices. With Sudhir's guidance, many began using organic inputs and water conservation techniques, significantly improving their crop yields and reducing input costs. The automated weather station played a crucial role in enabling better planning, ensuring that farmers could adapt to changing climatic conditions.

Community Impact and Recognition:

Sudhir's journey had a ripple effect across the region. Farmers who once doubted the feasibility of agriculture on hilly, eroded land now saw his farm as a beacon of hope. Testimonials from his mentees highlighted the practical and transformative nature of his advice. They credited him with introducing them to sustainable methods and modern tools, which significantly improved their livelihoods.

The savings group he founded became a lifeline for many farmers, offering financial security during critical farming periods. Members expressed their gratitude for the timely loans that allowed them to invest in seeds, fertilizers, and equipment without falling into debt traps.

A Legacy of Resilience and Innovation:

Sudhir Thokale's story is more than a tale of personal success—it is a testament to the power of resilience, innovation, and community collaboration. From addressing soil erosion and water scarcity to promoting organic farming and financial inclusivity, he has transformed not only his land but also the lives of those around him.

Sudhir's farm, once written off as barren and unworkable, now stands as a thriving example of what determination and sustainable practices can achieve. His leadership and mentorship continue to inspire farmers to embrace change, adopt innovative solutions, and strive for a better, more sustainable future in agriculture.

Installation of automated weather station

12.2.18 Building Climate Resilience Through Integrated Farming and Sustainable Animal Husbandry

Name of Farmer: Nagmode

Region: Latur

Nagmode's Visionary Farming: Transforming Rocky Terrain into a Thriving Ecosystem

Nestled in the mountainous terrain of Chincholirawwadi, near Latur in Maharashtra, farming has traditionally been a daunting task. Poor soil quality, erratic rainfall, and scarce water resources have plagued the region, leaving farmers struggling with economic instability and unsustainable practices. Yet, over two decades ago, a determined farmer named Nagmode began an extraordinary journey to defy these challenges. His efforts have since transformed

this seemingly barren land into a self-sustaining, thriving agricultural ecosystem, becoming a beacon of hope and inspiration for others in the region.

Turning Challenges into Opportunities:

Latur's semi-arid climate poses a constant challenge to agriculture. The region experiences high evaporation rates, making water a precious resource. Farmers in the area, historically dependent on monocropping and chemical fertilizers, faced declining soil fertility and diminishing returns. However, Nagmode saw potential where others saw limitations.

Innovating with an Integrated Farming System

Nagmode introduced a closed-loop farming system, integrating fisheries, dairy, goat rearing, and crop cultivation into a symbiotic model. Each component of the system supports the other, ensuring maximum resource efficiency. For instance, cow dung and goat manure enrich the soil, while wastewater from fish tanks is filtered and reused for crop irrigation. This holistic approach not only addressed the region's resource constraints but also maximized productivity.

Sustainable Practices - Enhancing Soil Fertility:

Nagmode tackled the rocky, infertile soil head-on by incorporating organic inputs like cow dung and goat manure. This practice gradually improved the soil's health, making it more productive and resilient.

Efficient Water Management:

Water scarcity was one of the most critical challenges. Nagmode devised an automated water management system that captures wastewater from fish tanks, channels it through animal shelters, filters it naturally, and stores it in a man-made pond. This system ensures zero water wastage and has become a model for water conservation in the region.

Leveraging Government Schemes:

By aligning his initiatives with the Pradhan Mantri Matsya Vikas Yojana, Nagmode established 16 fish tanks, each generating an impressive ₹1,00,000 annually. His success highlights the importance of utilizing government support to amplify local innovations.

Remarkable Results - Economic Stability:

Nagmode's integrated farming model generates a sustainable income from multiple sources:

- Fisheries contribute ₹16,00,000 annually.

- Additional income flows from dairy, goat rearing, and organic crop cultivation.

Environmental Benefits:

- Water Conservation: The innovative filtration and reuse systems have eliminated water wastage.
- Soil and Biodiversity: By adopting organic farming, Nagmode has significantly improved soil health and fostered biodiversity on his farm.

Community Impact:

Nagmode's success has inspired local farmers to embrace sustainable practices. His farm serves as a demonstration model, attracting agricultural extension officers and fellow farmers eager to learn and replicate his methods.

Voices of Appreciation:

Farmers visiting Nagmode's farm frequently commend his practical and cost-effective solutions. Those who have adopted his techniques report reduced input costs and improved yields in both crops and livestock. Agricultural officers have described his farm as a "model for integrated and sustainable agriculture," further emphasizing its role in fostering regional development.

A Blueprint for Rural Development:

Nagmode's story illustrates the transformative power of resilience, innovation, and collaboration. His integration of diverse farming systems, coupled with resource-efficient practices, has turned a barren landscape into a thriving agricultural enterprise.

By leveraging government schemes and prioritizing organic methods, Nagmode has not only achieved financial stability but also contributed to environmental conservation. His call for greater farmer representation in policymaking underscores the importance of tailoring solutions to regional challenges.

Inspiring Future Generations:

Nagmode's farm is more than just a source of income—it is a hub of learning and inspiration. It demonstrates how sustainable and integrated farming can uplift entire communities, turning challenges into opportunities. His journey serves as a powerful testament to the potential of farmer-led innovation in transforming rural India.

12.2.19 From Soil to Shelf: Transforming Organic Farming Through Innovation and Value Addition

Farmer Name: Mandar Deshpande

Region: Wardha

In the semi-arid region of Marathwada, where droughts are frequent and agriculture often seems like an uphill battle, one mechanical engineer decided to challenge the status quo. Over the past 15 years, this visionary has turned the challenges of erratic rainfall, water scarcity, and soil degradation into opportunities for sustainable innovation, crafting a model farm that now inspires farmers across the region.

The Beginning of a Transformative Journey:

Marathwada is infamous for its harsh climatic conditions, with rainfall patterns so unpredictable that many farmers struggle to make ends meet. Against this backdrop, the engineer-turned-farmer decided to trade his career in mechanical engineering for a life dedicated to sustainable agriculture.

Starting with a modest investment of ₹2 lakhs, he embarked on his organic farming journey with a strong commitment to producing chemical-free food and improving the environment. In a region dominated by monocropping and chemical-intensive practices, he chose a path of resilience, determined to prove that sustainability and profitability could coexist.

Building the Foundation: Organic Practices:

The farmer's approach revolved around nurturing the soil and fostering biodiversity. Recognizing that healthy soil is the cornerstone of agriculture, he employed a mix of organic fertilizers, including Jeevamrut, cow dung manure, and green manure. These practices enriched the soil naturally, restoring its fertility and vitality.

To protect his crops, he replaced chemical pesticides with eco-friendly solutions. Neem extracts, Dashparni, and biological traps like pheromone and sticky traps became the mainstay of his pest control strategy. These methods not only kept pests at bay but also preserved the ecological balance of his farm.

Beyond Farming: The Power of Value Addition:

While many farmers in the region struggled with low returns, this farmer saw the potential in value-added products. Instead of selling raw produce, he transformed his harvest into high-demand products such as:

- Hibiscus-based syrups and jams, which became instant hits for their natural flavors and health benefits.
- GI-tagged Waigaon turmeric powder, prized for its quality and authenticity.
- Millet-based cookies and natural food colors, catering to health-conscious urban consumers.
- Hibiscus fizz drinks, a novel product that combined tradition with innovation.
- Hand-made organic cotton fabrics with block printing, tapping into the artisanal market.

By focusing on quality and innovation, he created products that stood out in a crowded market. This approach not only fetched higher prices but also built a loyal customer base that extended to cities like Pune and Mumbai.

Leveraging Policy for Growth:

The farmer's success was not a solo effort—it was amplified by his strategic use of government schemes. Under the solar pump program, he ensured sustainable irrigation, while sprinkler systems helped conserve water in this drought-prone region. Seed support programs and subsidies for equipment like brush cutters further reduced his operational costs. By aligning his efforts with government policies, he not only optimized his farm operations but also demonstrated how farmers could benefit from these initiatives to achieve self-reliance.

Results That Speak:

- Economic Gains - The farmer's diversification strategy proved highly profitable. The sale of value-added products significantly boosted his income, providing stability in an otherwise volatile agricultural market.
- Environmental Impact - By eliminating chemical inputs, he rejuvenated the soil and encouraged biodiversity. The farm became a thriving ecosystem where crops, insects, and animals coexisted harmoniously.
- Market Reach - Participation in events like Beejotsav helped him connect with urban consumers and showcase his products to a broader audience. Word-of-mouth endorsements further solidified his reputation as a producer of authentic organic goods.
- Community Engagement - Farmers from the region began visiting his farm, eager to learn about his methods. Many adopted his organic practices, leading to improved yields and reduced reliance on chemical inputs.

Challenges and the Road Ahead:

While the farmer has achieved remarkable success, challenges remain. Packaging, labeling, and marketing are areas where he seeks support to compete effectively with larger brands. However, his dedication to networking with urban consumers and participation in organic platforms ensures steady progress.

Evidence of Success:

- Economic Resilience: The diversified product range continues to find a niche in competitive urban markets.
- Customer Testimonials: Consumers frequently praise the unique flavor and authenticity of his hibiscus syrup and turmeric powder.
- Farmer Adoption: Local farmers credit him with inspiring their transition to organic methods, proving that sustainable practices can be profitable.
- Sustainable Practices: His integration of organic inputs and value addition showcases a model of resilience and innovation.

A Model for Modern Agriculture:

This is not just the story of a farmer; it is a story of transformation—of turning challenges into opportunities and vision into reality. By combining traditional knowledge with modern innovation, the engineer-turned-farmer has created a blueprint for sustainable agriculture that addresses both environmental and economic concerns.

The produce from the farm feeds the family for the whole year

Mandar on the bullock cart to plough his field

12.2.20 Seedogreen: Redefining Rural Prosperity through Farmer-Led Innovations

Farmer Name: Ashok Chinte

Region: Latur

In the semi-arid landscape of Latur, Maharashtra, farming had always been a tough endeavor. The region's unpredictable monsoons and frequent droughts made agriculture a gamble for

the local farmers. Soil degradation and a lack of quality inputs further compounded their struggles, leaving many vulnerable to financial instability. The absence of organized systems for input supply and market linkages only worsened the situation, creating a cycle of poverty and low productivity.

Ashok Chinte, a progressive farmer and former sarpanch, saw this struggle firsthand. Having grown up in the heart of Latur's farming community, he understood the challenges faced by his fellow farmers. Recognizing the need for a solution, he took it upon himself to make a change. With a vision for a more sustainable and prosperous future for agriculture, Chinte founded the Farmer Producer Company (FPC) 'Seedogreen.'

Chinte's approach was rooted in innovation and practicality. One of the key initiatives was the establishment of a seed production enterprise. He focused on crops like soybeans, ensuring that farmers had access to high-yielding, regionally adapted seeds. By addressing the root cause of low productivity—poor-quality seeds—he laid the foundation for a farming revolution in the area.

Technological innovations became another cornerstone of Seedogreen. One of the first breakthroughs was the introduction of a token system for soybean cultivation. This system optimized seed spacing, boosting productivity and enabling farmers to make the most of their land. Additionally, Chinte developed simple yet effective pest management techniques, like the Kamgandh Sapale—larval traps that reduced pest infestations without the use of harmful chemicals.

Chinte also championed sustainable farming practices. He advocated for organic farming, promoting the use of fertilizers derived from agricultural waste instead of chemical fertilizers. This not only improved soil health but also reduced the environmental pollution caused by the burning of farm residues, a common practice in the region.

Women empowerment was another vital aspect of Chinte's vision. He planned to establish women-managed warehouses to provide financial independence and skill development opportunities to women in the community. This initiative was designed to create a more gender-inclusive agricultural sector, one that allowed women to play a central role in decision-making and economic activities.

The government quickly recognized the alignment of Chinte's initiatives with existing programs supporting FPCs, organic farming, and rural entrepreneurship. His work became a

model for how localized solutions could address larger agricultural challenges, and his efforts gained national and international attention.

The results were remarkable. Farmers involved with Seedogreen saw their crop yields increase significantly. The optimized seed spacing and pest management techniques proved successful, leading to higher productivity. Additionally, the shift towards organic fertilizers contributed to improved soil fertility and reduced pollution. Soybean seed production, which was once a struggle, had now become a profitable enterprise, providing economic stability for many farmers.

The community also benefited from the collaborative platform Seedogreen had created. Farmers now had better access to quality inputs, training, and market opportunities, helping them stay competitive and sustainable. Through regular training sessions and field demonstrations, Chinte empowered farmers with the knowledge and skills needed to adopt modern technologies while preserving traditional practices.

The impact of Seedogreen was evident not just in improved yields but in the testimonials of farmers. Many spoke about how the practical solutions offered by Chinte had transformed their farming practices. They expressed their appreciation for the availability of quality seeds, reduced input costs, and the knowledge they had gained through training. Women in the community, too, voiced their excitement about the proposed warehouses, seeing it as an opportunity for financial independence and skill development.

Chinte's contributions did not go unnoticed. At the state level, he was recognized for his leadership as a former sarpanch. On the international stage, he was honored with a World Bank award for his innovative agricultural practices. These accolades were a testament to his unwavering commitment to transforming agriculture in Latur.

Ashok Chinte's journey was one of resilience, innovation, and leadership. Through Seedogreen, he had created a lasting impact—empowering farmers, promoting sustainability, and ensuring a brighter future for the agricultural community in Latur and beyond.

Photo with FGD

Photo with SHG

Photo with FPO Founder- Ashok Chinte

13 Chapter 13. Training Management Framework for Capacity Enhancement of Stakeholders

13.1 Introduction:

The Training Management Framework is required to be prepared for the capacity enhancement of stakeholders in the project aimed at addressing the challenges being posed by climate change in agriculture. The stakeholder mapping engaged 857 respondents from a diverse range of groups, including farmers, local governance bodies, allied organizations, and Department of Agriculture officers. This inclusive approach was designed to gather insights that would help create effective, equitable, and sustainable interventions, including capacity-building training programs.

By integrating the perspectives of farmers, governance leaders, and supporting organizations, the mapping identified key challenges and opportunities for fostering climate resilience. This effort laid the foundation for a comprehensive training management framework that will empower stakeholders, inform policy makers, and support collective action toward sustainable and climate resilient agricultural practices.

13.2 Stakeholders Identification and their involvement in the Survey Exercise:

The instant report summarizes the findings of a comprehensive survey conducted under the NDKSP; a Project on Climate Resilient Agriculture (PoCRA) – II across 79 villages in eight districts. The survey aimed to assess agricultural practices, challenges, and opportunities by gathering responses from various stakeholders, including farmers (categorized into subgroups like female, young, and SC/ST), Gram Panchayat members, Farmer Producer Organizations (FPOs), Self-Help Groups (SHGs), NGOs, financial institutions, educational institutions, and Department of Agriculture officers. Through group discussions and interviews, the survey identified current agricultural practices, constraints, and the support required for climate-resilient farming, providing actionable insights for promoting sustainable practices and enhancing agricultural resilience and productivity.

The stakeholder mapping undertaken for this project represents a strategic and inclusive approach to understanding and addressing the complex challenges being posed by climate change in agriculture. By engaging a total of 857 respondents across a diverse range of stakeholder groups,

the study aimed to capture the perspectives necessary for designing effective and sustainable interventions including Capacity Enhancement Training Programmes.

Farmers lie at the heart of this mapping effort, with 610 respondents drawn from various categories, including progressive farmers, women farmers, and those from socio-economically marginalized communities. Their inclusion ensured that the study incorporates the experiences of those who were directly affected by climate impacts, such as erratic rainfall, soil degradation, and pest outbreaks. Progressive farmers have brought insights into innovative practices, while women and marginalized farmers highlighted the systemic inequities that exacerbated their vulnerability. This diversity ensured that the proposed solutions are practical, equitable, and responsive to the varied realities of farming communities.

Complementing the farmers' perspectives were the voices of 77 members of local governance bodies, including representatives from Gram Panchayats (GP) and Panchayat Samitis (PS). These local leaders play a critical role in translating government policies into actionable programs and ensuring the delivery of resources to farming communities. Their understanding of localized challenges and their capacity to mobilize communities were found invaluable for designing interventions that are context-specific and grounded in the realities of rural governance.

The mapping also integrates 110 respondents from allied organizations, such as Farmer Producer Organizations (FPOs), Self-Help Groups (SHGs), Nongovernmental Organizations (NGOs), educational institutions, and financial institutions. These stakeholders form the backbone of support systems that enable farmers to adopt climate-resilient practices. FPOs and SHGs drive collective action for enhancing the bargaining powers of farmer members and market access, while NGOs and educational institutions foster capacity building and awareness about sustainable farming methods. Financial institutions, on the other hand, provide essential credit and insurance products that mitigate risks associated with climate shocks. Their inclusion ensured that the study addresses systemic challenges and leverages the potential of these organizations to enhance the impact of climate-smart interventions.

Finally, the inputs from 60 officers and staff members from the Department of Agriculture (DOA) is also documented. These functionaries, including Agricultural Officers (AO), Circle Agriculture Officers (CAO), Taluka Agricultural Officers (TAO), and Deputy Project Directors and Project Directors (DPD / PD ATMA), are at the forefront of implementing policies and programs aimed at enhancing agricultural productivity and sustainability. Their technical knowledge and field experience provided useful insights into the operational challenges of scaling up climate-smart

practices and identifying gaps in the extension system. Their perspectives are crucial for ensuring that the institutional mechanisms are strengthened and aligned with the needs of farmers.

This comprehensive mapping highlights the application of principles of inclusivity and collaboration. It recognizes that addressing climate change in agriculture requires a multi-stakeholder approach that bridges the gap between grassroots realities and institutional frameworks. By engaging diverse groups, the study aimed to:

- Understand the multifaceted impacts of climate change on agriculture in project areas in Maharashtra.
- Develop adaptive strategies that are farmer-centric and systemically supported as well.
- Foster synergies among farmers, governance bodies, and allied organizations for collective resilience.
- Influence policy and practice by highlighting actionable insights and best practices.

13.3 Themes for the Capacity Enhancement Training Programmes for respective Stakeholder Groups as emerged from the Survey activities:

13.3.1 Stakeholder Group – I:

Stakeholder Group	Members	Targeted Number of Respondents
I	Individual Farmers (*Progressive Farmers, Women Farmers, Young farmers and Farmers from Socio-economically Marginalized Sections etc.*)	610

Farmers:

The survey, conducted with 610 farmers (*Progressive Farmers, Women Farmers, Young farmers and Farmers from Socio-economically Marginalized Sections etc.*) across area under study, assessed challenges and identified the agricultural practices to help address the climate resilience in the project areas. In view of the same, various training programs to effectively address the farmers' knowledge gaps, financial limitations, and technical knowledge needs, and to equip them

with the skills required to enhance productivity and income while building climate resilience are proposed as follows. (*In alphabetical order*)

1. Climate-Resilient Farming Practices
2. Integrated Water Management and Irrigation Practices
3. Market Linkages and Financial Literacy
4. Post-Harvest Management and Value Addition
5. Soil Health Management and Testing

Women Farmers: The survey highlighted the challenges faced by women farmers, including balancing household duties, limited access to resources, and lack of support. They called for flexible training schedules, financial assistance and gender-sensitive programs. Overcoming logistical and social barriers is essential to empower women farmers and boost their participation in agricultural development. Based on the findings, the most relevant training programs for female farmers to address their unique needs and challenges are suggested: (*In alphabetical order*)

1. Access to Credit and Financial Management
2. Gender-Sensitive Farm Management Training
3. Skill Development for Value Addition and Promotion of Agri-Allied Enterprises

Young Farmers: The survey found that young farmers prefer on-site, youth-focused training with young trainers. They are motivated by family tradition, passion for agriculture, and economic opportunities. Training should address land, technology, and financial access, with a focus on modern farming techniques, business management, and sustainability, blending technical skills with entrepreneurship. Based on the findings, the most relevant training programs for young farmers to address their specific needs are suggested: (*In alphabetical order*)

1. Agripreneurship and Agribusiness Management
2. Collaborative Farming Models and Resource Optimization
3. Modern Farming Techniques

Scheduled Casts and Scheduled Tribes Farmers:

The survey revealed that SC/ST farmers face challenges in accessing financial support due to high interest rates, lack of collateral, and limited awareness of government schemes. They highlighted the need for grants, low-interest loans, and crop insurance, along with training in modern farming and business management. Limited adoption of modern tools and inadequate outreach to these

farmers calls for increased financial aid, better scheme implementation, and more inclusive training programs. In light of the same the most relevant training programs for this group of farmers are indicated herewith: (*In alphabetical order*)

1. Awareness of Government Schemes and Projects
2. Business Management and Market Linkages
3. Capacity Building in Group Farming and Cooperatives
4. Financial Literacy and Access to Agricultural Credit
5. Introduction to Modern and Sustainable Farming Practices

13.3.2 Stakeholder Group – II:

Stakeholder Group	Members	Targeted Number of Respondents
II	Members of Local Governance Bodies (*GP/PS Members*)	77

The survey highlights key findings regarding climate-resilient agricultural practices and support mechanisms in rural areas. It reveals low awareness of the PoCRA program among peoples' representatives. The Gram Panchayat can play a role in supporting sustainable agriculture. It can contribute to climate resilience through groundwater recharge. Challenges such as budget constraints, lack of technical knowledge, and infrastructure gaps hinder effective implementation. Based on the given survey findings, here are most relevant training courses for Gram Panchayat Committee members associated with supporting climate-resilient agricultural practices (*In Alphabetical Order*):

1. Climate-Resilient Agriculture and Sustainable Practices
2. Promotion of Agroforestry Policies and Schemes
3. Project Planning and Management for Rural Development
4. Technology Applications in Agriculture for Climate Adaptation
5. Water Resource Management and Groundwater Recharge

13.3.3 Stakeholder Group – III:

Stakeholder Group	Members	Targeted Number of Respondents
III	FPO Members, Self-Help Groups Members, Nongovernmental Organizations Members, Educational Institutions Members, Financial Institutions Members	110

FPO Members:

The survey highlighted key training needs of Farmer Producer Organization (FPO) members, focusing on water use efficiency, soil health, pest management, and post-harvest practices, along with storage, packaging, branding, and governance. Members also expressed interest in training on organic production, micro-irrigation, bio-fertilizers, and protected cultivation. These insights emphasize the need for tailored training programs to enhance skills in organizational management, sustainable farming, and accessing government support, addressing the unique challenges FPOs face in improving efficiency and sustainability. Based on the findings, the most relevant training programs for Farmer Producer Organization (FPO) members have been suggested as mentioned herewith: (*In alphabetical order*)

1. Accessing Government Schemes and Policies for FPO Growth
2. Contract Farming
3. Enhancing Access to Markets
4. FPO Governance
5. Integrated Pest Management for Sustainable Farming
6. Micro-Irrigation Systems: Efficient Water Management for FPOs
7. Natural Resource Management
8. Organic Farming Certification Procedures
9. Post-Harvest Management: Storage, Packaging, and Branding for FPOs
10. Protected Cultivation
11. Soil Health Management for Enhanced Agricultural Productivity

12. Sustainable Farming Principles and Practices
13. Value Addition in Agriculture
14. Water Use Efficiency and Sustainable Irrigation Practices for FPOs

Self Help Group (SHG) Members:

The survey highlights Self-Help Groups' (SHGs) contributions to agricultural production, microenterprises, and livestock rearing, along with financial services like savings, loans, and insurance. To enhance productivity and income, SHGs require financial support, technical training, market access, and quality inputs. The Suggested Training programmes are:

1. SHGs Capacity Building for Agri-Enterprises Promotion
2. Sustainable Agriculture Principles Practices
3. Efficient Natural Resources Management
4. Financial Literacy for SHG Members
5. Technical Training on Sustainable Livestock Management and Agri-Allied Services

Non-Government Organizations (NGOs):

The survey highlights NGOs' active role in promoting climate-resilient agriculture, organic farming, and water management, along with livelihood enhancement and environmental conservation. Despite positive impacts on crop yields, soil health, and food security, NGOs face challenges such as financial constraints, limited technical support, and resistance to change. Strengthening collaborations, enhancing financial and technical resources, and improving community engagement are key to scaling up their efforts and driving greater adoption of climate-resilient practices. Based on the survey findings, the most needful training programs for NGOs involved in the project CRA are – (*In alphabetical Order*)

1. Agroforestry – Opportunities for NGOs
2. Building Community Engagement for Sustainable Agricultural Projects
3. Climate-Resilient Agriculture: Strategies for NGOs
4. Enhancing Technical and Networking Support to Farmers.
5. Integrated Nutrient Management for Resilient Farming
6. Integrated Pest Management for Resilient Farming

7. Integrated Water Management for Agricultural Development
8. Promoting Organic Farming and Sustainable Practices
9. Resources Management and Community Engagement for Agricultural Projects
10. Strengthening NGO-Government-Private Sector Collaborations

Educational Institutions:

Eight of the 14 institutions surveyed, offer courses on climate-resilient agriculture, focusing on soil health, water management, and pest control, with extension services like training and soil testing. They engage farmers through workshops and field demonstrations. Despite ongoing programs to enhance crop yields and climate adaptation, challenges remain in technical expertise and resources. Recommendations include more research funding, climate-resilient crops, expanded training, and digital tools to strengthen resilience. In light of the discussion with respective stakeholders, the training programmes for members of Educational Institutions are proposed as follows – (*In alphabetical Order*)

1. Extension Services Management for Climate-Smart Farming
2. Management Development Programme for Farmers Field Schools
3. Trainers Training Programme for Integrated Nutrient Management for Climate-Smart Agriculture
4. Trainers Training Programme for Integrated Pest Management for Climate-Smart Agriculture
5. Trainers Training Programme for Soil Health and Water Management for Climate Adaptation
6. Trainers Training Programme for Sustainable Farming Practices

Financial Institutions:

The survey covered fourteen financial institutions offering equipment financing, crop loans, and microloans, with weather insurance underutilized. While most recognize climate risks, nine institutions provide support programs like insurance and subsidies for climate resilience, though adoption is limited. Challenges such as lack of awareness, resource constraints, and regulatory barriers hinder broader support for climate-resilient agriculture. To address these issues, the relevant training programmes for members of the Financial Institutions as proposed are – (*In alphabetical Order*)

1. Building Financial Solutions for Climate-Resilient Agricultural Practices
2. Climate Risk Assessment and Financial Products Development
3. Facilitating Access to Credit and Insurance for Climate-Resilient Farming
4. Financial Risk Mitigation in Agriculture
5. Understanding Climate Risks: Integrating Climate Data into Financial Decision-Making

13.3.4 Stakeholder Group – IV - Department of Agriculture (DOA) Officers and Staff Members:

Stakeholder Group	Members	Targeted Number of Respondents
IV	DOA Officers and Staff Members (*AA, AS, AO, CAO, TAO, DPD/PD ATMA, SDAO*)	60

The survey highlights the Department of Agriculture's (DOA) efforts to promote climate-resilient agriculture (CRA) amidst challenges like erratic rainfall, pest outbreaks, and soil degradation. Officers actively encourage practices such as crop diversification, soil conservation, and water-efficient irrigation but face barriers like limited training, funding, and infrastructure. Current strategies include awareness campaigns, workshops, and subsidies, with technologies like weather tools and drip irrigation gaining traction. To strengthen CRA, officers emphasize expanding subsidies, improving credit access, and focusing on soil health, renewable energy, and precision agriculture.

Suggested Training Programs for DOA Officers:

The survey findings highlight the key subjects for training programmes for DOA Officers and Staff members and are as follows – (*In alphabetical Order*)

1. Agricultural Extension Management
2. Agroforestry and Carbon Trading Opportunities
3. Developing Community-based Organizations
4. Effective Communication

5. Enhancing Market Access
6. Exports in Agriculture – Procedures and Documentation
7. Extension Approaches for promotion of Agribusiness
8. Integrated Nutrition Management
9. Integrated Pest Management
10. Integrating Renewable Energy in Agriculture for Carbon Offsetting
11. Natural Resource Management
12. Organic Farming Certification Procedures
13. Organic Farming Principles and Practices
14. Plant Health Management
15. Post-Harvest Management
16. Precision Agricultural Technologies
17. Soil Health Management
18. Sustainable Agriculture Principles and Practices
19. Value Addition in Agriculture
20. Value Chain Extension
21. Water Resource Management
22. Water Use Efficiency
23. Women Empowerment for Climate Resilient Agriculture

The above training themes were emerged from the primary data collection survey exercise however, in view of the broader objectives of the project; in consultation with the subject matter specialists and the discussions with the officials of the Project Management Unit (PMU); NDKSP, the felt needs for capacity building of DOA Officers and Staff members have been ascertained. The corresponding training programmes that may be considered are as indicated herewith –

1. Carbon Credits and Climate-Smart Agriculture
2. Carbon Markets and Trading Mechanisms
3. Carbon Sequestration Techniques in Farming Systems
4. Developing Carbon Credit Projects for Smallholder Farmers

5. Digital Tools and Technologies for Carbon Accounting in Agriculture
6. Agroecology and Biodiversity
7. Measurement, Reporting, and Verification (MRV) of Carbon Credits
8. ICT Applications for Effective Dissemination of Information
9. Role of Soil Health in Carbon Sequestration

The critical need for tailored, practical training programs to equip farmers and institutions with the skills required to adopt climate-resilient agricultural practices effectively are outlined. These scientifically designed programs must systematically address the unique challenges faced by identified stakeholder groups. The detailed training modules are provided separately at Annex – I

13.4Capacity Enhancement Training Broad Plan:

In light of the various training themes as indicated above for respective stakeholders, here is presented the details of each of the training themes. The programmes are considered to be classified into five categories as per the details indicated in the following table –

SN	Type of the Programme	Target Stakeholder Group	Programme Duration (Days)	Broad Objective of the Training Programme	Frequency
1	Sensitization Programmes (SP)	I, II, III, IV	2	To sensitize the participants for various components of the Project and Updates	Yearly
2	Project Appreciation Programmes (PAP)	II, III, IV	3	To create awareness for the project and provide detail inputs on the various developmental interventions being proposed in the project areas to address climate change effects	Bi-Annual
3	Performance Improvement Programmes (PIP)	I, II	3	To provide the subject knowledge and skills to help improve the functional performance of the trainees	Quarterly
		III	5		
4	Management Development Programmes (MDP)	IV	5	To develop capacities to help manage extension functions effectively pertaining to the subject	Round the Year
5	Capacity Enhancement Programmes (CEP)	IV	5	To impart knowledge, skill and exposure pertaining to the subject so that the required capacity to address the issues and challenges is enhanced	Round the Year

The indicative training plan for a year is proposed in the following table:

SN	Type of the Programme and Target Stakeholder Group	Training Location	Batch Size	Number of Programmes in a Year	Number of Participants	Estimated Cost INR		
						Cost Norm INR Per Trainee Per Day	Cost per Batch (INR Lakh)	Total Cost (INR Lakh)
1	Sensitization Programmes (I, II, III, IV)	Village / Block / District	50	100	5000	1000/-	1.00	100.00
2	Project Appreciation Programmes (II, III, IV)	Block / District	50	50	2500	1500/-	2.25	112.50
3	Performance Improvement Programmes (III)	Block	40	50	2000	1500/-	1.80	090.00
4	Management Development Programmes (IV)	RAMETI / VANAMATI	40	70	2800	2000/-	4.00	280.00
5	Capacity Enhancement Programmes (IV)	RAMETI / VANAMATI	30	50	1500	2000/-	3.00	150.00
TOTAL Estimated Annual Costs towards the Capacity Enhancement Programmes								732.5

The details of all the above-mentioned training programme are provided in ANNEX – 1

14 Chapter 14. Concluding Note:

In response to the growing challenges posed by climate change on agriculture in Maharashtra, a comprehensive capacity-building initiative has been designed to enhance the skills and knowledge of various stakeholders involved in agricultural extension. The primary goal of this training is to equip extension functionaries, farmers, community organizations, and other key actors with the technology and strategies necessary to address the adverse impacts of climate change on agricultural productivity, sustainability, and livelihoods.

The training programs cover a wide array of themes, each carefully chosen to tackle the multifaceted challenges emerging in agriculture. These themes are organized into distinct categories to ensure that different groups such as farmers, NGOs, educational institutions, financial institutions, and government officers receive relevant, focused knowledge to enhance their roles in building climate resilience in agriculture.

The proposed training programs are essential in addressing the urgent need for climate adaptation in agriculture. By focusing on sustainable farming practices, market linkages, resource management, and carbon markets, these programs aim to build resilience in Maharashtra's agriculture sector.

The training programs are highly relevant as they directly address the impacts of climate change on agricultural productivity, water resources, and soil health while offering solutions that help mitigate the adverse effects of climate change. These capacity-building efforts are crucial in preparing stakeholders to implement climate-resilient practices that will protect and improve agricultural systems, benefiting both farmers and the wider agricultural economy.

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ANNEX – I: Detailed Training Modules.