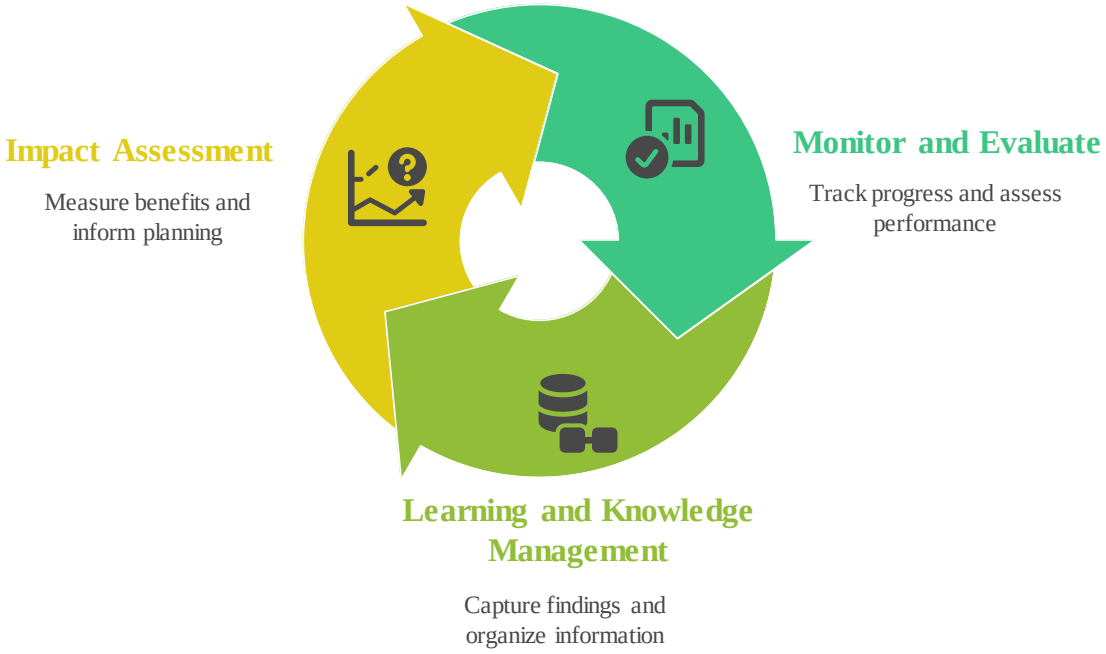
# Monitoring, Evaluation, Learning and Impact Assessment (MELIA)




ICAR-National Institute of Agricultural Economics and Policy Research (NIAP), New Delhi

भाकृअनुप
ICAR

# MELIA TEAM

| | | |
|---|---|---|
| **MELIA Steering Committee** | : | Secretary DARE and Director General, ICAR |
| | | Deputy Director Generals (DDGs) |
| | | Assistant Director General (PIM), ICAR |
| | | Director, ICAR-NIAP |
| | | Director, ICAR-IASRI |
| | | Head of the Department, Division of Technology and Sustainable Agriculture, ICAR-NIAP |
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# Contents

# Monitoring, Evaluation, Learning and Impact Assessment (MELIA) unit

## 1. Background

The Indian Council of Agricultural Research (ICAR), serving as the leading authority for coordinating, guiding, and managing agricultural research and education in India, plays a crucial role in ensuring sustainable food, environmental, and nutritional security (ICAR 2015). To enhance evidence-based decision-making, strategic learning, and accountability throughout the research ecosystem, a Monitoring, Evaluation, Learning, and Impact Assessment (MELIA) unit is established at the ICAR-NIAP. This unit will serve as a coordination center for Institutes under the ICAR umbrella.

The objective of the MELIA unit is to monitor project implementation against set targets, timelines, and resources; evaluate the effectiveness, efficiency, relevance, and sustainability of the projects; learn from the success and challenges of adaptive management and improvement; and assess the impact of ICAR technologies and initiatives on agricultural food security, livelihood, climate resilience, and agricultural development.

The guiding principles of MELIA are utilization oriented, ensuring the outputs should directly inform decision-making at ICAR; participatory and inclusive, engaging stakeholder at all levels; learning oriented, foster a culture of reflective practices and adaptive management; and evidence-based, relying on robust data collection and analysis. MELIA would be integrate ICAR broader planning, budgeting and reporting systems.

The MELIA Unit will catalog existing ICAR data systems, such as the institute MIS, KVK reporting, and NAHEP legacy systems, focusing on reporting outcomes. It will establish interoperability by implementing standardized data dictionaries, APIs, and exchange protocols. All MELIA reporting will be structured to integrate seamlessly into ICAR's planning, budgeting, and statutory reporting cycles.

The proposed note is divided into four subsections. Section 2 details the core activities to be conducted under the MELIA. Section 3 outlines the generalized framework of the MELIA, including the theory of change and impact pathways. Section 4 discusses the structure of the unit, and section 5 addresses the governance structure and roles.

## 2. Core Activities

The unit would undertake three core activities;

- Monitoring and Evaluation of projects
- Learning and Knowledge Management, and
- Impact Assessment of Technologies and Practices.

### 2.1 Monitoring and Evaluation (M&E)

The projects and programmes under the ICAR would be systematically tracked and assessed based on key performance indicators (KPIs). KPIs are specific, measurable, achievable, relevant, and time-bound metrics used to track the progress, performance, and results of a project/program against its objectives (See Box 1). This would help improve the performance, effectiveness, and impact of projects undertaken under ICAR. Monitoring would help research managers and principal investigators of the projects to track progress and to identify whether the resources are being used efficiently, and whether activities on schedule and outputs are delivered. The activities, schedules, outputs and planned objectives would be identified and co-development together with the research managers and principal investigators of the project.

Box 1: KPIs used in National Agricultural Higher Education Project (NAHEP, 2019)

- Increase in the percentage of UG students at participating Agricultural Universities that graduate on time (defined as three years)
- Higher cut-off scores for students in ICAR entrance tests at participating Agricultural Universities / Percent increase in Cut- off percent (Cut off score / Maximum possible score) in ICAR UG entrance tests

Suggestive KPI structure for ICAR

Level 1: ICAR-wide outcomes and impacts

- Technology adoption of ICAR innovations (Crop, Dairy, Fishery, Horticulture, Agricultural Engineering, Digital innovations, etc.)
- Economic returns to R&D (IRR, NPV, BCR at portfolio level).
- Contribution to productivity, resilience and income (e.g., TFP, yield stability, climate-resilient practice adoption and monetary impacts of such outcomes).
- Alignment with national priorities (e.g., SDGs, NDCs, national missions).

Level 2: SMD/portfolio outcomes

- Varietal release-to-adoption cycle time; area/households reached; value chain integration.

- Institutional and human capital outcomes (skills, placements, research-output quality).
- Partnerships and scaling pathways

Level 3: Project outputs and outcomes

- Outputs: trials completed, technologies validated, datasets produced, trainings delivered, Publications, etc.
- Outcomes: farmer/sectoral outcomes (yield, cost, risk reduction, income), service performance (timeliness, satisfaction), and policy uptake.

Indicator Standards:

- Each indicator will include definition, formula, baseline, target, disaggregation (state, ecologies, gender, farm size, social category), data source, frequency, and responsible unit. A central indicator dictionary and codebook will ensure consistency and comparability.

**A detailed list of KPIs for M&E and Impact assessment is given in Annexure 1**

In addition to routine monitoring, projects and programs will undergo periodic evaluations, including mid-term reviews for timely feedback and end-term evaluations to assess overall achievements. These evaluations would focus on outcomes and impacts, assessing the relevance, effectiveness, efficiency, and sustainability of projects and programs. These evaluations would be done by a third-party individual or institution. Together, this integrated monitoring and evaluation framework will enhance evidence-based decision making, improve accountability, and ensure that ICAR's research investments generate lasting contributions to agricultural development.

## 2.2 Learning and Knowledge Management

Learning and knowledge management are centered on capturing the project findings, institutionalising learning, and organizing the information generated. The goal is to ensure that knowledge is gathered and transformed into actionable insights that can inform future interventions.

The learning and knowledge management process would be carried out by organizing reflection workshops and learning reviews. These activities provide opportunities to critically assess results, identify success factors, and analyze challenges. The outcomes will then be synthesizing into a variety of knowledge products, including learning briefs, success stories, case studies and technical notes.

The output documents will serve as a practical guide for policy development, program design, and research strategies. By embedding these practices within institutional processes, learning and knowledge management can strengthen organizational memory, avoid duplication

of efforts, and foster a culture of continuous improvement. These processes document project-level experiences, which can be fed into strategic decision-making, ensuring that future initiatives are both evidence-based and responsive to evolving needs.

## 2.3 Impact Assessment

The impact assessment (IA) function within the MELIA formwork will be a core mechanism to generate an evidence-based analysis of how ICAR's research, technology, policies and capacity building initiatives could contribute to increasing agricultural productivity, sustainability and livelihoods. IA measures benefits across economic, social, environmental and policy dimensions to estimate returns on investment in ICAR research, and inform strategic planning and resource allocation.

Assessment covers the outputs of projects such as crop varieties, livestock breeds, fisheries technology, farm mechanization, ICT tools, capacity development programs, and system-level outcomes such as climate resilience, resource sustainability, and market integration. The outputs of the projects would be identified by the project leads and SMD leads and ICAR-NIAP would be handholding in doing impact assessment by providing consultancy, trainings, training manuals and review of the impact assessment reports.

The IA will follow five steps: 1) mapping theory of change and impact pathways (see Section 3 for details), 2) establishing baselines and counterfactuals using experimental or quasi experimental approaches (Table 1), 3) collecting primary and secondary data, including qualitative data, 4) estimating the effect of the project on the outcomes, and 5) reporting results and integrating it into ICAR's planning and review process of ICAR.

**IA Design Selection Guidance:** IA designs will be matched to the intervention type, scale, and evaluability:

- Phased rollouts and strong control over delivery: RCTs or other suitable experimental designs.
- State-wide or policy-level interventions: difference-in-differences, synthetic control, or regression discontinuity (where assignment rules permit).
- Mature/large-scale technologies with market effects: partial or computable general equilibrium models and sector simulations to capture spillovers.
- Complex, multi-actor/system outcomes: contribution analysis and mixed-method designs to assess both attribution and contribution.
- Where randomization is infeasible: quasi-experimental methods (PSM, IPWRA, and IV) with robustness checks.

The outputs from the IA exercise will be published as annual ICAR Impact reports, case studies, and meta-analyses of ICAR contribution to national goals in the agricultural sector.

**Table 1. Impact assessment approaches**

| | Ex-ante | Ex-Post |
|---|---|---|
| Primary data | Randomised Control Trial (RCT), Lab Experiment, Qualitative impact assessment | Propensity Score Matching (PSM), Inverse Probability, Weighted Regression Adjustment (IPWRA), Difference in Difference (DiD), Instrumental Variable, Machine Learning causal forest, Qualitative impact assessment |
| Secondary data | Trade-off analysis Minimum Data (ToA MD), Modelling: General Equilibrium Modelling, Partial Equilibrium Model, Simulations | Meta-analysis, Synthetic Control, Regression Discontinuity Design (RDD)[$] |

*Note: Ex-ante impact assessment is the evaluation of technology or programs before implementation. Ex-post impact assessment refers to the evaluation of the technology or programs after it has been implemented. [$]These approaches could be used also for primary data, given large surveys could be carried out for the study.*

# 3. Generalised Framework

This section discusses two underlying frameworks that are fundamental to MELIA; theory of change and impact pathway.

## 3.1 Theory of Change

Theory of change (ToC) is a structured explanation of how and what a project, program is expected to achieve its intended outcome and impacts. ToCs clarify causal pathways and assumptions. Robust and detailed ToCs are fundamental to the MELIA framework. They guide planning and implementation, support monitoring and evaluation, and inform the adaptive management. By mapping the causal pathways from activities to expected impacts and highlighting the assumptions involved, ToCs play a dual role in both project design and execution. They serve as essential tools for tracking progress, guiding course corrections, and shaping future strategy development.

Developing a ToC is a participatory structure process that involves clarifying what the project/program wants to achieve, how the change is expected to happen, and the assumptions and external factors that influences this process. ToC is a conceptual framework of the program, which can be drafted at different levels (SMD, project level). There are eight steps in developing ToC;

1) **Defining the long-term impact**: This step is done to define the long-term change thatthe project/programme is envisaging (e.g., improving livelihood of farmers by

increasing productivity of a […] crop). The long term impact should align with ICAR goals and national priorities.

2) **Identifying outcomes**: This step helps determine the medium-term results that will contribute to the long-term impact (e.g., adoption of new technologies). Outcomes should be specific, measurable and achievable within a reasonable timeframe.
3) **Mapping outputs**: In this step, results directly from project activities are mapped (e.g., releasing a new crop variety). The outputs should be a product or deliverable, which could lead to outcomes.

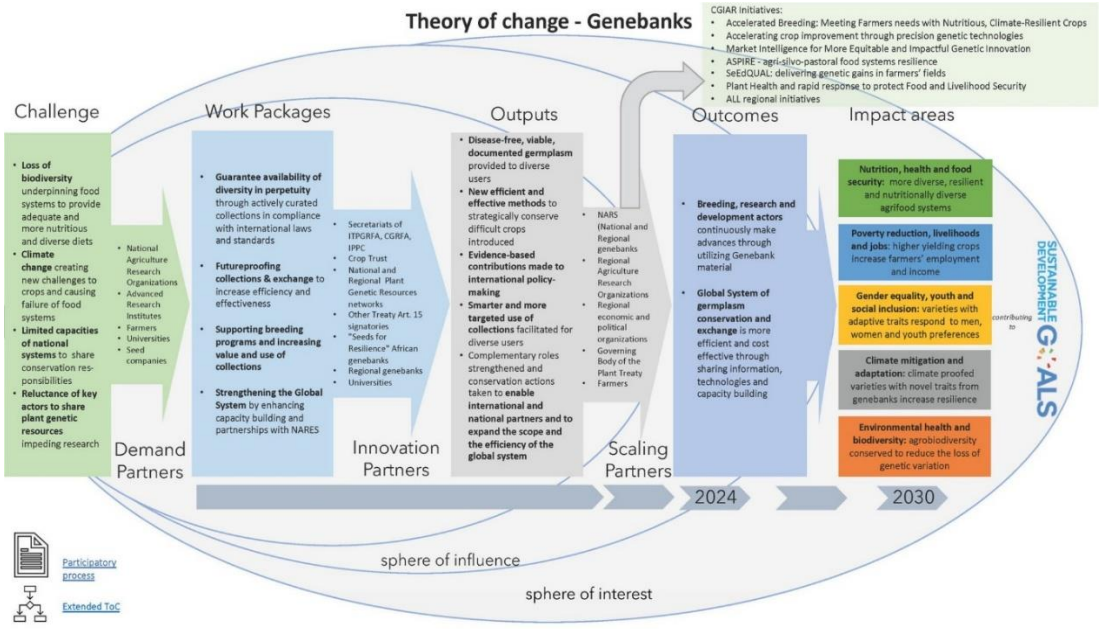


**Figure 1. Theory of change for the Gene bank initiative**

*Source: Ihar et al (2021)*

4) **List activities/inputs**: This step involves listing the interventions, actions, or programs that will produce the outputs (e.g., conducting field trials). Each activity is linked to outputs expected to be produced.
5) **Identifying assumptions**: In this step the underlying assumptions; conditions that must hold true for the project to achieve its impact should be made explicitly (e.g., farmers have access to inputs and credits, markets remain stable). This could also include other external factors that could influence outcomes (climate events, policy change)
6) **Defining indicators**: This step determines how the activity, output, outcome and impact are measured to track progress. The indicators should be SMART (Specific, Measurable, Achievable, Relevant and Time-bound)

7) **Validating the pathways**: In this step different stakeholders (farmers, researchers, extension agents and policymakers) are engaged reviewing and confirming whether the causal pathways are realistic.
8) **Visualizing the ToC**: This step involves creating a diagram to show the flow from inputs/activities to impact, with assumptions noted along the pathway (see Figure 1). Arrows and logical sequencing are required to be made to clarify the causal link.

### 3.2 Impact Pathway

The impact pathway is a focused, operational component of a ToC. It specifically maps the sequential steps through which an intervention produces impact, emphasizing the flow from research inputs to outputs (technology) to outcomes and impact (Figure 2). The purpose is to create an explicit chain of events that lead from research activities to impact. The scope is narrower than that of the ToC, as it focuses on translating the inputs into impact rather than the broader learning process. Impact pathways serve as the operational backbone and can be developed by the program lead along with other stakeholders. ICAR-NIAP would be providing guidelines, tool-kits and training for developing impact pathways.

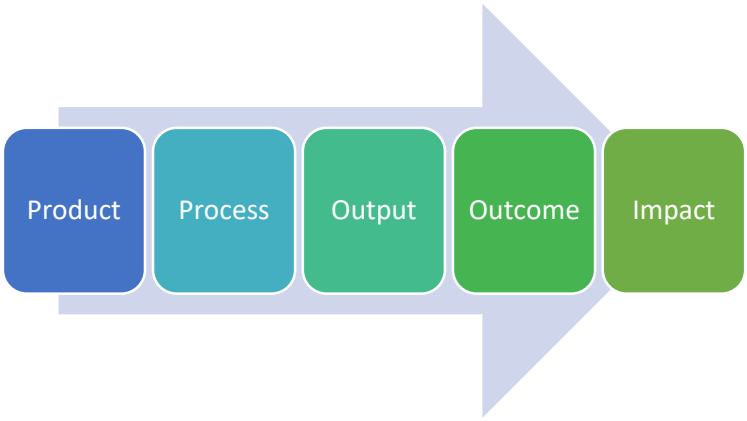


**Figure 2. A representative impact pathway**

## 4. Structure of MELIA Unit

The MELIA unit hosted at ICAR-NIAP is led by a unit lead under the MELIA steering committee of DG ICAR, DDGs, and Director ICAR-NIAP in network project mode (see Figure 3) as also highlighted in the governance section. The unit would comprise of four sub-units; 1) Monitoring and evaluation, 2) Learning and knowledge management, 3) Impact assessment, 4) Data analysis and IT support (See Annexure for the details of scientist being part of the MELIA unit of ICAR-NIAP). These sub-units would have a common dashboard and learning platform,

developed and maintained primarily by the data analysis and IT support teams. The arrow represents flow of information and access.

Monitoring and evaluating team would be handholding the projects investigators through a institute level nodal officers (each institute level) in developing framework and framework and key-performance indicators for tracking the progress of the projects and programmes. Learning and knowledge management unit will be facilitating learning activities, conducting review workshop and support in synthesizing the learnings from the study. The impact assessment unit would have impact assessment specialists, focusing on handholding and supporting impact assessments. Data analysis and IT support teams would focus on the data structure dashboards, and data visualization. In addition, they will also maintain a centralised impact assessment repository with meta-data


**Figure 3. Structure of the MELIA unit and function**

In addition to providing handholding and support for these activities, the MELIA unit organizes regular training on monitoring and evaluation, impact assessment, data analytics and knowledge management. It will also develop resource manuals and e-learning models for

scientist and staff would be developed to resource manuals and e-learning modules for scientists and institute staff to strengthen their capacities in these areas.

## 5. Governance Structure, Roles and Incentives

***5.1* Governance*:*** The MELIA Unit at ICAR-NIAP act as the custodian of MELIA standards and evidence repositories. A MELIA Steering Committee will comprise of DG ICAR (Chair), SMD leads, Director of ICAR-NIAP, and Head of Department of Technology and Sustainability. The steering committee will approve annual MELIA plans, major evaluation ToRs, annual results and impact report.

***5.2* Role and Responsibilities**

- MELIA Unit: standard-setting, quality assurance, commissioning evaluations, data governance, synthesis and meta-analysis, knowledge products, capacity building, and a helpdesk for projects and institutes. The MELIA unit-lead at ICAR-NIAP would coordinates four sub-units of MELIA. Each unit would consist of scientist from ICAR-NIAP who would be leading and handholding the MELIA nodal officers.
- MELIA nodal officer at ICAR Institute: portfolio oversight, quarterly performance and learning reviews, identification of thematic evaluations, and synthesis.
- Project principal investigators (PIs): MELIA plans, timely data collection and reporting, and documentation of use, uptake, and adoption.
- ICAR institutes directors: Maintenance of institute dashboards, data quality checks, compliance with data governance, hosting learning events.

***5.3* Incentives:** The MELIA system would be designed incorporating the existing reporting structures to ensure minimum reporting and duplication. In addition, incentive structures were built to support active participation from MELIA nodal officers and project PIs.

## References

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NAHEP. (2019) Monitoring and Evaluation Manual: National Agricultural Higher Education Project, ICAR, New Delhi.

# Annexures

## Table 1. Monitoring and Evaluation KPIs:

| S.No. | KPI | Institute level | SMD level | ICAR level |
|---|---|---|---|---|
| 1 | Project name | | | |
| 2 | Project themes/area | | | |
| 3 | Project funding amount | | | |
| 4 | Project funding source | | | |
| 5 | Project duration | | | |
| 6 | Project total funding | | | |
| 7 | Project annual expenditure | | | |
| 8 | Cost structure by component (research, capacity building, infrastructure, outreach) | | | |
| 9 | Number of researchers (scientists and other support staff) | | | |
| 10 | Number of institutes associated | | | |
| 11 | Share of researcher's time in each project | | | |
| 12 | Number of activities (targets) | | | |
| 13 | Focus region of the project (eg:Study area, technology developed target) | | | |
| 14 | Project activities percentage achieved per year | | | |
| 15 | Number of technology/products/Innovations: Details of technology developed Crop-based; Animal-based, including vaccines, Biological – biofertilizer, biopesticide, etc; IT based – database, software; Any other – please specify) | | | |
| 16 | Publications: Research papers, Reports/Manuals, Working and Concept Papers, Popular articles, Books/Book Chapters, Extension Bulletins | | | |
| 17 | Intellectual Property Generation: Patents - filed/obtained; Copyrights- filed/obtained; Designs- filed/obtained; Registration details of variety/germplasm/accession if any | | | |
| 18 | Presentation in Workshop/Seminars/Symposia/Conferences | | | |
| 19 | Trainings/demonstrations/workshops organized | | | |
| 20 | Number of farmers targeted | | | |
| 21 | Area targeted/achieved | | | |
| 22 | Increase in productivity (crop, animal, fisheries, labour, capital)* | | | |
| 23 | Increase in adoption* | | | |
| 24 | Decrease in poverty reduction* | | | |
| 25 | Other outcomes* | | | |

Note: These indicators are to be tracked based on the timeline (year-wise). *Estimates from

Table 2. Impact evaluation indicators

| **Scientific** | **Social** | **Economic** | **Environmental** |
|---|---|---|---|
| *Research Output & Quality*<br>• Number of peer-reviewed publications in high-impact journals<br>• Number of patents and intellectual property rights filed<br>• Number of new crop varieties, livestock breeds, or fisheries technologies released<br>• Number of research datasets produced and shared publicly<br>• Citation impact of research outputs<br>• Number of methodological innovations developed<br>• Number of experimental trials completed and technologies validated<br>• Quality of research outputs (peer review ratings, | *Farmer & Community Impact*<br>• Number of farmers/households reached by ICAR technologies<br>• Technology adoption rates disaggregated by gender, farm size, and social category<br>• Percentage increase in farmer participation in decision-making<br>• Number of Farmer Producer Organizations (FPOs) strengthened<br>• Changes in women's participation in agriculture (labor, decision-making, asset ownership)<br>• Number of youth engaged in agriculture through ICAR initiatives<br>• Food security improvements measured by Food Insecurity Experience Scale (FIES)<br>• Minimum Dietary Diversity for Women (MDD-W) as nutrition indicator | *Farm-Level Economic Impact*<br>• Percentage change in crop/livestock productivity (yields per hectare)<br>• Increase in farm income and profitability<br>• Reduction in cost of cultivation<br>• Benefit-cost ratio (BCR), Net Present Value (NPV), Internal Rate of Return (IRR) of ICAR technologies<br>• Changes in input use efficiency (fertilizer, water, labor)<br>• Market integration indicators (access to markets, price realization)<br>*Economic Returns to Research*<br>• Economic returns to R&D at portfolio level<br>• Total Factor Productivity (TFP) contribution<br>• Contribution to agricultural GDP growth<br>• Employment generation in agriculture and allied sectors | *Natural Resource Management*<br>• Water use efficiency (crop per drop metrics)<br>• Soil health improvements (organic carbon, nutrient status)<br>• Reduction in chemical fertilizer and pesticide use<br>• Area under conservation agriculture practices<br>• Groundwater table changes in intervention areas<br>• Biodiversity conservation metrics (on-farm diversity indices)<br>*Climate Change Mitigation & Adaptation*<br>• Greenhouse gas emissions reduction (CO2 equivalent)<br>• Carbon sequestration in agricultural systems |

| | | | |
|---|---|---|---|
| validation status)<br><br>*Research Capacity*<br>• Number of PhD/MSc students trained<br>• Number of research collaborations with national and international institutions<br>• Research infrastructure improvements (labs, equipment, field stations) | • Access to agricultural advisory services (number of farmers reached)<br>• Farmer satisfaction with extension services<br><br>*Capacity Development*<br>• Number of training programs delivered to farmers and extension workers<br>• Skill development outcomes (pre/post training assessments)<br>• Number of women farmers trained in new technologies<br>• Community resilience indicators<br><br>*Equity & Inclusion*<br>• Gender disaggregated data on all key indicators<br>• Participation of marginalized communities (SC/ST categories)<br>• Equitable benefit distribution across farm sizes | • Value chain integration outcomes<br><br>*Market & Trade*<br>• Area under improved varieties/technologies (hectares)<br>• Production volume changes of target nutrient-rich foods<br>• Market prices received by farmers<br>• Post-harvest loss reduction<br>• Export competitiveness indicators<br><br>*Risk Reduction*<br>• Yield stability improvements (coefficient of variation in yields)<br>• Income variability reduction<br>• Adoption of risk reduction strategies | • Area under climate-resilient practices<br>• Adoption of climate-smart agriculture technologies<br>• Reduction in agricultural residue burning<br>• Climate adaptation capacity scores<br><br>*Environmental Sustainability*<br>• Reduction in environmental pollution (nitrate leaching, pesticide residues)<br>• Ecosystem services maintained or enhanced<br>• Sustainable intensification indicators<br>• Agroecological diversity (Shannon Index, Simpson Index)<br>• Energy use efficiency in agriculture<br>• Circular economy indicators (waste to wealth initiatives) |

| | | | |
|---|---|---|---|
| | | | • Carbon credit, green credit, PES generated<br><br>*Alignment with National Goals*<br><br>• Contribution to Sustainable Development Goals (SDGs 1, 2, 5, 13, 15)<br><br>• Alignment with Nationally Determined Contributions (NDCs)<br><br>• Support to national missions (National Food Security Mission, etc.) |