



Aligning Food Systems in National Adaptation Plans (NAPs) and Nationally Determined Contributions (NDCs) Lao PDR Case Study



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List of Acronyms

AFOLU	Agriculture, Forestry, and other Land Use
ASEAN	Association of Southeast Asian Nations
BOLD	Biodiversity for Opportunities, Livelihoods and Development
BTR	Biennial Transparency Report
CSA	Climate-Smart Agriculture
DAEC	Department of Agricultural Extension and Cooperatives
DOA	Department of Agriculture
EbA	Ecosystem-based Adaptation
FAO	Food and Agriculture Organization of the United Nations
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
IGES	Institute for Global Environmental Strategies
IPCC	Intergovernmental Panel on Climate Change
IRRI	International Rice Research Institute
LDC	Least Developed Country
LNG	Lao National Genebank
LUCF	Land Use Change and Forestry
MAE	Ministry of Agriculture and Environment
MOI	Means of Implementation
MRV	Measurement, Reporting, and Verification
NAFRI	National Agriculture and Forestry Research Institute
NAP	National Adaptation Plan
NBSAP	National Biodiversity Strategy and Action Plan
NbS	Nature-based Solution
NDC	Nationally Determined Contribution
NSEDP	National Socio-Economic Development Plan
PGR	Plant Genetic Resources
PGRFA	Plant Genetic Resources for Food and Agriculture
PPP	Public-Private Partnership
RCC	Regional Collaboration Center
SCALA	Scaling up Climate Ambition on Land Use and Agriculture
SDG	Sustainable Development Goal
SLM	Sustainable Land Management
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

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FOREWORD

Agriculture today is evolving under pressures that extend far beyond any single sector or discipline. Ensuring stable and productive food systems increasingly requires coordinated action among institutions that conserve biodiversity, those that develop and distribute improved varieties, the extension services working directly with farmers, and the policymakers shaping national priorities. At the foundation of all these efforts lies one essential resource: the plant genetic diversity safeguarded in genebanks and maintained in farmers' fields.

This beneficial diversity, accumulated over millennia, is the raw material for every new crop variety, every breeding breakthrough, and every resilient production system. Yet its strategic importance has long remained implicit rather than central in national planning. The case studies presented here examine how national seed systems are reflected in overarching development priorities and strategies for transforming the food system, including the goals set out in National Adaptation Plans (NAPs), and Nationally Determined Contributions (NDCs). They also shed light on the roles and connections between genebanks, breeders, extension services, farmers, ministries, and financial institutions, and highlight where greater coordination in the area of climate resilience could be most beneficial.

This work was made possible through close international collaboration. The Institute for Global Environmental Strategies (IGES), together with the UNFCCC Regional Collaboration Centers (RCC) for Asia-Pacific and for MENA & South Asia, convened partners from Lao PDR, Viet Nam, and Pakistan to examine how their food and seed systems connect to national policy frameworks. The Crop Trust contributed technical leadership on the role of genebanks, providing expertise on conservation, data management, seed systems, and long-term strategies for securing plant genetic resources for food and agriculture.

The Biodiversity for Opportunities, Livelihoods and Development (BOLD) project, funded by the Government of Norway, has been instrumental in creating the enabling conditions for this work. BOLD strengthens national genebanks, supports the safe conservation and sharing of plant genetic resources, develops new climate resilient plant varieties, improves seed system linkages, and helps ensure that genetic diversity flows from conserved collections into farmers' hands where it can make a real difference. The project embodies the Crop Trust's long-standing mission: to secure crop diversity forever and make it available, without restriction, to all who depend on it.

These case studies illustrate what international cooperation can achieve. Government representatives, researchers, breeders, extension agents, farmers' organizations, and development partners brought their collective experience to map seed system actors, identify institutional bottlenecks, and design realistic action plans rooted in each country's priorities and capacities. Across all three countries, a similar insight emerged that genebanks are most valuable when they are connected actively, visibly, and sustainably to the broader agricultural system. This includes breeders who depend on diverse germplasm, extension services that support local adaptation, private seed enterprises that scale availability, and farmers who conserve, innovate, and ultimately determine which varieties thrive.

I am deeply grateful to the delegations from Pakistan, Viet Nam, and Lao PDR for their leadership and openness throughout this process. My appreciation also goes to colleagues at IGES and the UNFCCC RCCs, whose collaboration has been essential in shaping the analytical framework and guiding this multi-country effort. Finally, I thank the Government of Norway for its long-term support to the Crop Trust and the BOLD project, which continues to strengthen national capacities and ensure that the world's crop diversity remains protected and accessible for generations to come.



Dr. Benjamin Kilian
BOLD Project Coordinator, Global Crop Diversity Trust

EXECUTIVE SUMMARY

Lao PDR is at a pivotal moment in its development trajectory. As a least developed country (LDC) on track to graduate by 2026, its food systems face increasing pressure from climate change, structural transformation, and resource constraints. Agriculture remains central to livelihoods, food security, and poverty reduction, employing nearly three-quarters of the population and contributing close to one-third of GDP. At the same time, the country is among the most climate-vulnerable in Southeast Asia, with rising temperatures, erratic rainfall, floods, droughts, and land degradation directly threatening agricultural productivity and rural resilience.

This case study examines how food systems are embedded within Lao PDR's National Adaptation Plan (NAP) and Nationally Determined Contribution (NDC), with particular attention to seed systems, crop diversity, and plant genetic resources for food and agriculture as foundational enablers of climate resilience. Drawing on agriculture-focused frameworks, it highlights how genebanks, breeding systems, and local seed networks underpin both adaptation and mitigation outcomes, yet remain only implicitly reflected in climate planning.

The analysis shows that Lao PDR has made substantive progress in identifying agriculture as a priority adaptation sector, promoting climate-resilient crop varieties, climate-smart



Rice regeneration fields, Lao National Genebank. Crop Trust Photo

agriculture (CSA), ecosystem-based adaptation (EbA), and nature-based solutions (NbS). However, critical gaps persist in operationalizing these ambitions, particularly in linking national genebanks and seed systems with NAP and NDC implementation, strengthening institutional coordination, and mobilizing sustained finance and technical capacity.

Reflecting the Lao PDR delegation's breakout discussions during the Technical Workshop on "Cross-Linkages among Food System Actors and

Aligning Food Systems in National Adaptation Plans (NAPs) and Nationally Determined Contributions (NDCs)" (Figure ES-1), held November 25–26, 2025, in Bangkok, Thailand, the case study concludes with actionable entry points to better integrate food systems actors, especially genebanks, into Lao PDR's climate governance architecture, ensuring that adaptation and mitigation commitments are grounded in resilient, inclusive, and biodiversity-rich agricultural systems.

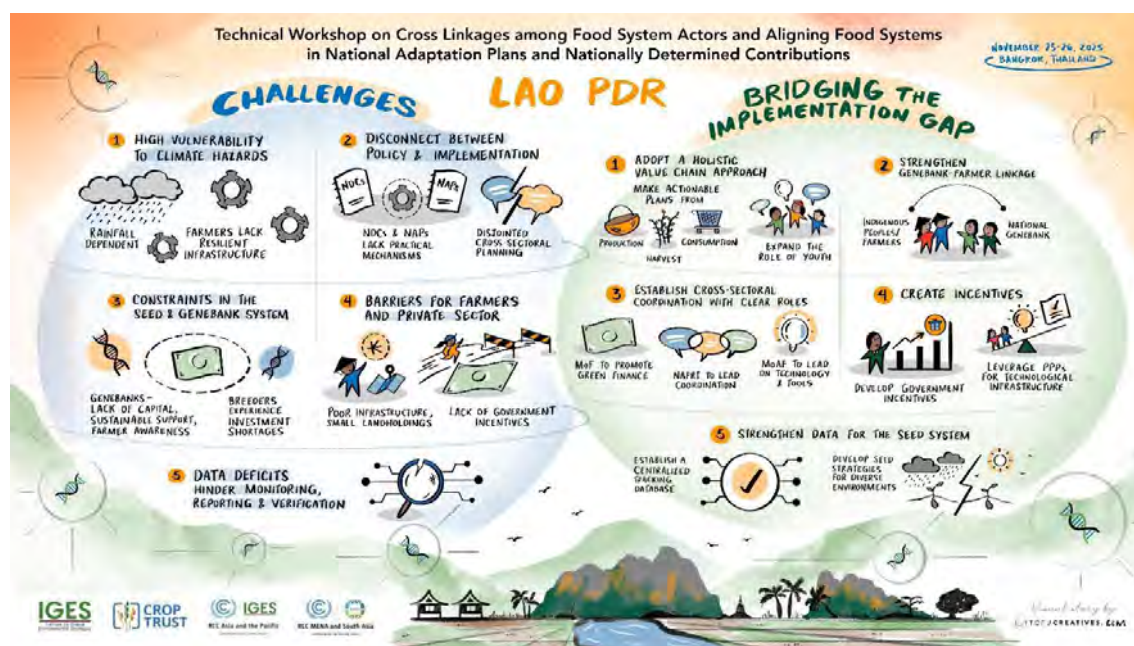


Figure ES-1. Lao PDR delegation's breakout discussions during the Technical Workshop on "Cross-Linkages among Food System Actors and Aligning Food Systems in National Adaptation Plans (NAPs) and Nationally Determined Contributions (NDCs)"

1. BACKGROUND

A critical enabler of resilient food systems is the integration of cross-sectoral linkages within adaptation planning. This includes leveraging genebanks and the conservation of crop genetic diversity, which serve as foundational resources for developing climate-resilient crop varieties that can withstand extreme weather, pests, and other stresses associated with climate change.

Embedding these approaches into NAP and NDC processes promotes coherence across agriculture, water and health among other sectors, facilitating efficient resource use and delivering broader benefits such as sustainable land management, secure livelihoods and empowerment of vulnerable groups including smallholder farmers, women and Indigenous Peoples.

The emphasis on resilient food and agricultural systems aligns with global commitments, underscoring the urgency for multi-sectoral strategies to strengthen food security amidst climate change. The UN Secretary-General's Call to Action for Accelerated Food Systems Transformation also highlighted the need to align national food systems transformation pathways with evolving NDCs and NAPs. Similarly, the COP28 UAE Declaration on Sustainable Agriculture and Climate Action affirmed that agriculture and food systems are central to achieving the Paris Agreement goals and must urgently adapt to climate realities. The UAE Framework for Global Climate Resilience, including the outcome of the first global stocktake and the global goal on adaptation, further prioritizes attaining climate-resilient food production, promoting sustainable, regenerative agriculture and equitable access to nutrition as one of the targets.

The project Biodiversity for Opportunities, Livelihoods and Development (BOLD), funded by the Norwegian Agency for Development Cooperation, and managed by the Global Crop Diversity Trust, aims to ensure and expand the availability of key national crop collections and promote their use by researchers, pre-breeders, and farmers for climate change adaptation in a number of partner developing countries. BOLD

contributes to implementing provisions of the FAO International Treaty related to conservation, sustainable use, and sharing of plant genetic resources for food and agriculture, and contributes to the achievement of SDG Target 2.5, which recognizes the maintenance of crop diversity through soundly managed and diversified genebanks at national, regional and international levels as essential to end hunger and malnutrition.

Genebanks play a crucial role in climate adaptation and can serve as a vital pillar for sustainable agriculture and food security in the face of climate change. They are central to national efforts in climate-resilient food systems. By preserving a wide array of genetic materials, genebanks can serve as repositories that can provide the genetic traits necessary for crop varieties needed in the face of changing climate conditions, pests, and diseases. With this backdrop, there is an opportunity for genebanks to be recognized in the NAPs and NDCs as a critical solution for food system resilience in the face of climate shocks and stresses. By integrating genebanks into these plans, countries can ensure that their food and agricultural strategies are underpinned by a strong foundation of genetic diversity and resource availability.

This case study presents country profiles of Lao PDR in terms of its national contexts, climate change impacts on food systems, the strategic role and priority measures of food systems in NAPs and NDCs, means of implementation, and current support for food system transformation.

2. NATIONAL CONTEXT

Lao PDR, a landlocked nation located in the Indochina and Southeast Asian region, has been classified as a low-middle-income country since 2011. It is on track to graduate from its Least Developed Country (LDC) status by 2026 (1).

Owing to its geographical features, agriculture remains the cornerstone of Lao PDR's economy and development strategy. Approximately 73% of the population relies on agriculture for their livelihood, contributing around 28% to the country's gross domestic product (GDP). Lao PDR is characterized by high agro-biodiversity, shaped by diverse agro-ecological zones and long-standing indigenous farming practices:

- Rice dominates national food systems, particularly glutinous rice, which is central to food culture and dietary intake.
- Lowland paddy systems coexist with upland rainfed and shifting cultivation systems, especially in mountainous areas inhabited by ethnic minority groups.
- Traditional landraces and farmer-managed seed systems remain widespread, particularly for rice, maize, legumes, vegetables, and root and tuber crops.

These systems are closely linked to local knowledge, cultural identity, and livelihood resilience, but are increasingly vulnerable to climate shocks, market pressures, and erosion of genetic diversity, underscoring the importance of safeguarding and mobilizing plant genetic resources for food and agriculture for adaptation.

The 9th Five-Year National Socio-Economic Development Plan (NSED) 2021–2025 highlights Lao PDR's strong commitment to stabilizing food production and ensuring national food security. The plan envisions a comprehensive transformation of the food system, extending beyond production to include industrial development in food processing, distribution, and consumption. In practice, however, policy and investment predominantly focus on enhancing agricultural production, reflecting persistent constraints in productivity,

infrastructure, and resilience (2).

In terms of the country's landscape for plant genetic resources (PGR) for food and agriculture, Lao PDR has established its Lao National Genebank (LNG) in 1995, under the Ministry of Agriculture and Forestry's Rice Research Center. LNG focuses mainly on rice landraces and vegetable crops such as eggplants, sorghum, millets, cucumbers and root and tuber crops (e.g., taro, sweet potato, and cassava).

LNG is also incorporated in the country's National Biodiversity Strategy and Action Plan (NBSAP) 2016-2025 prepared by the Ministry of Natural Resources and Environment (3). As a key component of the NBSAP, LNG is seen as the central institution implementing biodiversity conservation commitments in agriculture towards ensuring the sustainable management of PGRs for the country's climate resilience and food security.

In addition to LNG, there are also conservation units within research centers under the National Agriculture and Forestry Research Institute (NAFRI) such as the Rice Research Center and Horticultural Research Center for vegetable crop diversity preservation. There are also community seed banks and field genebanks in the country, such as in Phailom and Ekxang areas, the Lao Upland Rural Advisory Service, organic farms and integrated farming systems like the Phommaloek organic farm in Vientiane, and others supported by international partners including the International Rice Research Institute (IRRI) and World Vegetable Center.

3. CLIMATE CHANGE IMPACTS ON FOOD SYSTEMS

Like many Southeast Asian countries, Lao PDR is highly vulnerable to climate change. It experiences frequent climate-related hazards such as flooding, rain-induced landslides, extreme weather events, drought, and extreme heat, all of which severely impact its agricultural and food systems. Based on the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report, the Asian region in general, including Lao PDR, is expected to experience predominantly negative impacts from climate change on agriculture and food security, with adverse effects far exceeding any potential benefits. The risks associated with climate change to agriculture and food systems are likewise projected to intensify progressively as global warming approaches and exceeds 1.5°C above pre-industrial levels (4).

Aligned with Lao PDR's NSEDP, the National Adaptation Plan (NAP) highlights multiple climatic impact drivers that threaten the country's food system, particularly in food production. Key challenges include rising temperatures, reduced precipitation, reduced water availability for irrigation, flooding, crop losses due to extreme weather events, and increased prevalence of pests and crop diseases (5). These stresses not only reduce yields in the short term but also destabilize farmers' production and seed systems, making it harder to maintain locally adapted crops and reliable access to quality seed.

Specific impacts on the agricultural sector include:

- Extreme weather events undermining the income security of low-income agricultural workers;
- Flash floods destroying crops and livestock;
- Prolonged droughts, flooding, and heavy rainfall causing significant crop damage and lowered yields of staple foods such as rice, maize, cassava, and vegetables;
- Flood-triggered landslides and soil erosion devastating agricultural lands;
- Water shortages due to drought leading to irrigation difficulties, and
- Gradual loss of crop diversity in farmers' fields as repeated shocks deplete household seed stocks, narrow the range of varieties grown and increase reliance on a limited set of external seed sources.

Beyond production, Lao PDR is also addressing climate change effects on infrastructure related to food processing and distribution. The country's NAP and Nationally Determined Contributions (NDC) outline specific priorities to address these impacts, which will be detailed in the following section.

The impacts of climate change on food systems extend beyond agriculture to significantly affect public health and critical infrastructure. Persistent challenges in food production and security have compromised both the availability and quality of food, which in turn exacerbates health risks for the population. Among these challenges, food-borne diseases have emerged as a critical concern, often linked to improper handling, transfer, and storage of food. Addressing these issues is vital for strengthening the country's food system's resilience and underscores the importance of upgrading critical infrastructure to support safe and reliable food processing, storage, and distribution.



Banana. Horticulture Research Center.
Crop Trust Photo

4. FOOD SYSTEMS IN NAP

Agriculture is one of the sectoral priorities in Lao PDR's NAP. Under this priority, six strategies have been identified, including:

1. Preventing impacts on agricultural food crop production from climate hazards such as floods, erosion of agricultural land, and surface erosion;
 2. Initiating research to apply new technologies and techniques for improved climate-resilient agricultural production;
 3. Building human capacity for climate change adaptation within the agriculture and fishery sectors;
 4. Promoting communication tools to raise awareness of climate risks in the agriculture sector;
 5. Improving information management systems and strengthening the development of early warning systems within the agriculture sector;
 6. Enhancing tools, mechanisms, and facilities for better preparedness.
- Applying sustainable agricultural production practices including climate-smart agriculture (CSA), ecosystem-based adaptation (EbA), and nature-based solutions (NbS) that promote sustainable land management (SLM).
 - Upgrading food processing and storage infrastructure to protect perishable items such as meat, fish, and dairy in hot conditions.

Each of these strategies encompasses activities undertaken by multiple stakeholders primarily led by the Ministry of Agriculture and Environment (MAE), and to be implemented within a maximum of 10-year timeframe. Among these activities are:

- Updating and revising national policies to integrate management, prevention, and control of climate change impacts in the agriculture sector, thereby contributing to the achievement of agriculture-related targets.
- Developing and enhancing infrastructure and facilities for production, processing, and storage of climate-adaptive and disaster-resilient agricultural products.
- Adopting climate-resilient rice varieties and crop/plant seeds that are tolerant to flooding, drought, and cool weather, along with the development of appropriate plantation techniques.
- Initiating research into new rice varieties (e.g. early maturing glutinous rice) resistant to insect diseases, pests, floods, drought, and saline soils.

Among these activities, the adoption of climate-resilient rice varieties and crop/plant seeds that are tolerant to flooding, drought and cold weathers, and development of appropriate plantation techniques may indicate implicit dependence of climate-resilient varieties on access to diverse germplasm. Oftentimes, these varieties are developed by combining traits from local landraces, traditional varieties and international germplasm which are conserved in national and international genebanks. This specific activity highlights the role of plant genetic resources more evidently in Lao PDR's NAP and provides an opening to discuss on whether genebanks/breeding capacities in the country are sufficient to supply the varieties that would correspond to these stresses.

In addition to agriculture, adaptation strategies have also been outlined for the Forestry, Water, Health, and Labor and Social Welfare sectors to further contribute to the objective of promoting stability in food production and ensuring food security.



Cassava, Laos. Crop Trust Photo

5. FOOD SYSTEMS IN NDC

Lao PDR submitted its updated and enhanced NDC in 2021, with unconditional and conditional targets set for the sectors of agriculture, forestry, and land use (AFOLU), energy, transport, and waste. The enhanced unconditional target aims for a 60% reduction in greenhouse gas (GHG) emissions compared to the baseline scenario (6).

According to its Second National Communication, referenced in the NDC document, Land Use Change and Forestry (LUCF) and agriculture together account for over 95 per cent of the country's greenhouse gas emissions. The NDC document also presents progress made in these sectors from 2015 to 2020.

Specifically in agriculture, notable advancements were achieved in the research and development of flood- and drought-tolerant crop varieties, along with piloting climate-smart agriculture techniques such as direct seeding, system of rice intensification, composting to improve soil quality, greenhouse vegetable production, and innovative water management through water harvesting and groundwater use. In the livestock subsector, progress was made with regular disease control vaccination campaigns and the introduction of new fish culture methods. Additionally, the agro-climate

information service was strengthened to provide more reliable forecasts to support farm decision-making. Agribusiness value chains were enhanced through the development of resilient agricultural infrastructure, improved crop productivity, and the promotion of crop diversification. This progress aligns with Lao PDR's Agriculture Development Strategy (7), which promotes the modernization of the agriculture sector while ensuring its resilience to climate change and its impacts.

In this context, the NDC outlines one short-term target (to be achieved by 2025) and two long-term targets (to be achieved by 2030) under the agriculture sector to support Lao PDR's path toward food systems transformation:

- Mainstream climate change adaptation into sectoral strategy and action plans, including through a results-based management framework (short term)



Eggplant. Characterization and clustering of local Lao eggplant project. Horticulture Research Center, Laos. Crop Trust Photo



KU50 cassava variety in Tissue Culture Laboratory of Rice Research Center, Laos.
Crop Trust Photo

- Promote climate resilience in farming systems and agricultural infrastructure, including the establishment of model resilient farms and upgrading of nurseries (long term)
- Disseminate appropriate technologies for climate change adaptation, including nature-based and circular economy solutions, such as distributing climate-resilient crop varieties to farmers and farm operators (long term)

The NDC document also identifies priority actions, including the introduction of 50,000 energy-efficient cookstoves (unconditional) and the adoption of adjusted water management practices on 50,000 hectares of lowland rice cultivation (conditional).



Mr. Xaysana Phomsavang, curator of the medium-term storage facility at the Lao National Genebank near Vientiane, Laos. Crop Trust Photo

6. ROLE OF GENE BANKS AND SEED SYSTEMS

Plant genetic resources for food and agriculture (PGRFA) constitute a foundational pillar of climate-resilient food systems in Lao PDR. Given the country's heavy reliance on smallholder agriculture, rainfed systems, and traditional crop varieties, genetic diversity is a primary risk-management asset against climate variability rather than a secondary conservation concern.

In the context of increasing floods, droughts, temperature extremes, and pest and disease pressures, access to diverse, locally adapted germplasm enables the development of crop varieties tolerant to multiple climate stresses, maintenance of production stability across heterogeneous agro-ecological zones, and the preservation of culturally and nutritionally important crops that underpin rural livelihoods and food security. These functions align directly with global priorities articulated in the IPCC Sixth Assessment Report, the FAO Global Plan of Action on PGRFA, and the UN Secretary-General's Call to Action on Food Systems Transformation, all of which emphasize genetic diversity as a prerequisite for adaptation under climate uncertainty.

Lao PDR established the Lao National Genebank (LNG) in 1995 under the Ministry of Agriculture and Forestry, with operational responsibility currently linked to the Rice Research Center. The LNG primarily conserves traditional rice landraces, including glutinous rice varieties central to national food culture, vegetable crops such as eggplant, cucumber, and leafy greens, cereals such as sorghum and millets, and root and tuber crops including cassava, taro, and sweet potato. These collections reflect the country's agro-ecological diversity and the historical reliance of farming systems on farmer-selected and farmer-maintained varieties. Importantly, many of these accessions originate from upland and marginal environments, where climate vulnerability is highest and adaptive capacity is lowest.

The LNG is embedded in the National Biodiversity Strategy and Action Plan (NBSAP) 2016–2025, positioning it as a core institution for biodiversity conservation and climate resilience. Complementary conservation efforts exist within NAFRI research centers, community seed banks, and field genebanks, often supported by international partners such as International Rice Research Institute (IRRI) and the World Vegetable Center.

However, Lao PDR's climate commitments depend structurally on the functioning of genebanks and seed systems. Under the NAP, priority actions such as the adoption of flood, drought, and cold tolerant rice varieties, development of early-maturing and pest resistant crops, and the promotion of climate-smart and ecosystem-based agricultural practices, all require sustained access to diverse germplasm, systematic characterization of traits, and effective pathways from conservation to farmer adoption. Similarly, under the NDC, long-term objectives to enhance climate resilience in farming systems, disseminate appropriate adaptation technologies, and improve productivity while reducing vulnerability, cannot be achieved without functioning seed multiplication, certification, and distribution systems linked to national genetic resources.

In this sense, genebanks operate as a cross-cutting enabler, supporting adaptation through enhancing resilience traits, mitigation through higher productivity, reduced land pressure, and

improved resource-use efficiency, and livelihood resilience through preservation of culturally appropriate and locally preferred crops. Unfortunately, several constraints currently limit the contribution of genebanks and seed systems to climate action in Lao PDR, including:

- weak conservation-use linkages,
- genetic materials conserved ex situ not being consistently integrated into breeding programs, extension services, or farmer seed supply chains,
- limited breeding and characterization capacity,
- constraints in human resources, infrastructure, and digital tools limiting the ability to rapidly identify and deploy climate-relevant traits,
- fragmented institutional coordination,
- responsibilities for conservation, research, extension, and climate planning being distributed across institutions with limited formal coordination mechanisms,
- under-recognition in climate finance and planning,
- genebanks and seed systems rarely being costed or prioritized in climate finance proposals, despite their high leverage for resilience outcomes,
- erosion of on-farm diversity, and
- repeated climate shocks, combined with market pressures, narrowing the range of varieties cultivated by farmers, increasing long-term vulnerability.



Mrs. Alidsala Dethvongsa, genebank technician, in the long-term storage facilities, Lao National Genebank. Crop Trust Photo

7. MEANS OF IMPLEMENTATION FOR FOOD SYSTEMS TRANSFORMATION

Transforming Lao PDR's food system in line with its NAP, NDC and other policies will require coordinated means of implementation (MoI) across finance, technology, capacity, data/MRV and enabling policy frameworks. These MoI needs are most acute for smallholder, upland and remote communities where climate risks, market access constraints and service delivery gaps intersect.

Lao PDR has accessed funding support from diverse sources, including multilateral climate funds such as the Green Climate Fund (GCF), Global Environment Facility (GEF) through LDC Fund (LDCF) and Special Climate Change Fund (SCCF), and Adaptation Fund (AF), along with bilateral assistance from development partners. Domestic public resources are also utilized to implement unconditional targets, including through domestic funding programs specifically established to support the implementation of

climate and agriculture-related strategies and action plans.

Between 2015 and 2020, approximately 29.3% of total funding received from various sources for adaptation responses was allocated to the agriculture sector. This was the second-highest proportion following transport and urban development, which received 32.5% of the total funding (8).

Table 1 Finance needs for Lao PDR's food system transformation

Report / Plan	Scope	Estimated Cost (USD)	Timeframe
2015 Agriculture Development Strategy 2025 and Vision 2030	Food production to achieve food security and agricultural commodity production; national programs and projects such as development of irrigated agriculture (agro-irrigation system), technical infrastructure, agricultural research and experiment, the expansion of agriculture technical service networks, human resource development in parallel with rural development and poverty reduction	23,375 million	2015-2025
2020 NDC and its 2023 Implementation Plan (9)	Agriculture adaptation actions under the NDC	52.4 million	2020-2030
2025 NAP	Implementation of food system-related activities under various sectors, including agriculture sector	N/A (Costing not available)	2025-2035

Finance needs and priorities

- Mobilizing climate and development finance: Lao PDR's NDC estimates that achieving its conditional mitigation target over 2020–2030 would require approximately USD 4.7 billion, highlighting the scale of investment needs and reliance on international support (including for agriculture-aligned mitigation actions such as low-emission farming practices and bioenergy value chains).
- Strengthening adaptation finance for agriculture and food security: sectoral tracking in national planning indicates that over USD 112 million in adaptation-related funding is anticipated for the agriculture sector within the broader pipeline of adaptation investments, underscoring both opportunity and the need to maintain a coherent pipeline aligned with NAP/NDC priorities.
- Blended finance and de-risking for value chains: priorities include concessional finance and risk-sharing instruments to crowd in private investment for climate-resilient value chains (e.g. coffee, tea, bamboo, cassava, horticulture), irrigation modernization, post-harvest management and cold chains, and sustainable input/seed markets.
- Project preparation and bankability: dedicated resources are needed for feasibility studies, safeguards, MRV baselines, and investment-ready proposals, especially for integrated landscape programmes that combine adaptation, mitigation and biodiversity co-benefits.

Technology and innovation needs

- Climate-resilient production technologies: scaling water-efficient irrigation (including solar irrigation), soil and water conservation, agroforestry/landscape restoration, and climate-smart livestock and aquaculture practices suited to upland and lowland contexts.
- Climate information services and early warning: strengthening agro-climatic monitoring and advisory services to support risk-informed decision making for farmers,

extension agents and planners, with interoperability for NAP/NDC monitoring.

- Digital solutions for farmers: expanding digital advisory, traceability and finance solutions to improve access to extension, inputs, markets and finance for smallholders, including women and youth.

Capacity and institutional strengthening needs

- Mainstreaming climate adaptation in sectoral strategies and annual plans: continued capacity support is needed to institutionalize results-based management, budgeting and monitoring for the agriculture sector's adaptation targets under the NDC, including at provincial and district levels.
- Extension and farmer organization capacity: strengthening last-mile service delivery (public extension, producer groups, cooperatives and farmer field schools) to accelerate adoption of resilient practices and improve access to quality seed and inputs.
- Food systems governance and multi-stakeholder coordination: enhancing coordination across agriculture, environment, planning/finance, health, education, trade and industry to deliver coherent food systems outcomes (nutrition, resilience, low emissions), including mechanisms for regular dialogue with private sector, civil society and development partners.



Role of genebanks and seed systems as a cross-cutting MoI priority

- Strengthening national genebank functions: investments are needed in infrastructure (cold storage, laboratories), human resources, and digital information systems to safeguard and utilize Lao PDR's crop genetic diversity for climate resilience, and strengthen functions like conservation, characterization, safety duplication and access.
- Linking genebanks to farmer-led seed systems: strengthening community seed banks, participatory varietal selection and on-farm conservation to ensure climate-resilient and culturally appropriate varieties are accessible and adopted.
- Quality assurance and enabling regulation: improving seed certification/quality control, phytosanitary measures and market oversight to expand availability of quality seed while protecting farmers and ecosystems, and to support regional seed exchange and trade where appropriate.

Data, MRV and learning needs

- Food systems indicators aligned with NAP/ NDC: establishing a core set of indicators for adaptation outcomes, mitigation co-benefits, and biodiversity outcomes, with routine data collection and reporting.
- Peer learning and south-south exchange: structured peer-to-peer exchanges (including within ASEAN and among other LDCs) can accelerate policy learning on seed system regulation, climate-smart extension models, investment planning and food systems governance.



BOLD reviewers at rice regeneration fields, Lao National Genebank.
Crop Trust Photo

8. STOCKTAKE OF CURRENT SUPPORT FOR FOOD SYSTEMS TRANSFORMATION

This section summarizes indicative current support (national programmes and development partner initiatives)¹ that contributes to food systems transformation and to the agriculture-related objectives in Lao PDR's NAP and NDC.

- Financing Agrochemical Reduction and Management (FARM), funded by GEF and implemented by UNDP and the Ministry of Agriculture and Environment (MAE), has a project fund of USD 4,000,000 and runs from 2021 to 2026, aiming to support strengthened regulatory frameworks for sound agricultural chemical management, reduction of harmful agrochemical use, and improved access to low/non-chemical alternatives and environmentally sound waste management (including plastics).
- Support for mainstreaming climate change adaptation into sectoral planning in Lao PDR is funded by GCF and implemented by the Global Green Growth Institute (GGGI), with a project fund of USD 1,000,000 and a time frame from 2022 to 2024.
- Climate Smart Agriculture Alternatives for Upland Production Systems in Lao PDR is funded by GEF and implemented by FAO, aimed to support mainstreaming climate-smart agriculture into policies and land-use planning, strengthening institutional capacities, and piloting CSA practices in upland production systems. The project fund amounts to USD 18,502,968 and spans from 2021 to 2026.
- Support for Scaling-up Sustainable and Low-Carbon Agricultural Practices and Improving Food Security in Lao PDR, focused on innovative digital solutions and improved smallholder access to finance to promote sustainable farming, reduce emissions/pollution and increase productivity and profitability. This project is funded by the Republic of Korea and implemented by UNDP and the Department of Finance, with a project fund of USD 3,300,000 and a time frame from 2024 to 2027.
- The Integrated Programme for Climate Resilience and Empowerment in Attapeu Province: Building Climate Resilient and Eco-Friendly Agriculture Systems and Livelihoods (Climate REAL), funded by KOICA and implemented by FAO, has a project fund of USD 2,000,000 and ran from 2020 to 2023.
- IFAD supported rural development and nutrition-sensitive agriculture programmes include investments in irrigation, commercialization and value chain development, with emphasis on inclusive livelihoods, climate resilience and nutrition outcomes.
- FAO and UNDP's Scaling up Climate Ambition on Land Use and Agriculture (SCALA) programme supports countries in strengthening agriculture components of NDCs and NAPs through capacity building, policy support and multi-stakeholder engagement, including engagement with private sector actors.
- Development partners have also supported assessments of scalable climate-smart technologies and investment priorities to inform national planning, extension packages and investment pipelines.



¹ The list is not exhaustive and should be updated periodically as the national pipeline evolves.

9. STAKEHOLDER MAPPING

Food systems transformation requires whole-of-government coordination and broad stakeholder engagement. With this in mind, a stakeholder mapping has been done to identify to what extent the seed system actors interact with each other, with a focus on the linkages between the genebank and other actors. Specifically, a high score indicates an effective connection between the actors that require no further action. Conversely, a low score highlights weak relationship, which signals a priority area for innovation to bridge the disconnect. It is noteworthy that the stakeholder mapping discussed in the case study is specifically limited to the conservation aspect of the seed system. This is distinct from a full food systems analysis, which is significantly broader and would necessitate addressing additional factors such as food security, nutrition, livelihoods, environmental health, and equity.

The following key stakeholders were identified and mapped by their core roles in policy, service delivery, research/seed systems, finance, implementation and accountability²:

1. Government (policy, coordination and public service delivery)

- Ministry of Agriculture and Environment (MAE) and line departments (in particular the Department of Agriculture; Department of Agricultural Extension and Cooperatives (DAEC); Department of Livestock and Fisheries; Department of Environment; Department of Land Management)
- Ministry of Finance
- Ministry of Industry and Commerce
- Provincial and district authorities

2. Research, genebanks and seed system institutions

- National Agriculture and Forestry Research Institute (NAFRI) and associated research centres
- Genebanks, seed quality control and certification bodies (as mandated by national regulations) and laboratories
- Universities and vocational training institutions



The Lao PDR delegation attended the technical workshop on “Aligning Food Systems with NAPs and NDCs,” held November 25–26, 2025, in Bangkok, Thailand.

² Identified and mapped by the Lao PDR delegation during breakout discussions at the Technical Workshop on ‘Cross-Linkages among Food System Actors and Aligning Food Systems in National Adaptation Plans (NAPs) and Nationally Determined Contributions (NDCs),’ held November 25–26, 2025, in Bangkok, Thailand.

3. Farmers, producer organizations and civil society

- Smallholder farmers, farmer groups and cooperatives
- Public and private plant breeders
- Mass organizations and community networks (including women and youth groups)
- Civil society organizations and NGOs

4. Private sector and finance ecosystem

- Input suppliers and seed enterprises (formal and semi-formal)
- Aggregators, processors, traders and retailers
- Financial institutions (commercial banks, microfinance, mobile money providers) and insurers

5. Development partners and regional platforms

- International and technical organisations like UN agencies including FAO, UNDP, WFP and IFAD
- Financing agencies like GCF, GEF, Adaptation Fund and bilateral partners
- Regional initiatives and peer-learning platforms like the UNFCCC Regional Collaboration Centre, ASEAN, Mekong cooperation etc.

The stakeholder scatter map, given below, was developed using the Participatory Analysis Tool (10) that undertakes an interaction matrix analysis. This reflects the Lao PDR delegation's breakout discussions during the Technical Workshop on 'Cross-Linkages among Food System Actors and Aligning Food Systems in National Adaptation Plans (NAPs) and Nationally Determined Contributions (NDCs),' held November 25–26, 2025, in Bangkok, Thailand.

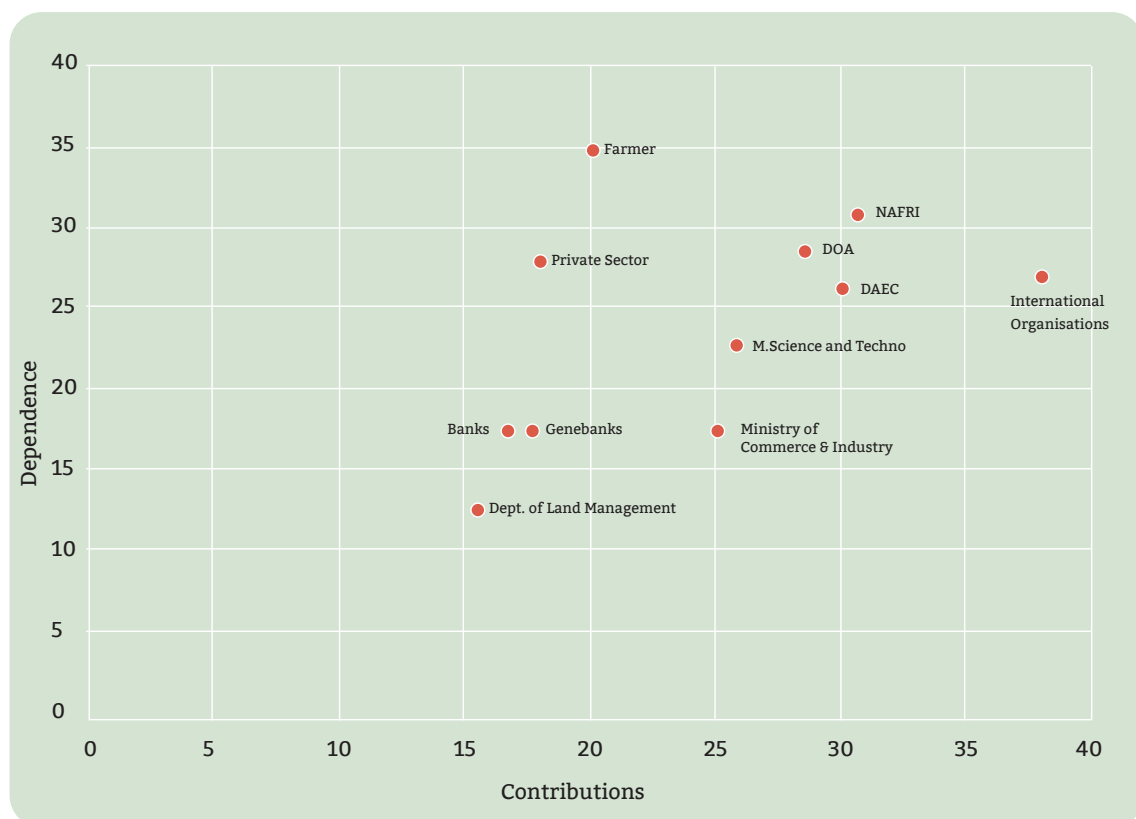


Figure 1. Stakeholder Scatter Map for Seed System Actors in Lao PDR

Based on the stakeholder scatter mapping exercise, the following conclusions can be drawn regarding the roles, interdependencies, and strategic importance of key actors in Lao PDR's seed system:

- **Core engine (Top-right quadrant: High contribution / High dependence)** - Actors in this quadrant form the functional backbone of the seed system. They are deeply interlinked, mutually dependent, and essential for system performance.
 - **Government institutions (DOA, DAEC):** Government actors play a critical role in the Lao seed system. The Ministry of Agriculture and Environment and its technical arms, particularly the Department of Agriculture (DOA) and the Department of Agricultural Extension and Cooperatives (DAEC), show both high contribution and high dependence, reflecting the strong regulatory, planning, and service-delivery role of the state in seed systems. The Ministry sets policy direction, approves varietal release processes, and anchors seed system governance and the DOA plays a central role in varietal testing, approval, and coordination with research institutions, while the DAEC is critical for downstream delivery, farmer outreach, and dissemination of seed and planting material. However, they struggle with logistical barriers to accessing farmers and the coordination complexities inherent in a diverse agricultural landscape. This positioning highlights that Lao PDR's seed system remains highly state-led, with public institutions acting as both system drivers and system dependents, reliant on farmers, research, and international partners to deliver results.
 - **NAFRI (National Agriculture and Forestry Research Institute):** NAFRI sits firmly within the core engine, reflecting its dual role as both a major contributor and a dependent actor. As the primary national research body, NAFRI generates breeding material and applied research, hosts and interfaces closely with genebank functions, and depends on government mandates, international technical assistance, and farmer uptake to translate research into impact. Its position signals that research is central but not autonomous-its effectiveness depends on stronger linkages with extension systems, farmers, and policy processes.
 - **Farmers:** Farmers show very high dependence and high contribution, underscoring their role as the ultimate adopters and custodians of seed diversity, particularly in a system dominated by smallholders and traditional varieties. In Lao PDR most farmers rely heavily on public extension services, informal seed exchange, and development programmes for access to seeds, and at the same time they contribute significantly through on-farm conservation, local variety selection, and informal seed multiplication, especially in upland and rainfed systems. This dual positioning reflects a high vulnerability-high agency dynamic where farmers are indispensable to system functioning but remain highly dependent on upstream actors for quality seed, information, and resilience support.
 - **International organisations:** International organizations such as UN agencies, IRRI etc. are positioned as strong net contributors, while also being dependent on the government and local actors to be able to carry out their role. Their high contribution reflects provision of technical assistance, funding, and global germplasm, support to research, extension, climate resilience, and seed system pilots, while their contribution is strongly dependent on national delivery mechanisms in Lao PDR.
- **NAFRI (National Agriculture and Forestry Research Institute):** NAFRI sits firmly within the core engine, reflecting its dual role as both a major contributor and a dependent actor. As the primary national research body, NAFRI generates breeding material and applied research, hosts and

- Bridging actors with constrained influence (Mid-zone: Moderate contribution / Moderate dependence)
 - Private sector (seed producers, agribusinesses): The private sector occupies a position of moderately high contribution and dependence, indicating a growing but still constrained role. Private actors contribute through seed multiplication and distribution in selected crops, input supply and emerging value-chain activities. However, they are significantly dependent on government regulation, market scale, access to finance and reliant on consumer behaviour, which constrains their ability to act independently. This reinforces the observation that Lao PDR's seed system is not yet market-driven, but rather public-sector anchored with emerging private participation.
 - Breeders: Breeders occupy a middle position, suggesting technical importance but limited systemic influence. While playing a critical role in enhancing food security and economic stability by developing high-yielding, resilient crop varieties tailored to local conditions, they depend on research institutions and genebanks for germplasm, government approval processes and extension systems for dissemination. This reflects a system where breeding capacity exists but translation from breeding to farmer adoption remains fragmented.
 - Ministry of Industry & Commerce (MOIC): MOIC appears in the mid-range, indicating a latent but underutilized role. While it contributes to value-chain development, trade, and market regulation, its weaker linkage to seed system actors suggests that seed-market-trade integration remains limited, especially for climate-resilient and traditional varieties.
- Peripheral enablers (Bottom-left quadrant: Low contribution / Low dependence): Actors in this quadrant have potential enabling roles but currently show weak integration into the seed system.
 - Banks and financial institutions: Banks show relatively low contribution and dependence, indicating that finance is not yet structurally embedded in seed system functioning. Credit for seed multiplication, storage, and farmer adoption remains limited. Financial institutions are weakly linked to extension services, cooperatives, and seed actors. This demonstrates that lack of tailored financial instruments is a key bottleneck for scaling resilient seed systems in Lao PDR.
 - Genebanks appear in the lower-to-middle contribution range with moderate dependence, reflecting a critical but under-leveraged role. While genebanks provide foundational genetic resources, their lower contribution score suggests limited downstream integration with breeding, extension, and farmers, and weak visibility in policy, NAP/NDC implementation, and investment planning. This positioning reinforces workshop findings that genebanks in Lao PDR function more as repositories than active system hubs, representing a major opportunity for strategic upgrading.
 - Department of Land Management: This department shows low contribution and dependence, indicating weak integration of land-use planning with seed and crop system decisions, despite its relevance for zoning, climate risk, and long-term agricultural resilience.

Key insights

The analysis highlighted the genebank-farmer gap, where the low scores for the genebanks indicate they are not directly connected to farming communities. While indigenous communities actively conserve diverse landraces and neglected species on-farm, they lack a strong link to the national genebank for back-up conservation. Conversely, the connection between genebanks and breeders is strong (high contribution/dependence), suggesting this area requires less intervention. The main challenges in Lao PDR are that farmers are limited by poor infrastructure, small landholdings, and financial constraints, while breeders contend with investment shortages and the pressing impacts of climate change, and genebanks suffer from a lack of capital, sustainable support, and lack of farmer awareness. At the same time, within the government, responsibilities for conservation, research, extension, and climate planning are distributed across institutions with limited formal coordination mechanisms.

Overall, the scatter map reveals a seed system that is state-centric, farmer-dependent, and externally supported with weak financial, market, and conservation-use linkages. Strengthening Lao PDR's seed system will therefore require:

- elevating genebanks and research from peripheral roles into the core engine
- embedding finance and value-chain actors more structurally
- reducing over-dependence on international actors by reinforcing domestic coordination and incentives



Mrs. Alidsala Dethvongsa, genebank technician, in the medium-term storage facilities, Lao National Genebank.
Crop Trust Photo

10 ACTION PLAN

Based on the policy to action strategy that integrates Lao PDR's NAP and NDC goals together with the agriculture and development identified by the Laos delegation in the workshop, the Action Plan aims to move from this theoretical high-level alignment to a cohesive operational framework with actionable activities to integrate seed system actors into the NAP and NDC processes.

Workshop discussions underscored that Lao PDR's food systems transition is constrained not by a lack of ambition, but by six interlinked policy gaps:

1. insufficient private-sector incentives and awareness
2. data deficits and weak MRV readiness
3. inadequate technology and tools (including digital infrastructure)
4. fragmented cross-sectoral planning (vertical and horizontal)
5. limited shift toward holistic value-chain approaches
6. disjointed financing and planning flows that slow implementation and reduce bankability

In response to these critical policy gaps identified by the Laos delegation, the action plan proposes a suite of targeted solutions to address them across three phases: a short-term foundation (2025–2030) focused on awareness, pilot studies, MRV databases, and drafting incentives; a medium-term execution phase (2030–2035) to finalize incentives, launch PPPs, and upgrade infrastructure; and a long-term transformation (2035+) centered on financing policies, sub-sector working groups, and a permanent shift toward holistic food systems.

To ensure delivery and accountability across sectors, the plan assigns clear lead roles:

- Finance & incentives: Ministry of Finance, in partnership with private sector and banks (green finance instruments)
- Evidence & data: Ministry of Agriculture & Environment Statistics Bureau, working with universities, research institutes, and international organizations
- Technology & tools: Ministry of Agriculture & Environment, supported by NAFRI, universities, and international organizations

- Value chains & trade: Ministry of Industry & Commerce and Ministry of Agriculture & Environment, including bilateral cooperation and market mechanisms (e.g., carbon trading readiness where relevant)
- Horizontal integration: Statistics Bureau to coordinate vertical and horizontal integration across line ministries including common indicators, reporting, and planning coherence.
- Research & value chain actors: NAFRI leads coordination with value chain actors (producers, processors, aggregators, traders, standards bodies, extension).

This governance set-up directly addresses fragmentation and silo effects and is consistent with UN-supported approaches that emphasize integrated governance and institutional strengthening for climate-resilient agriculture.



Seed viability testing, Lao National Genebank.
Crop Trust Photo

Phase 1: Short-term foundation (2025–2030)

I. Establish a holistic food systems coordination mechanism:

- Create a food systems coordination mechanism co-chaired by the Ministry of Agriculture & Environment and the Ministry of Finance, with the Ministry of Industry & Commerce and NAFRI as standing members.
- Adopt a results framework linking food systems priorities in the NAP, NDC, NBSAP and national strategies.
- Formalize a coordinated stakeholder dialogue mechanism including farmer groups, private sector, cooperatives, women/youth, agripreneurs, research institutions etc., ensuring feedback loops into policy updates.

II. Build the evidence base and MRV readiness:

- Commission a national research agenda led by the Statistics Bureau, supported by NAFRI and universities to address data gaps including development of metrics and baselines and mapping of seed systems and climate-resilient varietal adoption.
- Prioritize pilot MRV methodologies for key measures like rice water management, fertilizer-related emissions, livestock emissions and crop resilience etc.
- Draft MRV protocols and quality assurance/quality control procedures for (i) practice adoption, (ii) outcomes (yield, income), and (iii) emissions/resilience, that are designed to feed future BTR needs.
- Establish a comprehensive MRV system to track climate-smart impacts on GHGs and agricultural indicators, enabling credible reporting and finance mobilization.

III. Create a centralized tracking database (Food Systems MRV & Investment Dashboard):

- Develop a centralized database led by the Statistics Bureau that tracks progress of NAP and NDC measures by province, financing sources, project status, results indicators, seed/variety dissemination and adoption metrics.
- Ensure interoperability with national finance systems and sectoral information platforms.
- Design the database to support investment readiness with standardized project templates, costing fields and safeguards to support project pipelines.

IV. Launch awareness and outreach campaign:

- Ministry of Finance to lead awareness and outreach with banks and private sector on climate risk, returns to CSA, and compliance & market access opportunities.
- Draft an incentive framework including time-bound tax/fee measures, risk-sharing instruments, concessional credit lines, or guarantee windows for CSA-related investments, as well as incentives for storage/processing upgrades that reduce climate losses and improve food safety.
- Develop criteria for eco-labelling for prioritized low-carbon and climate resilient commodities to support value chain upgrading.

Phase 2: Medium-term execution (2030–2035)

I. Finalize and operationalize incentive packages:

- Convert Phase 1 draft incentive framework into operational incentive instruments such as green credit incentives for climate-smart inputs and services, blended finance facilities for processing/storage, performance-based payments tied to MRV outcomes etc.
- Establish a national green finance pipeline for agrifood investments anchored in the Food Systems MRV & Investment Dashboard.
- Use the UN joint programme on green/climate finance, which explicitly targets bridging the gap between ambition and available resources through stronger financing systems and coordination.

II. Launch Public-Private Partnerships (PPPs) for technology and infrastructure:

- Implement PPPs for climate-resilient irrigation modernization and water management tools, digital advisory systems (climate services, pest alerts), post-harvest storage/cold chain and processing upgrades in priority value chains.
- Require PPP projects to embed MRV-by-design including data capture and verification procedures.

III. Shift from project-by-project to holistic value-chain approaches:

- Establish commodity transformation packages for selected priority chains like rice, coffee, cassava, bamboo, tea etc., resilient production practices, aggregation/processing/logistics upgrades, quality standards and traceability, market access and trade facilitation.
- Align with convergence-style implementation that emphasizes integrated investment that upgrades rural infrastructure and promotes CSA while strengthening export value for key commodities as outlined in the Convergence Action Blueprint approach for Lao PDR.

IV. Scale subnational delivery and institutionalize learning:

- Move to mandatory provincial food systems climate plans, linked to national targets laid out in the NAP and NDC and budget processes.
- Expand farmer-facing implementation models like climate-smart village approaches, which research shows can use seed system strengthening as a core entry point for CSA adoption.
- Establish a national Training-of-Trainers system for extension and local planners.



Phase 3: Long-term transformation (2035 onwards)

I. Institutionalize financing and planning flows:

- Embed food systems climate priorities into routine public financial management, focusing on climate budget tagging for agrifood, standardized appraisal criteria for resilience and emissions and multi-year budget frameworks for priority value chains.
- Centralize the Food Systems MRV & Investment Dashboard as a comprehensive source for planning, finance tracking, and results reporting across ministries.
- Strengthening national financing systems and coordination and institutionalizing these mechanisms is key to durability beyond project cycles.

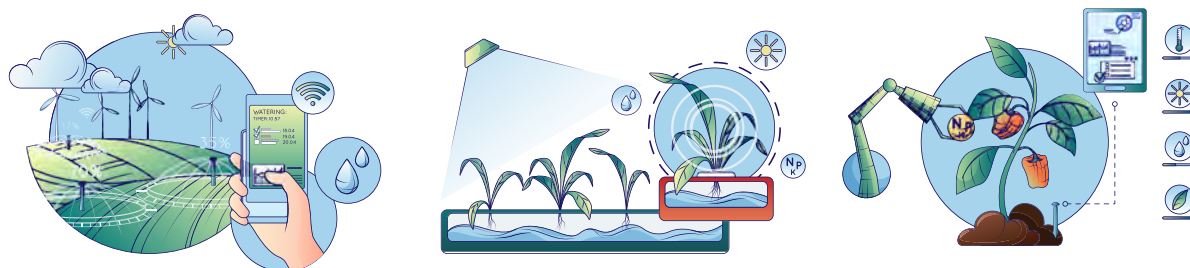
II. Create an institutionalized coordination mechanism for holistic food systems:

- Establish standing sub-sector working groups for key components of food systems like rice systems (water, methane, seed systems), livestock & feed systems, horticulture and nutrition-sensitive value chains, post-harvest/processing and food safety etc.

- Ensure that each working group maintains its own pipeline of bankable investments, MRV protocols, and annual reports.
- Integrate and include non-government stakeholders, especially farmer groups, genebanks and the private sector, including SMEs.

III. Mainstream genetic diversity as infrastructure in long-term food systems resilience:

- Elevate seed systems and PGRFA as a core of food systems resilience with focus on participatory variety selection and breeding pipelines, national genebank modernization and digitalization, decentralized/community seed systems with quality assurance.
- Expand research and adoption pathways, as participatory approaches have demonstrated effectiveness in matching varieties to farmer needs under rainfed and stress-prone environments.



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