

International training workshop and stakeholder consultations on Enhancing access to quality maize seed and feed in the crop- livestock farming system of Lao PDR

Crowne Plaza Hotel, Vientiane, Laos, 7-9 May 2024

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The [Sustainable Intensification of Mixed Farming Systems Initiative](#) aims to provide equitable, transformative pathways for improved livelihoods of actors in mixed farming systems through sustainable intensification within target agroecologies and socio-economic settings.

Through action research and development partnerships, the Initiative will improve smallholder farmers' resilience to weather-induced shocks, provide a more stable income and significant benefits in welfare, and enhance social justice and inclusion for 13 million people by 2030.

Activities will be implemented in six focus countries globally representing diverse mixed farming systems as follows: Ghana (cereal–root crop mixed), Ethiopia (highland mixed), Malawi: (maize mixed), Bangladesh (rice mixed), Nepal (highland mixed), and Lao People's Democratic Republic (upland intensive mixed/ highland extensive mixed).

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¹ <https://www.cgiar.org/initiative/mixed-farming-systems/>

² <https://www.cgiar.org/initiative/seed-equal/>

³ <https://www.cgiar.org/initiative/plant-health/>

Training agenda, news and video

The agenda: <https://www.cimmyt.org/content/uploads/2024/05/Quality-Maize-Seed-Workshop-web.pdf>

CIMMYT News: <https://www.cimmyt.org/news/enhancing-maize-seed-and-feed-security/>

NAFRI Facebook video:

<https://www.facebook.com/watch/?mibextid=rS40aB7S9Ucbxw6v&v=1613399492789626>

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Abbreviations and acronyms

ABC	Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT)
CIMMYT	International Maize and Wheat Improvement Center
NAFRI	National Agriculture and Forestry Research Institute (Lao)
SI-MFS	Sustainable Intensification of Mixed Farming Systems Initiative

1 Background

Maize is the second most important cereal in Laos after rice, driven primarily by the demand for animal feed in neighboring countries such as China, Thailand, and Vietnam. Laos has an export-oriented maize sector, with most of the production destined for these markets. The sector reached its peak in 2016, reaching 0.26 million hectares in area, 1.55 million metric tons in production, and 6.00 metric tons per hectare in productivity. Over 90% of the maize production relies on rain-fed agriculture, with maize grain and stover serving as the primary source of feed for smallholder farmers, who depend on integrated crops and livestock farming for their livelihoods.

However, between 2016 and 2022, both total maize area and production declined significantly, contracting by 64% and 70% respectively by 2022 (FAOSTAT, 2022). Several factors have contributed to this decline, including volatile market prices, competition from cassava and other crops, rising production costs, and yield losses due to pests, diseases, and soil nutrient degradation because of monocropping. Additionally, Laos relies on imported hybrid maize seed, primarily from Thailand and Vietnam, creating dependence on external suppliers and exposing farmers to price fluctuations. Recognizing the importance of improving maize productivity and sustainability, the Laotian government is taking steps to enhance local capacity for seed production and ensure access to affordable high-quality feed.

In line with these efforts, the National Agriculture and Forestry Research Institute (NAFRI) and CIMMYT are evaluating high-yielding maize hybrids for grain and stover quality. In 2023, twelve yellow-kernel maize hybrids developed by the CIMMYT-Asia breeding program were evaluated in Laos, and the same set of hybrids are also being evaluated in 2024 to identify stable and suitable hybrids for the mixed farming system of Laos. To strengthen the capacity of NAFRI and other stakeholders for the development and seed production of the new hybrids, NAFRI and CIMMYT, under the CGIAR Sustainable Intensification of Mixed Farming Systems (SIMFS), Seed Equal and Plant Health Initiatives, organized an international training workshop and stakeholder consultations on “Enhancing access to quality maize seed and feed in the crop-livestock farming system of Lao PDR.” The workshop took place from 7–9 May 2024, in Vientiane, and aimed to achieve the following objectives:

1.1 Objectives

- Understand the challenges and opportunities of the crop-livestock farming nexus and integrate these into a more sustainable and productive system.
- Promote synergistic partnerships among value-chain actors in enhancing local access to good quality seed and feed.
- Enhance participants’ technical skills in understanding and applying the principles and practices of quality hybrid maize seed production.
- Exchange experiences and knowledge from different countries that can be applied to strengthen institutional and human resource capacities across the seed and feed value chains.

1.2 Scope of the training

A zero assessment of participants' knowledge and skills was done to establish the scope of the training. Based on the zero assessment results, the two-day course (see Appendix 2) focused on the following areas.

On day 1, participants gained knowledge on breeding concepts and principles and, supporting ongoing on-station and on-farm varietal trials, the training-built capacities of stakeholders on techniques of hybrid seed production to ensure development of quality seed types considering key determinants of productivity. Through training, stakeholders' knowledge and capacities were built for them to effectively participate in distinguishing morphological traits in maize and develop or follow standard operating procedures (SOPs) for roughing, detasseling and pollen control. Then a roadmap for institutional set-up for seed production and marketing was made that included seed grower selection, contracting, pricing, and budgeting.

Day 2 of training focused on crop management, seed processing and marketing. Based on zero assessment, participants knowledge and capacities in basic principles of seed quality control to ensure certification were shared and developed. Participants also gained knowledge on seed processing, packaging, and storing, seed sales promotion and marketing techniques and how to strengthen local seed production. The training also builds the capacity of stakeholders to devise early warning systems, establishing procedures for identifying and managing major pests and diseases.

2 Status, challenges, and opportunities

2.1 Maize seed production in Lao PDR

In her opening remarks, the Directorate of the National Agriculture and Forestry Research Institute (NAFRI) emphasized the need to revitalize maize production in Laos, particularly in Oudomxay (ODX) and Sava provinces, which contribute over 25% each to national output, followed by Xieng Khouang (XKH). The grain value chain remains basic, with most farmers linked to traders who export maize to neighboring countries, leaving only a small fraction for domestic use. Major trading companies, including CP, New Hope, and Green Feed, purchase approximately 180,000 tons of maize annually, with around 105,000 tons exported. Meanwhile, sweet corn production stands at 15,000 tons, despite growing local and regional demand for maize-based feed. With domestic feed production covering only 65% of demand, the need to strengthen local seed systems and increase production is critical to reducing dependency on imports. This training offered a timely opportunity to equip participants with the skills required to develop and manage efficient maize seed production systems.

A key focus of the training was dual-purpose maize, which meets two of the farmers' most important targets: income from grain sales and feed for livestock from biomass. Dual-purpose maize offers both marketable grain and high-quality forage, allowing farmers to diversify their revenue streams and reduce feed costs. This dual benefit aligns with the priorities of farmers seeking both income and self-sufficiency, as it provides grain for sale to traders and biomass for on-farm livestock use. As Laos struggles with a feed shortfall, dual-purpose maize will play a crucial role in helping farmers bridge this gap by offering a sustainable solution to meet their feed needs while generating additional income. By integrating dual-purpose maize into their systems,

farmers can also reduce reliance on external feed supplies, making their operations more resilient.

The training introduced maize seed stakeholders practical seed production techniques tailored to dual-purpose maize. To ensure long-term sustainability, crop rotation with cassava by the Alliance of Bioversity and CIAT is proposed, helping to restore soil fertility, manage pests, and diversify income sources. Through collaboration with NAFRI, research will continue to improve seed production practices and develop context-specific business models to suit different farm types—those prioritizing grain, forage, or mixed systems. These tailored business models will empower farmers to align their seed production with market demand and livestock needs, ensuring that maize production is both profitable and sustainable.

2.2 CGIAR collaboration

The CGIAR centres (CIMMYT and the Alliance of Bioversity and CIAT) reiterated the need for a system approach to address feed challenges in Laos PDR. Considering that cassava and maize are closely linked, and both are affected by prices on international market especially in China. Research approaches such maize-cassava rotation and mixed cropping that allows long-term soil fertility buildup and breaking of disease cycles will be heightened.

The CGIAR centres also highlighted the need for stronger collaboration with the private sector for breeding of both maize and cassava for Lao PDR to be competitive. Recognizing that seed systems are informal (e.g. Facebook and other social media), which are full of bad information. Without control and regulation, the exchange of planting materials through local seed systems spread diseases. If regulated, the local systems are very efficient in spreading new varieties and need formalizing. Labor e.g. for weeding is a big limitation for research trials in Laos. Funding is a problem because the importance of upland systems is not recognized among donors.

3 Maize seed value chain analysis

The maize seed value chain in Laos faces several challenges, from research and varietal development to quality seed production, marketing, and certification. Roundtable discussions among researchers, regulators, and demand-supply actors have identified bottlenecks and areas for improvement across the value chain. The aim is to create a sustainable seed system that reduces dependency on imports and builds local capacity for high-quality maize seed production.

3.1 Research and varietal development.

Laos remains a net importer of maize seed, with government efforts underway to reduce dependency on imports by developing locally adapted varieties. In 2010, NAFRI released a maize variety that showed initial promise but lost popularity after just three years due to the country's limited seed production capacity and the variety's inability to compete with higher yielding, imported alternatives in terms of profitability. This experience highlights the need for a stronger research-to-market pipeline that not only focuses on varietal development but also ensures scalability, market competitiveness, and farmer adoption. Going forward, the government aims to intensify research partnerships to develop drought-tolerant and dual-purpose maize varieties that align with local market demand

NW1 Group-1

Research and varietal development

สิ่งที่ทราบ

- บทบาทของกรม
- รัฐบาล

แหล่งข้อมูล

- ข้อมูลจากกรม
- ข้อมูลจากหน่วยงานที่เกี่ยวข้อง

ข้อมูลที่ได้รับ

- ข้อมูลจากกรม
- ข้อมูลจากหน่วยงานที่เกี่ยวข้อง

สิ่งที่ต้องการ

- ข้อมูลจากกรม
- ข้อมูลจากหน่วยงานที่เกี่ยวข้อง

สิ่งที่ได้

- ข้อมูลจากกรม
- ข้อมูลจากหน่วยงานที่เกี่ยวข้อง

Stakeholders	Involvement in the issue	Importance
NAFRISU DOA	- องค์กรที่มีส่วนเกี่ยวข้อง	1
DIP	- องค์กรที่มีส่วนเกี่ยวข้อง	1
DAEC, PAFO, company	- องค์กรที่มีส่วนเกี่ยวข้อง	2
Farmer	- ผู้มีส่วนเกี่ยวข้อง	3

Name	Organization	Position
1. Mr. Vantana	9. Mrs. Khamkhan	
2. Mr. Malai		
3. Mr. Don		
4. Mr. Khamphanh		
5. Mr. Phanthan		
6. Mr. Khamho		
7. Mr. Khamkhan		



The capacity for local seed production remains limited, unable to meet the growing demand. CP, the largest seed trader in Laos, offers high-quality seeds with drought-tolerant traits that can yield 7–8 tons of grain per hectare with 20 kg of seed. Farmers often access these seeds on loan, with repayment scheduled after harvest. However, reliance on imported seeds presents challenges, such as delayed deliveries—often up to three months due to border formalities—and shortages of requested amounts. These delays place significant pressure on traders and farmers, forcing them to accept lower-than-expected seed quantities.

3.3 Seed certification

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testing. Furthermore, there is limited follow-up once seeds are distributed to shops, making it difficult to ensure quality at the retail level. Regulatory interventions are mostly reactive, addressing problems only after they arise, with insufficient preventive measures in place.

4 Techniques for hybrid seed production and marketing

The training course provided comprehensive insights into the critical techniques and processes involved in hybrid seed production and marketing, equipping participants with practical skills to strengthen local seed systems. With a focus on producing high-quality hybrid seed, the course emphasized best practices at each stage of production, from field operations to post-harvest management and marketing strategies. These techniques are essential to establishing a reliable hybrid maize seed industry in Laos that can compete with imported seeds, improve farmer access to quality seed, and support sustainable agricultural growth.

4.1 Seed Production: Roughing, Detasseling, and Pollen Control

Participants learned key field management practices to ensure the genetic purity and quality of hybrid maize seed. Roughing involves removing off-type plants that could contaminate the seed crop, ensuring uniformity and high-quality seed production. Detasseling—the removal of tassels from female plants—was covered as a crucial practice to prevent self-pollination, ensuring that only pollen from male plants fertilizes the female plants to produce hybrid seed. Techniques for pollen control were also introduced, including managing the timing of pollen shed and pollination to enhance seed quality and ensure the production of desired hybrids. These field operations are essential to maintaining genetic integrity and producing high-yielding, drought-tolerant hybrid maize varieties.

4.2 Seed Quality Control, Certification, and Post-Harvest Management

The course also focused on quality control and certification procedures necessary to meet national and international standards. Participants were trained in key aspects of seed inspection and certification processes, such as field inspections and seed sampling protocols. Special attention was given to post-harvest management practices, including seed processing, packaging, and storage, to preserve seed quality and extend shelf life. Techniques for seed cleaning, grading, and moisture control were discussed, with practical demonstrations on how to use packaging materials that prevent contamination and maintain seed viability. Proper storage conditions, such as controlling humidity and temperature, were highlighted to minimize seed deterioration and ensure that seed is ready for sale during planting seasons.

4.3 Marketing, Sales Promotion, and Pricing Strategies

To address market challenges, the training covered effective sales promotion and marketing techniques to increase demand for locally produced hybrid seeds. Participants learned how to design pricing strategies and budgeting models that reflect production costs and market conditions while remaining competitive with imported seeds. Emphasis was placed on developing promotional campaigns to showcase the benefits of locally produced hybrid maize, particularly the dual-purpose varieties that provide both grains for

income and biomass for livestock feed. These marketing strategies aim to build farmers' trust in local seed products, which is essential for market growth. The training also explored strategies to mitigate logistical challenges, such as delays in delivery, by promoting better coordination between producers, traders, and farmers.

4.4 Seed Grower Selection, Contracting, and Business Models

A vital aspect of the course was training participants in the selection of seed growers and the development of effective contracting models. Participants were guided on how to identify and contract experienced seed growers to ensure consistent production and quality. The importance of formal agreements was emphasized, detailing roles and responsibilities, payment terms, and quality expectations to ensure smooth operations between seed companies and growers. Business models were explored to align hybrid maize seed production with different farm types, such as those focusing on grain, forage, or diversified systems. These models provide flexibility, allowing farmers growing pastures or cassava to integrate dual-purpose maize into their systems. Through these contracts, farmers gain access to technical support and quality inputs while ensuring reliable seed supplies for local markets.

5 Plant protection.

The Director of CIMMYT Maize Program, Dr. Prasana, gave a training session on key maize diseases hindering productivity. The training highlighted the fall armyworm (*Spodoptera frugiperda*) as a critical pest threatening maize production in Laos, with participants learning to monitor infestations through field scouting. As Laos makes strides to develop a viable maize seed industry, several diseases were noted that include gray leaf spot (*Cercospora zeae-maydis*), Southern corn rust (*Puccinia polysora*) which spreads rapidly under warm, humid conditions, reducing yield and grain quality, Maize streak virus (MSV) and Northern leaf blight (*Exserohilum turcicum*).

Integrated pest and disease management (IPDM) strategies were discussed, focusing on the development and selection of resistant maize varieties as the primary defense.

6 Farmer Participation, Multi-Objective Strategies, and Stakeholder Engagement

The training emphasized the importance of farmer engagement throughout maize production, from setting breeding goals to participatory variety selection (PVS). Farmers identified key traits such as drought tolerance, high grain yield, and improved stover quality for livestock feed. On-farm trials provided hands-on experience in evaluating new varieties under real conditions, allowing farmers to give direct feedback to researchers and seed producers, fostering trust and encouraging the adoption of dual-purpose maize. The dual-purpose varieties, with stay-green traits, were highlighted for their ability to meet grain market demands and provide high-quality stover for livestock feed, supporting both income generation and cost-effective livestock management. Crop rotation with cassava and legumes was promoted to improve soil fertility, reduce pests, and diversify income streams, enhancing the sustainability of farming systems. The training also emphasized stakeholder collaboration—engaging farmers, researchers, traders, and policymakers to align maize production with market needs and farmer livelihoods.

Strengthening extension services, improving input access, and building knowledge-sharing networks were identified as essential steps for creating a resilient, sustainable maize sector in Laos.

7 Conclusion and the way forward

Following the indoor training on seed systems, participants expressed a strong desire for hands-on training, marking a crucial step toward practical application in Laos. The initial focus will be on variety screening, where participants will engage in field trials to assess the performance of dual-purpose maize varieties under local conditions. These trials, conducted in collaboration with the National Agriculture and Forestry Research Institute (NAFRI), will evaluate grain and biomass yield, disease resistance, and adaptability to various soil types and climate conditions. Dual-purpose maize, offering both food and livestock feed, supports smallholder farmers in increasing productivity while enhancing resilience. Additionally, crop diversification through rotations with cassava will be promoted to improve soil structure, control pests, and provide alternative income streams.

The next phase will involve hands-on training in seed production techniques tailored for dual-purpose maize. Participants will learn essential practices such as isolating fields to maintain genetic purity, managing pests and diseases, and applying fertilizers effectively. A focus will be placed on integrated fertilizer strategies, incorporating both synthetic fertilizers (NPK) and organic inputs like compost and manure to enhance soil health. This combined approach ensures sustainable productivity by improving soil fertility, promoting microbial activity, and reducing long-term dependency on chemical inputs. Fertilizer applications will target key growth stages, such as planting and flowering, to optimize grain and biomass production. Participants will also be trained in post-harvest management to maintain seed quality and viability. These efforts will enable farmers to produce reliable seed stocks adapted to local conditions, reducing reliance on external inputs.

A key component of this initiative is the development of inclusive seed business models that cater to different farm types and cropping systems. For farmers focused primarily on maize for grain, models will emphasize high-yielding varieties and improved marketing channels. For those growing maize primarily for forage, seed production will align with livestock feed systems and explore opportunities to diversify through rotational cropping with pasture or cassava. These models will also provide alternatives for farmers currently growing pastures, offering them the option to integrate forage maize as a complementary crop. Through collaboration with NAFRI, research will continue to refine these business models, ensuring they are context-specific and meet the diverse needs of the farming communities. Participants will also receive training on seed certification, quality assurance, and market linkages, building a robust seed sector that enhances food security, supports livestock production, and promotes sustainable agricultural practices across Laos.

Participants list

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