Food and Agriculture Organization of the United Nations

EXPLORING BANANA FUTURES

Building banana sustainable and climate resilient pathways in Lao People's Democratic Republic

Funded by:

gef

CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security

CCAFS

Utrecht University

STORYMAP HIGHLIGHTS

SCOPE & OUTLINE

CURRENT & FUTURE TRENDS

BARRIERS & UNDERLYING CAUSES

ROOT IMPACTS OF TRENDS

PRIORITY ACTIONS

STAKEHOLDERS

CONTEXTUAL SCENARIOS ANALYSIS

CLIMATE RESILIENT IMPACT PATHWAY FOR BANANA

SCOPE

Using SAMIS Agro-Ecological Zoning (AEZ) future crop suitability maps to build hotspot maps under the RCP 8.5 and a six steps foresight planning approach to identify climate risks, opportunities and transformative actions for banana production. Priority actions and recommendations were formulated and have been tested against two contextual scenarios and form the foundation of a climate resilient actions pathway to ensure an effective implementation of the Agriculture Development Strategy (ADS) 2025 and the vision to the year 2030.

CURRENT AND FUTURE TRENDS

- Changing climatic suitability for banana production
- Commercial farming of banana for export has rapidly expanded
- Better access to water and electricity
- More banana varieties and modern techniques available regionally
- Modern and cost-effective processing plants
- Increase of GDP shares and relative increase of income of farm households.
- Rising and fluctuant commodity prices
- More foreign investors in the sector
- Commercialisation of the banana and export orientation
- Moving from subsistence livelihood to commercial
- Environmental risks due to pesticides uses on soil and water

BARRIERS

- Overuses of chemical products in banana plantation
- A banana sector that is more commercial orientated with foreign investment
- Banana plantation not located in the most suitable areas
- Banana plantation workers lacking protection and safe working conditions
- Low access to climate resilient and market orientated banana varieties and seed
- Low infrastructures and logistic to support a growing banana sector
- Limited access to processing facilities

ROOT IMPACTS

- Disputes and tensions over land uses and dedicate commercial banana plantation
- Environmental degradation of soils and overuses of natural resources
- Lack of knowledge and capacity on banana processing
- Low banana prices
- Banana workers have health risks
- Banana value chain nationally focusing on fresh banana
- No banana farmers groups

PRIORITY ACTIONS

- Manage investment and land zoning for the banana sector
- Facilitate both international and national investments
- Ensure production quality according to international standards
- Develop infrastructure-oriented policy and investment for the banana sector

KEY STAKEHOLDERS

Ministry of Agriculture and Forestry: Department of Agriculture, National Agriculture and Research Institute, Department of Agricultural Land Management, Department of Technical Extension and Agro-Processing
Prime Minister Cabinet office
Laos-KOREA Agricultural Techniques and Rural Development Training Center
Ministry of Planning and Investment:
Ministry of Industry and Commerce
National Chamber of Commerce and Industry
Ministry of Finance: Department of Taxation, Department of State Property
Ministry of Natural Resources and Environment: Department of Land, Department of Environmental Management
Ministry of Labour and Social Welfare: Department of Skills Development, Department of Management, Department of Social Welfare
National University of Lao: Faculty of Economics and Business Administration, Faculty of Agriculture,
Private sectors and Chinese investors
Local authorities: PAFO, DOFA, PONRE, DONRE

SCENARIO FARMERS IN NEED OF A RESCUE TEAM

(High availability of skilled labor and low land security)
Impacts:
Decreased use of chemical inputs through policy enforcement and high skill workers trained in good agriculture practices. Low agriculture land secure ownership due to tensions between different stakeholders
Food security is achieved for the high skills labours. However, due to land security issues, smallholders' farmers face food insecurity
Better land planning and management of banana plantations with an increase of the GDP share by banana sector.

SCENARIO HAPPY FARMERS

(Insufficient governmental communication and clear land zoning)
Impacts:
Better land zoning reduces disputes over commercial banana plantations land Suitable land identification optimize sustainable banana production for both local and international markets Private sector is the main driver of development in the banana sector

PRIORITY RECOMMENDATIONS

1. Identify and allocate suitable land for banana

2. Enhance public and private partnership

3. Support clean agricultural production techniques and organic agriculture as per international standards, and use of Integrated Pest Management techniques

4. Reinforce capacity to address human rights risks, gender inequalities and safety

5. Identify and facilitate the access of processing technologies for banana bi-products in Lao People's Democratic Republic in order to diversify bi-products

SCOPE & OUTLINE

In this "story map", the banana production system is analyzed using the output of the SAMIS AEZ future crop suitability maps and multiple foresight analysis tools. All elements of the banana value chain are identified, as well as current and future risks and opportunities. Based on these analyses, policy recommendations containing proposed actions and strategies are imposed in the form of a pathway action plan. This is done in order to ensure an effective implementation of the Agriculture Development Strategy (ADS) 2025 and the vision of the agriculture sector to the year 2030.

This document aims at ensuring food security, producing comparative and competitive potential agricultural commodities, developing clean, safe and sustainable agriculture and shift gradually to the modernization of a resilient and productive agriculture economy, linking with rural development contributing to the national economic basis. Achieving these goals requires all partners both at the central and local levels including farmers to pay attention, enhance the coordination and collaboration needed for consistency and strong support. This story map is a crucial tool for policy markers and other stakeholders involved in banana production.

As stated in the ADS 2025 and the 9th national socio-economic development plan of the government for the years 2021-2025, banana production is aimed to be increased to a total area of 24,830 ha and yield of 735,580 ton/year. In 2020, banana trees in Lao PDR represented about 65,000 ha and a yield of more than 1.272,810 ton/year.

Who is this story map for?

At national level, the story maps is a mean of communication for technical spatial teams to formulate priority areas for investments in an understandable and efficient manner. Experts from Ministry of Agriculture and Forestry (MAF) can use the results of the analyses to base policy or investment related decisions on. The story maps can also be used to communicate results in between departments, teams of the MAF and relevant stakeholders of the assessed crop value chains.

The key themes in this document are:

Food security, land management, resilient production, climate change, sustainable banana production, protection of labour force, reducing environmental impacts on production, land zooning, robust decision making process.

CLIMATE CHANGE, BANANA SUITABILITY AND HOTSPOT MAPS

The crop suitability trends are visible in the selection of map outputs from the SAMIS project that are shown below (figure 1). The current suitability is shown for one variety of banana (2010-2019, 1a) for medium input, and the projected future suitability (2050, RCP8.5, figure 1b) for medium input. The differences between the two time periods are shown in figure 1c, the hotspot map combined with the visualization of current natural conservation areas. These map indicate the areas that are likely to increase or decline in suitability for banana production. With this information it is possible to allocate the areas that would be most suitable for banana production, while avoiding using natural forest area and/or paddy rice area as sites for future expansion of banana production. Mostly high and very high suitable areas are in Savannakhet, Vientiane, some part of Vientiane capital, and northern part except Louangphabang, Xaiyabouli, Xaisomboun provinces. The southern part is mostly marginal or not suitable.

Banana suitable areas mostly increase however those areas are inside current forest area. Increase trend is noted from marginal and moderate to high and very high at Parksong district (Champasack province), Xiengkhoung province, and increase from marginal to moderate in Borlikhamxai and Oudomxai provinces. Decrease trend is noted from very high and high to moderate and marginal at Savannakhet province, Vientiane capital, Vientiane province, Champasack and Khammouan provinces.

The trends that have influence on the future banana production system are:

- Use of chemical inputs
- Land ownership and demarcation
- Food security
- Land use planning
- Development of GDP
- Soil degradation
- Water irrigation
- Education level
- Sustainable investment

WHAT ARE RCPs?

RCPs are Representative Concentration Pathways that describe different climatic futures under different projections of greenhouse gas (GHG) emission in the coming decades. There are four RCPs, constructed under four possible ranges of radiative forcing values in 2100. They indicate different trends in emission declines and consecutive global temperature increases (Van Vuuren et al., 2011):

RCP	Temperature increase	GHG trend
RCP2.6	~2.0°C	Strongly declined emissions
RCP4.5	~2.4°C	Slowly declined emissions
RCP6.0	~2.8°C	Stabilising emissions
RCP8.5	~4.3°C	Rising emissions

For this analysis, RCP8.5 is chosen in visualizing the crop suitability changes as outputs of the SAMIS project. As this scenario represents a scenario without climate policy and with unstopped GHG emissions, the extent of climatic possibilities is covered.

WHAT ARE INPUT LEVELS?

Input levels as determined by FAO are based on the level of agricultural management that is general for an area. (FAO/IIASA, 2012):

Input level	Agricultural management
LOW	traditional management, subsistence based, labor intensive techniques
INTERMEDIATE	Improved management, partly market oriented, improved varieties, some mechanization
HIGH	advanced management, mainly market oriented, commercial production, optimum use of chemical inputs

WHAT IS A HOTSPOT MAP?

- The hotspot map highlights the difference between the maps of present and future suitability for a certain crop.
- The hotspot maps indicate the areas that are likely to increase or decline in suitability for the identified priority crop production. With this information it is possible to allocate the areas that would be most suitable for the crop production, while avoiding using natural forest area and paddy rice areas as sites for future expansion of the identified crop production.

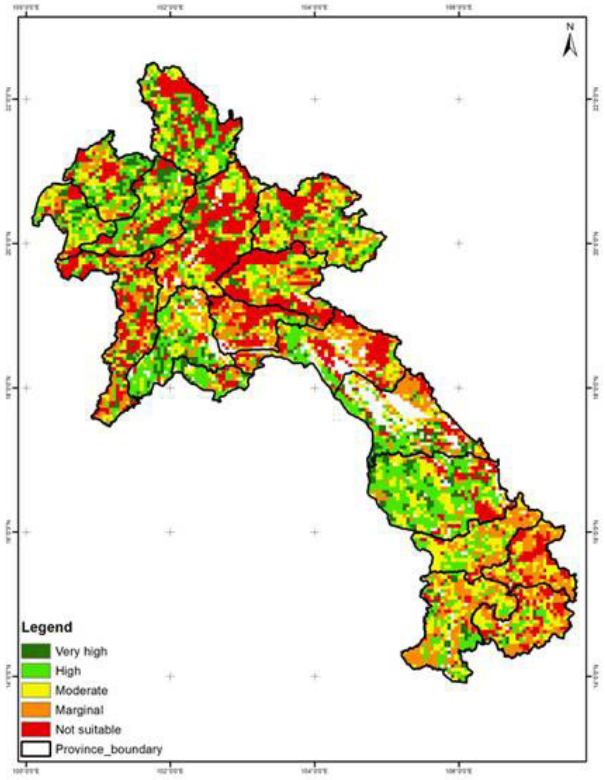
CURRENT & FUTURE SUITABILITY AND HOTSPOT MAP: BANANA

PRESENT

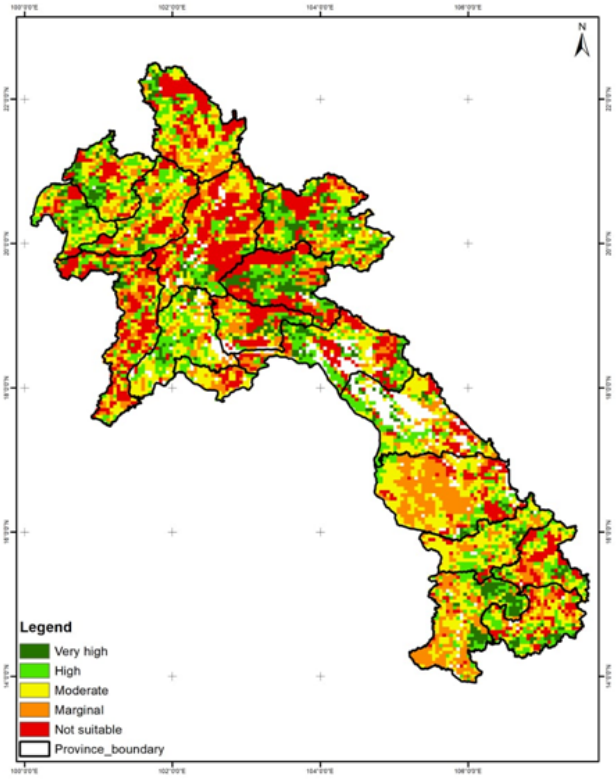
FUTURE

DIFFERENCE PRESENT AND FUTURE SUITABILITY

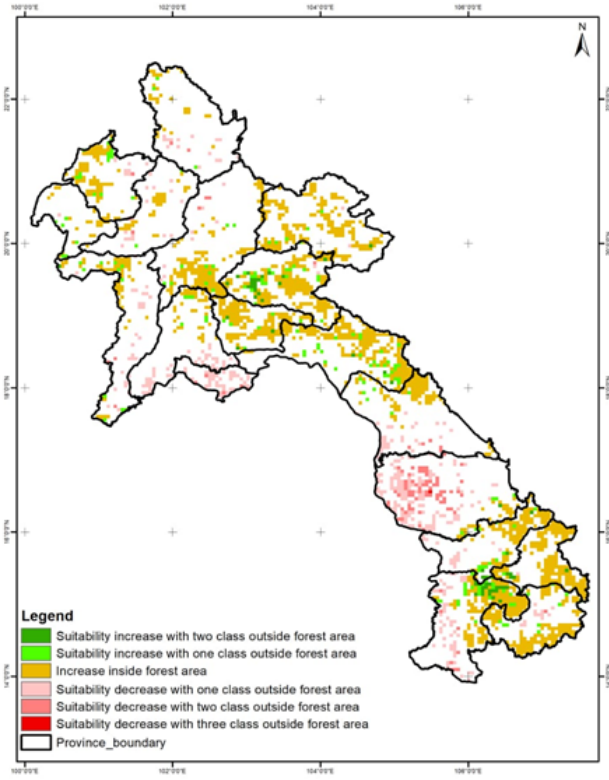
1.a Suitability of banana using medium input level (2010-2019)



1.b Suitability of banana using medium input level (2041-2050) RCP8.5



1.c Banana hotspot map

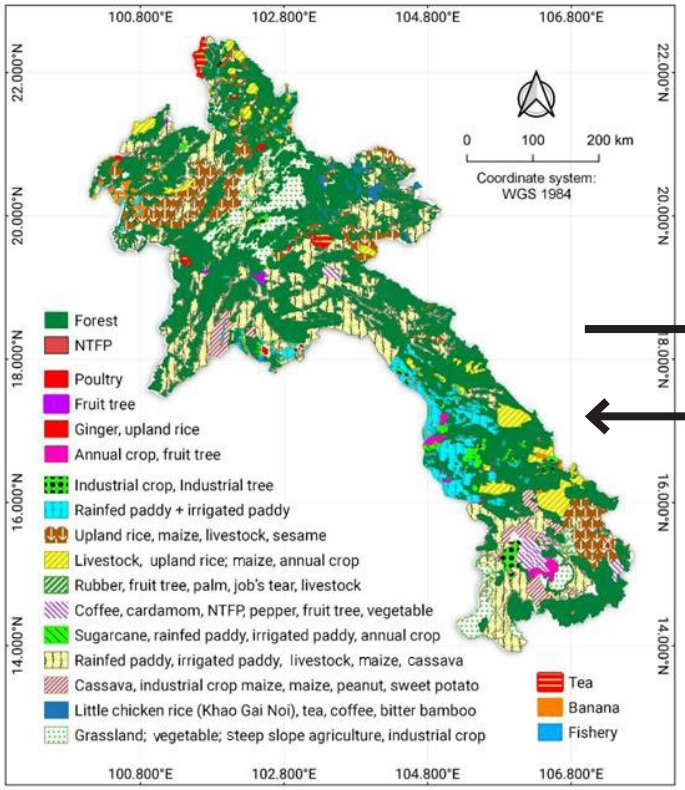


Source: banana suitability and hotspot map by Department of Agriculture Land Management, Ministry of Agriculture and Forestry, 2022.

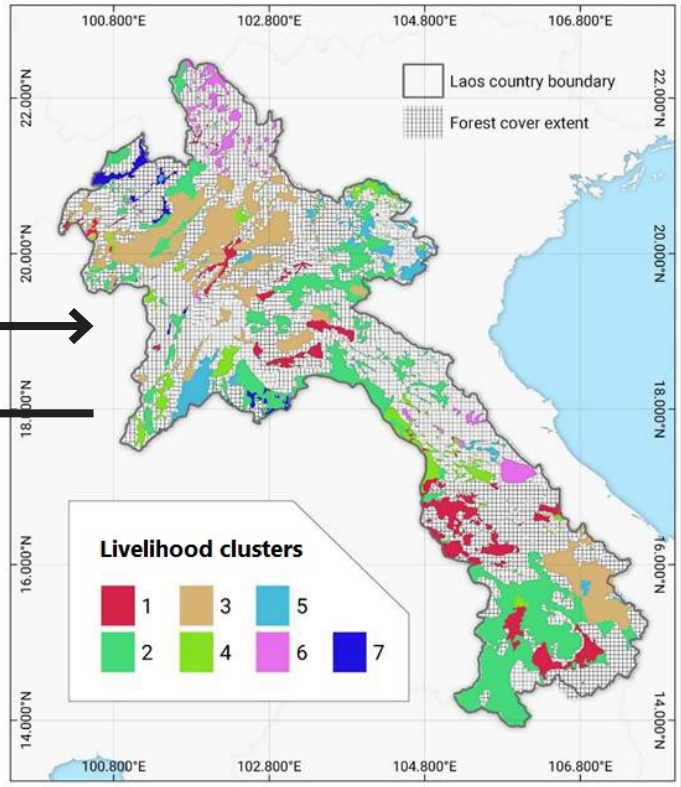
Administrative boundaries of Lao People Democratic Republic, National Geographic Department, 2013.

Figure 1. Overview of 1.a Present suitability for Banana production (2010-2019), 1.b Future projected suitability using medium input level and RCP8.5 for the time period 2041-2050. 1.c Hotspot map showing the change in suitability class between present and future suitability, with increased suitability in forest area indicated in orange. Data are available at https://lrims-dalam.net/?thematic=aez.

AGRICULTURAL LIVELIHOODS AND ADAPTIVE CAPACITY



Source: map by Department of Agriculture Land Management, Ministry of Agriculture and Forestry, 2022.



Administrative boundaries of Lao People Democratic Republic, National Geographic Department, 2013.

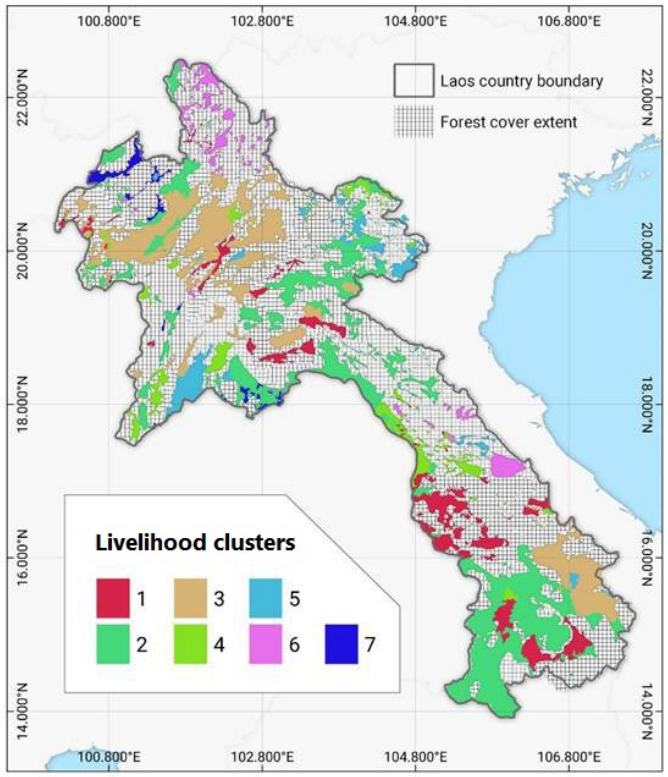
A livelihood zones is a landscape unit that have similar set of production system, scale of farm operation, natural environment, and level of market orientation of farmers

Each cluster describes a group of landscape units that shares the same socio-economic and institutional attributes. A subset of information on adaptive capacity can be used to analyze a specific crop-based system using the livelihood zones

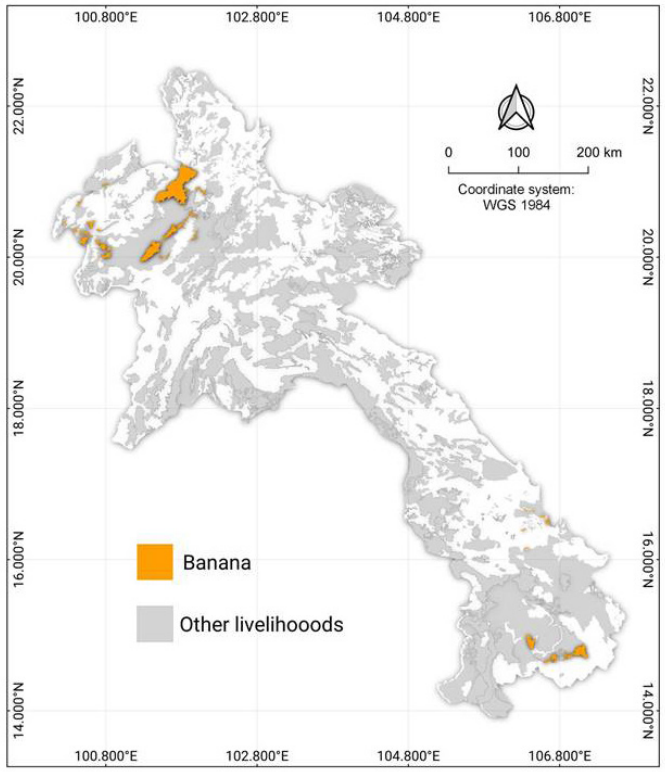
Data are available at https://lrims-dalam.net/?thematic=sava

- Participatory approach with local crop experts was used to map the livelihood zones
  - Livelihood zones are land areas with homogeneous physical and social attributes. Each zone referred to as a "**landscape unit**" is characterized by a specific production system, a defined farm size, a unique natural environment, and scale of market access
- Local consultation per district was undertaken to assess adaptive capacity of each landscape unit
  - Adaptive capacity assessment was based on a characterized set of indicators for three conditions: basic needs satisfaction, conditions for innovations, and capacity to translate innovations into action
- Hierarchical clustering model was applied to the adaptive capacity data to group together landscape units with similar characteristics. Each cluster describes a group of landscape units that shares the same adaptive capacity characteristics but is unique with other clusters
- A livelihood map was developed through collaborations of the **DeRISK SE Asia Project** (Applying seasonal climate forecasting and innovative insurance solutions to climate risk management in the agriculture sector in SE Asia), **SAMIS** (Strengthening agro-climatic monitoring and information systems), **DALaM** (Department of Agricultural and Land Management), and **NAFRI** (National Agriculture and Forestry Research Institute)

OPPORTUNITIES AND BARRIERS FOR BANANA-BASED LIVELIHOOD ADAPTATIONS



Source: map by Department of Agriculture Land Management, Ministry of Agriculture and Forestry, 2022.



Administrative boundaries of Lao People Democratic Republic, National Geographic Department, 2013.

Each cluster is a group of landscape units that shares similar socio-economic and institutional attributes. A subset of information on adaptive capacity can be used to analyze a specific crop-based system

Location of landscape units where banana is an integral part of farmers' livelihood

Data are available at https://lrims-dalam.net/?thematic=sava

- Farmers in **cluster 2** are characterized by having good income sources with lower poverty levels. Better access to credit and financing can partly explain the higher diversity of agricultural livelihood which farmers rely on for income and high utilization of improved banana varieties which increase production. This can be supported by higher use of fertilizers which is a common practice if using improved varieties to optimize production. However, Information and Communication Technology (ICT) use is comparatively lower and might be a barrier for climate change adaptation.
- Farmers in **cluster 3** have limited access to credit and financing seems to be limited which could partly explain low use of improved crop varieties and fertilizer application. This can hamper climate change adaptation as use of stress tolerant varieties might become more relevant in the future. Lower income level could be a reason why there is a low penetration of credit and financing institution. However, ICT use is comparatively high which means there is an opportunity to disseminate good agricultural management practices and climate information through mobile services.
- **2050 scenario**: Climate suitability of banana is projected to decrease in cluster 2 based on simulation using RCP 8.5 emission scenario. On the other hand, simulation in cluster 3 shows that majority of the landscape units will have no changes in suitability by 2050, but ≈20 percentage of the landscape units will experience either a decrease or increase in climate suitability.

KEY TRENDS

The trends in banana production affect multiple elements in the production chain and have a large range of different impacts for people, the economy and the environment. The trends have been categorized in the major STEEP categories (socio-cultural, technological, economic, ecological and political) and their possible impacts are identified. For each category, the possible actions to counteract these trends are given. To further strengthen the knowledge and effectivity of the proposed actions, the knowledge gaps that need further research are highlighted.

Key trends:

- Commercial farming of banana for export has rapidly expanded.
- Improvement of infrastructure such as access to electricity. supplies, water, and community online / internet etc.
- Improved varieties and modern techniques available.
- Modern processing plants reducing worker costs exists, but this is targeting commercial banana plantations only.
- Increase of GDP shares and relative increase of income of farm households.
- Rising commodity prices.
- Relative stability of market shares.
- There are more investors and traders.
- Moving from subsistence basic livelihood to commercial crop.
- Environmental risks on soil and water due to over uses of pesticides.

TRENDS, IMPACTS & ACTIONS

Major Category	Trends	Impacts	Actions
• Ecological	• Create and add more green space. • Adjust the natural balance. • Shade for other plants. • Helps absorb carbon dioxide in the atmosphere.	• Decline in soil condition or Soil degradation. • Contaminants in soil and water sources. • There is odour pollution to people and the environment. • Plantations does not cause land areas decline of other crops, such as paddy fields and short duration cover crops.	• Create a balance for the ecosystem. • Ensure sustainable soil fertility.
• Political	• There is political stability. • There are weird rules to govern protection.	• Loss of investment opportunities (missed opportunity). • There is a conflict between investors and farmers. • Enforcement of irrigation usage has not yet been tightened, for example, there is no specific irrigation for banana cultivation.	• Ensuring social rights. • There is social governance by law. • Facilitate and secure investments and marketing.
• Socio-cultural	• There is improvement of infrastructure such as access to electricity supplies, water, and community online / internet etc. • Ensure food security. • Society is based on solidarity.	• Lifestyle or livelihood has changed due to the conversion of other crops to banana plantation. • Banana plantation workers moves to other areas lack of the labor. • Health deteriorating due to workforce or labour-force and use of chemicals use.	• Set and fix the rules in social management. • Ensure gender equality. • Ensure the infrastructure policy. • Ensure the quality of being sophisticated and socio-culture. • Make sure to generate the additional income for farmer sector.
• Technological	• There are improved varieties and modern techniques (implementing sustainable drainage systems). • Good network and connection exist. • There are modern processing plants reducing worker costs in production.	• High price level. • Local and remote areas cannot access modern technology services.	• Quality control and management tools. • Farmers can use highly accurate modern tools in production and save money. • Ensure production quality according to international standards.

BARRIERS & UNDERLYING CAUSES

Banana Farm, Huaxaiy district Lao PDR, by Khamhou (2022)

Trends and drivers of change often have underlying issues or developments that cause a system to change in a certain direction. Trends are then a result and therefore a symptom of these underlying causes, as they can follow from a cascade of developments. To understand the identified trends and the barriers they form for realizing sustainable and resilient cassava production, the trends are looked at in a systems-approach. With this approach, the root causes and implications are being identified from the key barrier. This is visualized in a causal analysis framework. As the deeper roots of the barriers are being investigated, the framework allows for a focus on the problems underlying the driving forces instead of symptoms.

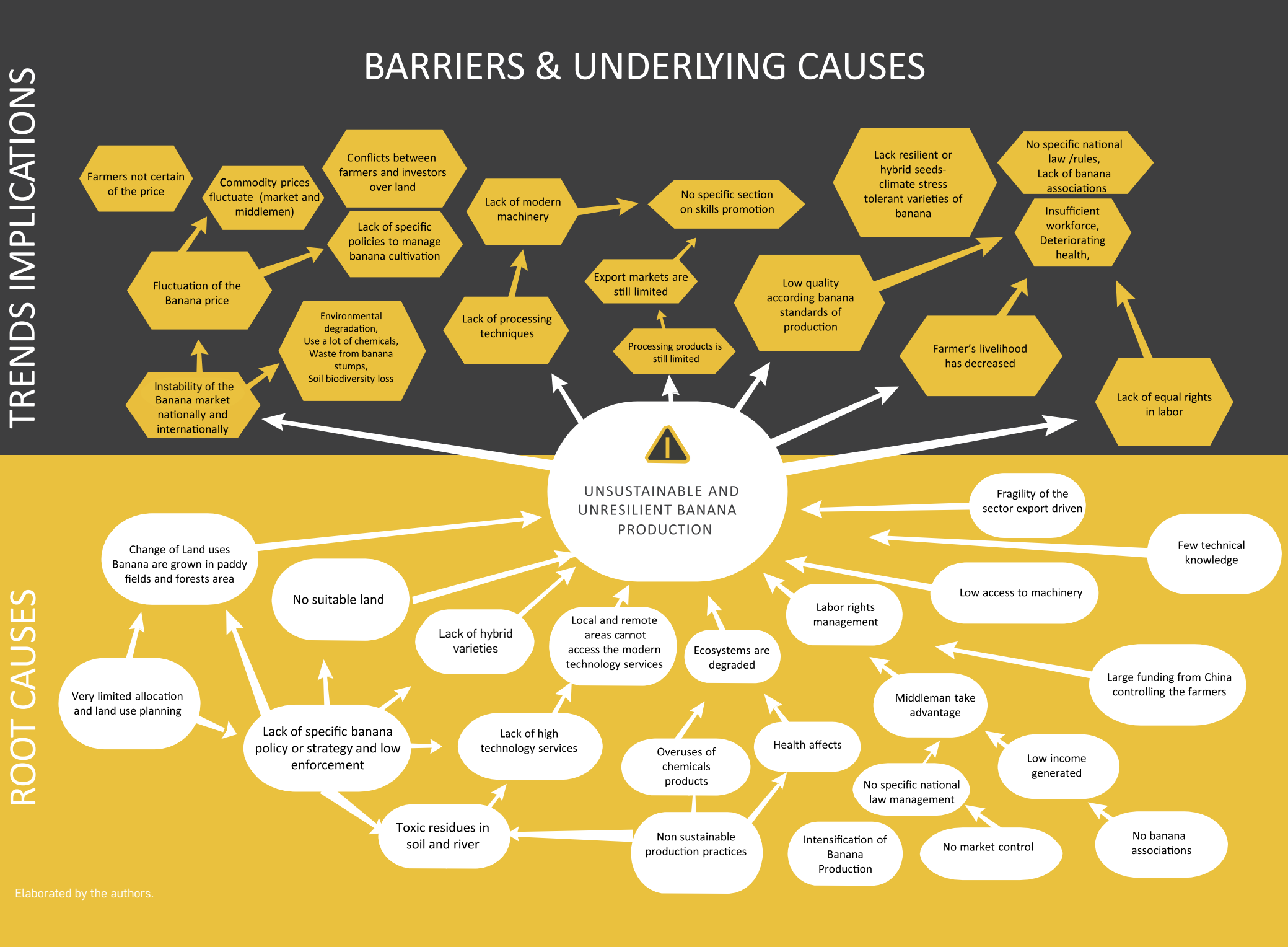
The underlying causes of the trends:

- Overuses of chemical products in banana plantation.
- A banana sector that is more commercial orientated with foreign investment
- Banana plantations are not located in the most suitable areas.
- Banana plantation workers lacking of protection and safe working conditions.
- Low access to climate resilient and market orientated banana varieties and seed.
- Low infrastructures and logistic to support a growing banana sector.
- Limited access to processing facilities.

The trends implications:

- Disputes and tensions over land uses and dedicate commercial banana plantation.
- Environmental degradation of soils and over uses of natural resources.
- Lack of knowledge and capacity on banana processing.
- Low banana prices.
- Banana workers health risks.
- National banana value chain focusing on fresh banana.
- No banana farmers groups

BARRIERS & UNDERLYING CAUSES



Elaborated by the authors.

KEY STAKEHOLDERS

The stakeholder mapping serves as a tool to understand the variety of stakeholders in the banana value chain, as well as their influences and interactions. The results show that climate change and unsustainable farming practices not only influence farmers, but all actors in the value chain. Also, the key actors in banana production can be identified. These key actors are the stakeholders that are most important to involve in a transformation of the system towards climate resilient production. There a seven identified stakeholder groups with the banana sector and their key mandates were highlighted. The policy frameworks and stakeholders on global, regional and national level are indicated below.

GLOBAL LEVEL

The SDG Framework, The United Nations Framework Convention on Climate Change Paris Agreement, Lao Intended Nationally Determined Contribution, Lao PDR's National Determined Contribution (NDC).

REGIONAL LEVEL

ASEAN Regional Guidelines for promoting climate smart agriculture practices , ASEAN Ministries of Agriculture and Forestry.

NATIONAL LEVEL

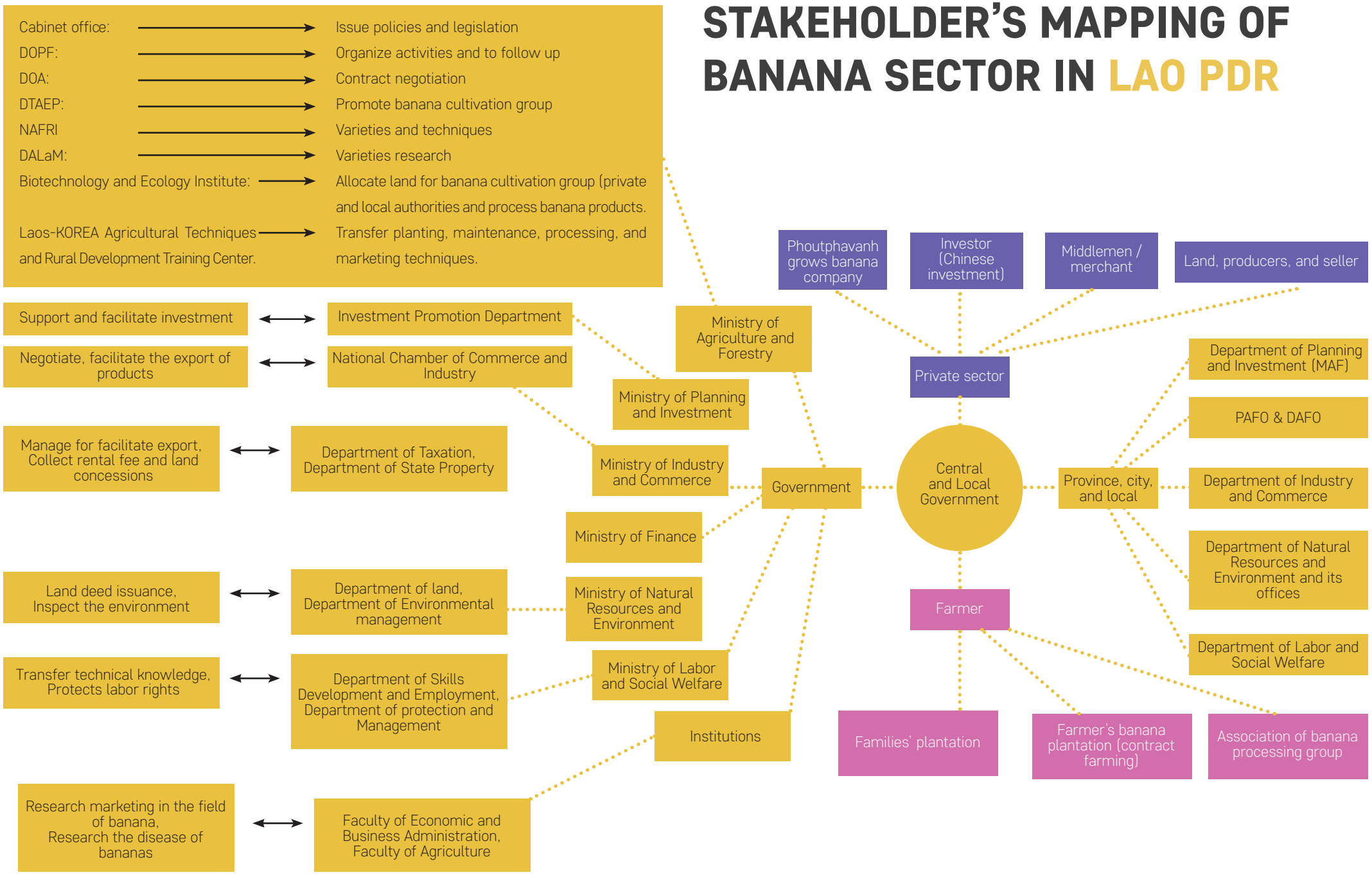
Ninth National Socio-economic development Plan (NSEDP) Lao Agriculture Development Strategy, 2020.

Ministry of Agriculture and Forestry;

- DOA: **Contract negotiations.**
- NAFRI: **Varieties and techniques.**
- Biotechnology and Ecology Institute: **Varieties.**
- DALaM: **Allocate land for banana cultivation.**
- DTAEP: **Promote banana cultivation groups (private and local authorities) and process banana products.**
- Cabinet office: **Issue policies and legislation.**
- Laos-KOREA Agricultural Techniques and Rural Development Training Center: **Transfer planting, maintenance, processing, and marketing techniques.**

2. Ministry of Planning and Investment;
- Investment Promotion Department: **Support and facilitate investment.**
3. Ministry of Industry and Commerce;
- National Chamber of Commerce and Industry: **Negotiate, facilitate the export of products.**
4. Ministry of Finance;
Department of Taxation: **Manage for Facilitate exports.** Department of State Property: **Collect rental fee and land concessions.**
5. Ministry of Natural Resources and Environment;
- Department of Land: **Land deed issuance.**
- Department of Environmental Management: **Inspect the environment.**
6. Ministry of Labour and Social Welfare;
- Department of Skills Development: **Transfer technical knowledge.**
Employment and Department of Management: **Protects labor rights.**
7. Research institution:
- Faculty of Economics and Business Administration: **Research marketing in the field of banana.**
- Faculty of Agriculture, National University of Lao: **Research the disease of bananas.**
8. Private sector: **Investment, techniques, processing techniques, marketing, exports and welfare for workers, control and protection of the environment.**
9. Local authorities: **Land, producers and sellers.**

STAKEHOLDER'S MAPPING OF BANANA SECTOR IN LAO PDR



Elaborated by the authors.

FUTURE CONTEXTUAL SCENARIOS ANALYSIS

The contextual scenario narratives described have been developed during the SAMIS contextual scenarios workshop of 2020 (Peou et al., 2020) and adapted during the training workshop on 2021 to specific crop. The scenarios are concrete examples of what future states could look like. They are based on current developments in the agricultural sector in Lao PDR. These so-called drivers of change are then extrapolated to the year 2030. When combining a selection of these drivers, a possible future context can be sketched. A narrative of this context describes a possible future state of the banana sector, with two of the drivers that are dominant. The dominant drivers have a large variety of impacts on other trends, for example food security, income, migration, export values and environment. The contextual scenarios give an understanding of the complexity of the food system, and explore a range of possibilities for the future. Policy documents and proposed actions can be evaluated on their robustness by imagining their effectiveness if one of these scenarios would be reality. With this information, specific priority actions were formulated to respond to the developments in the scenarios focusing on how key indicators will unfold.

Key priority actions based on the two scenarios:

- Manage investment and land zoning for the banana sector.
- Facilitate both international and national investments
- Ensure production quality according to international standards.
- Develop infrastructure-oriented policy and investment for the banana sector.

AGRICULTURE IN NEED OF RESCUE TEAM

Less secure land ownership & high availability and skills of labor forces

In 2030, crop production of banana is highly specialized in Lao PDR and expecially in the provinces of Bokeo, Luangnamtha, Oudomxay, Luangprabang, Savannakhet and Salavan that are recognized nationally for high quality. However the quantities produced are insufficient to respond to the demand coming from different regions of Lao PDR. This is due to the insecure land ownership of farmers as over the years multiple land issues raised such as land conflicts between farmers or investors, no land or suitable land for banana plantation, low land quality due to insecure land ownership.

Meanwhile the production levels of staple commodities that maintain food security cannot be kept stable and the youngsters of the village are seeking new opportunities in the main cities as agriculture incomes decreased. The labor force available decreased due to insecure land ownership and main labor goes to work in other areas. Key agricultural production areas, green baskets in all provinces mentioned above and other provinces are being left empty due to land degradation related to the over use of fertilizers and pesticides. Farmers use fertilizers and pesticides to prevent weeds, diseases and increase banana yield, however in large plantation there is an over uses of chemical as there is no responsibility related to land ownership.

To mitigate the migration outflux the government is encouraging agro-industries to build factories in non-permanent lands. Those large lands areas are being taken by agro-industries doing intensive agriculture such as contract farming, promoting farmers cultivate banana or industrial crops without consideration which land should cultivate rice. This decreased even more the soil fertility and has a tragic impact on the environment. Despite big factories that have been located in the agriculture land or communal land, people are still migrating. Continued migration is linked to highly mechanized modern agriculture. Only two type of jobs are available: those that requires almost no skill and are badly paid, and those that requires degrees in science and research with high salaries.. As families are regularly out of food cannot control the food price and food insecurity and income insecurity. There is a need to further improve public administration, especially laws, decrees and regulations and to establish a specific decree or regulation to promote and support for sustainable banana plantation in terms of production, protect right workers and friendly environment.

HAPPY FARMERS

Clear land zoning & insufficient communication between government actors

In 2030, weak governmental management, relationship capacity and low technical and developmental support to provinces on topic such as the prioritization. It has led to delays in accessing local information and delivering climate hazard information to farmers and people on the ground in 21 villages in details such as Mueang Long district, LuangNamtha province. With the increase of contract farming, banana plantation owners are aiming to improve their works with the banana farmers and reduce their environmental impacts. Modern techniques for farmers are taught mainly in commercial banana plantations maintaining stable production levels of a diverse type of banana varieties. Better incomes for banana workers and family incomes due to more stability of the sector, better prices and productivity with high investment from the private sector on machineries and factories. Farmers have access to more resilient and nutritious banana varieties. Thanks to the private investment in the infrastructures and banana processing, new banana derived products are being developed, consumed and traded such as banana chips, banana candies, banana juices, etc...

The government in early 2020 introduced banana plantations and implemented key master plans that are already in place engaging more the private sector to support the effort for a clear land zoning and a better land management in the agriculture sector. The government is very conscious on balancing land and resources following their regional and international commitments. Major improvements are made in sustainable practices around banana production which reduced the soil degradation and over used of chemical products. This is made possible with an emphasis on agroforestry and integrated crops productions. Farmers diversify livelihoods and source of foods while banana workers benefit from higher incomes and better work conditions.

There is stability in productivity, farmers are happy, resulting in better living conditions, the children are better educated level, have a better understanding and can use the area /land in a better qualities.

PRIORITY RECOMMENDATIONS

With this document, the need to include all relevant factors in the current and future production of banana for Lao PDR is highlighted. It is highly recommended that all partners use and support the scientific output and following recommendations described in this document. Before implementation of the recommendations, it is necessary to get the permission of all relevant partners. The recommended priorities for realizing effective land use planning and a sustainable and climate resilient banana production system are explained below. Next, the components that would help build income for farmers as well as building the national economy are described.

1. Identify and allocate suitable land for banana in a robust process using pFALUPAM, AEZ maps and hotspots maps while integrating the insights to sub-national and national planning policies. It will empower the government to better apply land zooning and conduct systematic survey to allocate future banana plantation concession in suitable land as well as reduced competitiveness over land uses.

2. Enhance public and private partnership by creating a portfolio of incentives covering market orientated policy, research & development, innovations, tax free investment, better market control, banana trade association create to encourage responsible investment in the banana sector.

3. Support clean agricultural production techniques and organic agriculture following criteria of the Department of Agriculture by developing technical guidelines to facilitate the dissemination of information that will enhance sustainable and resilient banana production which targets both domestic and international market and promotes targeted education programs to implement best practices, including the selection and use of pesticides as per international standards, and Integrated Pest Management techniques.

4. Reinforce capacity to address human rights risks, gender inequalities and safe labour to protect banana workforce in commercial plantation by conducting trainings and establishing banana workers groups.

5. Identify and facilitate the access of processing technologies for banana bi-products in Lao PDR to diversify bi-products with respect to process optimization, packaging and consumer acceptance and preference to high nutritional qualities products.

CLIMATE-RESILIENT IMPACT PATHWAY FOR BANANA

Scope and Timeline

Using SAMIS AEZ future crop suitability maps to build hotspot maps under the RCP 8.5 and a six steps foresight planning approach to identify climate risks, opportunities and transformative actions for banana production.

Priority actions and recommendations were formulated and have been tested again two contextual scenarios and form the foundation of an climate resilient actions pathway to ensure an effective implementation of the Agriculture Development Strategy (ADS) 2025 and the vision to the year 2030.

Key trends

Trends analyses till 2030

Changing climatic suitability for Banana production
Commercial farming of banana for export has rapidly expanded
Better access to water and electricity
More banana varieties and modern techniques available regionally
Modern and cost-effective processing plants
Increase of GDP shares and relative increase of income of farm households
Rising and fluctuant commodity prices
More foreign investors in the sector
Commercialisation of the banana and export orientation
Moving from subsistence livelihood to commercial
Environmental risks due to pesticides uses on soil and water

Stakeholders

Growing number of stakeholders

Ministry of Agriculture and Forestry: DOA, NAFRI, DALaM, DTAEP, Cabinet office, Laos-KOREA Agricultural Techniques and Rural Development Training Center.
Ministry of Planning and Investment.
Ministry of Industry and Commerce; National Chamber of Commerce and Industry.
Ministry of Finance; Department of Taxation, Department of State Property.
Ministry of Natural Resources and Environment; Department of Land, Department of Environmental Management.
Ministry of Labour and Social Welfare: Department of Skills Development, Department of Management, Department of Social Welfare.
National University of Laos: Faculty of Economics and Business Administration, Faculty of Agriculture, private sectors and Chinese investors.
Local authorities such as PAFO, DOFA, PONRE, DONRE.
Farmers, banana workers in plantations.

Barriers & Underlying causes

Current assumptions, concerns, barriers, and behaviours

Barriers

Overuses of chemical products in banana plantation
Banana sector that is more commercial orientated with foreign investment
Banana plantation located not in the most suitable areas
Banana plantation workers lacking protection and safe working conditions
Low access to climate resilient and market orientated banana varieties and seed
Low infrastructures and logistic to support a growing banana sector
Limited access to processing facilities

ROOT IMPACTS

Disputes and tensions over land uses and dedicate commercial banana plantation
Environmental degradation of soils and overuse of natural resources
Lack of knowledge and capacity on banana processing
Fragile banana prices
Banana workers in position of health risks
National banana value chain focusing on fresh banana
No banana farmers groups

Priority Actions

- Manage investment and land zoning for the banana sector
- Facilitate both international and national investments
- Ensure production quality according to international standards
- Develop infrastructure-oriented policy and investment for the banana sector

Scenarios analysis

SCENARIO FARMERS IN NEED OF A RESCUE TEAM
(High availability of skilled labor and low land security)
Impacts:
Decreased of uses of chemical inputs thanks to enforcement of policy and high skills workers trained in good agriculture practices . Low land secured ownership due to tensions over agriculture lands between different stakeholders
Food security is achieved for the high skills labours however due to land issues smallholders' farmers faced food insecurity
Better use land planning and management of banana plantations with an Increase of the GDP share of Banana.

SCENARIO HAPPY FARMERS
(Insufficient governmental communication and clear land zoning)
Impacts:
With better land zoning, disputes over commercial banana plantations land uses are reduced. Suitable land are identified to optimize the sustainable production of banana for both local and international markets. The main drivers of development in the banana sector comes from the private sector.

Priority Recommendations

- **1.Identify** and allocate suitable land for banana
- **2.Enhance** public and private partnership
- **3.Support** clean agricultural production techniques and organic agriculture as per international standards, and Integrated Pest Management techniques
- **4.Reinforce** capacity to address human rights risks, gender inequalities and safe
- **5.Identify and facilitate** the access of processing technologies for banana bi-products in Lao PDR to diversify bi-products.

SDGs TARGETS

The 17 Sustainable Development Goals (SDGs) were agreed on in 2015 by the Member States of the United Nations to create a better world by 2030. These goals envision the urgency to take on actions against poverty, hunger, inequality, climate change and biodiversity decline. Governments, the private sector and civilians are taking up the SDGs to indicate the societal value of their projects. This story map explains the vision of multiple relevant department of the Ministry of Agriculture and Forestry (MAF) for the future of maize production, therefore having a large influence on achieving relevant SDGs. The SDGs that are being adhered to by the analyses and recommendations indicated in this document are displayed below.

MORE INFORMATION

Food and Agriculture Organization of the United Nations
Representation in the Lao People's Democratic Republic.
128 Phone-Xay Road, Phonxay Village, Saysettha District, Vientiane capital Mailing Address: PO Box 1640, 01004 Vientiane.
Telephone: +856-21-414503.
Fax: +856-21-414500.
E-mail: FAO_LA@faoo.org
Website: http://www.fao.org/in-action/samis/en/

Concrete inquiries can be directed at GIS Unit of the **Department of Agricultural Land Management**
Telephone: +856 (0)21 770 075, 770 201.
Website: www. dalam.org.la

or at the NAFRI, **National Agricultural and Forestry Research Institute**
Telephone: +865 21 770097,
Website: www.nafri.org.la


©FAO/Petri

The boundaries and names shown and the designations used on these maps do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries. Dashed lines on maps represent approximate border lines for which there may not yet be full agreement.