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European Union



NUTRITION SENSITIVE VALUE CHAIN ANALYSIS (NSVCA)

FOR

ACCELERATING HEALTHY AGRICULTURE AND NUTRITION (AHAN) PROJECT

FINAL REPORT



Acknowledgements


The Nutrient Sensitive Value Chain selection and analysis was conducted by a national consultant with strong supports and significant technical contribution from World Vision, AVSF and GCDA teams. This report has benefitted from the guidance, coordination, logistic and inputs provided by line Provincial and District Agriculture, Forestry and Rural Development Offices. Information from communities and private sectors has significantly contributed to the report. To all of these contributors the team would like to express their sincerely thanks and high appreciation.

Disclaimer: This publication has been produced with the assistance of the European Union. The contents of this publication are the sole responsibility of the Author and can in no way be taken to reflect the views of the European Union.

Abbreviations

AHAN	Accelerating Health Agriculture and Nutrition
AVSF	Agronomes et Vétérinaires Sans Frontières
CAFCT	Concise ASEAN Food Composition Table
CBA	Cost-Benefit Analysis
CU5	Children Under five years old
DAFO	District Agriculture and Forestry Office
EU	European Union
FAO	Food and Agriculture Organization
FGDs	Focus Group Discussions
GCDA	Green Community Development Association
GDP	Gross Domestic Product
GoL	Government of Lao PDR
HH	Household
IFAD	International Fund for Agriculture Development
INGO	International Non-Governmental Organization
LDP	Livestock Development Project
LSIS	Lao Social Indicator Survey
LWU	Women Union
MAF	Ministry of Agriculture and Forestry
MDGs	Millennium Development Goals
MT	Metric Tonnes
NNS	National Nutrition Strategies
NSA	Nutrition Sensitive Agriculture
NSVC	Nutrient Sensitive Value Chain
NSVCA	Nutrition Sensitive Value Chain Analysis
NTFPs	Non-Timber Forestry Products
PAFO	Provincial Agriculture and Forestry Office
PHO	Provincial Health Office
PRF	Poverty Reduction Fund
SO	Specific Objective
VDF	Village Development Fund
UNICEF	United Nations for Children Fund
USD	US Dollar
VVS	Village Veterinary Services
WASH	Water, Sanitation and Hygiene
WRA	Women of Reproductive Age
WV	World Vision

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1. Executive Summary

In spite of the strong economic growth and rapid development in the last decade, Lao PDR still faces many challenges to meet the global Millennium Development Goals (MDGs). One of the main national concerns is the food security and malnutrition issue with a recent estimated 33% of under-five children (CU5) being stunted. Malnutrition is a complex condition that can involve multiple, overlapping deficiencies or excess of nutrients. The causes of malnutrition are multiple, cutting across sectors such as food, health, and care, etc. and all levels from individual, household, community, society and government. To cope with the malnutrition issues, the National Nutrition Strategies (NNS) has clearly identified the causes and set out the strategic frame work with request of closer partnership, collaborations and supports from international organizations.

Funded by EUR grant, Specific Objective 1 (SO1) of the Accelerating Health Agriculture and Nutrition (AHAN) project aims to ensure the availability of a diversified food all year-round in both quantitatively and qualitatively among project beneficiaries. To address these nutrition and food security gaps, the project will promote the intensification and diversification of selected crops and livestock production with better market linkages through Nutrient Sensitive Value Chain (NSVC) approaches.

NSVC is a food value chain consists of all the stakeholders who participate in the coordinated production and value-adding activities that are needed to make food products. It aims at improving the availability, affordability, quality and acceptability of nutritious food thru leveraging opportunities to improve the supply and demand for nutritious food (minimize loss) at each step of the chain. The NSVC framework tries to analyze the complexity of food systems and identify interventions to ensure that food CV contribute to improved food security and nutrition.

The AHAN project NSVC Analysis (NSVCA) started with designing the criteria for selection of shortlisted nutritious rich food value chains that have potential to improve local nutrition with potential to improve productivity and value addition, as well as, potential to increase income through production, demand and income impact pathways for better food system. In consultation with and verification from PAFOs, DAFOs and project technical team, and targeted communities, the nutrition rich foods including native chicken, frog, cricket, corn, banana, pumpkin and moringa were selected for detailed VC analysis in targeted districts and provinces. These products particularly, some crops are relatively high in protein, mineral, vitamins, dietary diversity, local availability and familiarity, as well as, potential for value addition.

Field visits were conducted between 22nd April and 11th May, 2019 in seven targeted districts of three provinces namely: Samakixay, Saravan, Laongam, Ta-oy, Sepon, Atsaphone and Xonbouly. A total of 49 individual households, 21 Focus Group Discussions (FGDs) in 14 main villages were participated in the discussion and interviews. About 20 local collectors, traders, wholesaler and retailers who are based in surveyed villages, districts, Pakse and Savannakhet were also discussed and interviewed.

Results of the field survey indicate that native chicken, corn, banana and pumpkin are very localized in targeted districts with some local market linkages have been well established; however, rather low productivities were commonly observed mainly, resulting from "low input, low output" with organic by default and traditional production system practiced and thus, low profit and low return on labor. The indicative cost-benefit analysis of these selected products shows that with current production system, farmers get profit (profit margin) of about 35 USD/83 birds/year/ HH (13.9%), 155 USD/0.48 ha/year/HH (60%), 169 USD/0.82 ha/year/HH (57%) and 115 USD/0.5 ha/year/HH (50%) for chicken, corn, banana and pumpkin respectively.

While raised frog, raised cricket and moringa are considered new in some smaller districts particularly, in some remote villages, production and consumption of these products are more common in bigger cities and are expected to immerge. The cost-benefit analysis of the frog production shows that, metamorph producers could earn at least 50% for the profit margin compared to about 99 USD/400 metamorphs/year/HH. Cricket raising provides about 182 USD/2 boxes/5 cycles/year/HH with a profit margin of about 33%. No cost-benefit analysis for moringa was conducted as it is new and nearly no trading at the moment (except for wet market in Savannakhet province).

Potential in improving of productivities through production intensification and diversification exists through the promotion of the NSVC approaches from better inputs provision, introduction of intensive or semi-intensive production system, harvesting and post-harvesting and processing. Currently, three main challenges faced by livestock farmers are: epidemics disease control, production improvement and better quality breeds for native chickens; high input cost, un-stable supply of metamorph and raising techniques including disease control and market for raised frogs; raising techniques, pest and high feed price for cricket raising.

While crop farmers indicate that water sources and facility for dry season corn production, processing technologies and market for rainy season are the main constrains for corn producers; production techniques and disease control as well as, processing technique and access to water sources are the main constraints for banana and pumpkin production.

In order to highlight the NSVC approaches for better contribution of the shortlisted products to local nutrition improvement and therefore, better food system, following interventions are strongly recommended.

Given that there is minimal awareness on food security and nutrition, promotion of nutrition awareness from native chickens, raised frogs, cricket, corn, banana, pumpkin and moringa's consumption to stimulate both the supply and demand along VCs in targeted villages and districts is crucial. The promotion could be done on any occasions when there are any meetings, through specific nutritional campaigns and distribution of simple and visual materials. Provision of sufficient information to propagate and to raise awareness of selected nutritious rich products to targeted commodities through participatory demonstration of diverse food recipes.

Consolidate and distribute simple and visual (poster, leaflet, video, etc.) technical improved production model package for selected livestock with demonstration of improved semi-intensive production system (breed selection, penning, feeding-forage, vaccination and health care, etc.) and improved production package for crops: cultivating schedule, soil, variety and seed selection, proper land preparation, planting, farm-management (weeding, GAP fertilization and disease control, watering, etc.), harvesting and post-harvesting is recommended.

Synthesize NSVC's materials and provide capacity building to extension and field staff to better understand the NSVC approaches and its impact pathway. At the same time, select targeted motivated and active farmers and form producer groups. Ideally, the group should be about 5-10 HHs/village from the beginning and scaling out in following years. Women should be encouraged to join as they are considered the main persons to take care of these chickens, frogs and cricket raising and for some crops such as moringa. Identifying successful farmers who have adapted and adopted improved production technologies and utilize them as "smart lead farmers" to accompany extension staff in technical trainings.

Participatory activity planning with selected farmers with clear schemes for necessary inputs supports (good quality breeds, tools, materials and equipment, forages seeds and feed, seedling, etc.). The physical supports should be not more than 2-3 production cycles. In some villages, farmers are very demanding; therefore a clear activity plan should be strategized from very beginning.

Provide improved technical production trainings for native chickens, frogs and crickets, corn, banana, pumpkin and moringa to producer groups with clear demonstration of concerned issues. Support some committed and active farmers to be on the job technical trainings are also recommended. Organize study tours and cross visits to improved production sites or technical learning centers for better production technique and market linkages.

Facilitate in group formation with building the capacity of group committee. Improve group management through better business planning (raising period and cycling and production seasonality) and linking to markets for better quality supply and price. Close monitoring the producer groups and timely provide managerial and technical advisory supports. Ideally, each group should be mentored once a week. Where possible, utilize social media to share technical experience and market information of the selected VCs.

2. Introduction

2.1 Lao PDR and Malnutrition Overview

In the past decade, Lao PDR's economy has experienced increasing growth of around 7.0-8.0%, making it one of the fastest-growing economies in the region. In 2017, the Gross Domestic Product (GDP) expanded by 6.9% and reached 17,067 million USD, the country's GDP income per capita was 2,468 USD. However, the economy remains largely agrarian with the total population of rural communities currently exceeds 4.4 million, with the agriculture sector accounting for about 16.2% of the GDP, and employing about 77% of the population. In 2017, the agriculture sector grew by 2.9% reaching 22,801 billion kip, a marginal increase from 2.8% in 2016. Rice and other agricultural crops accounted for 67.7%, whilst livestock, fishery and forestry account for 12.8%, 13.4% and 6.1% respectively.

In spite of the recent strong economic growth and rapid development, Lao PDR remains one of the poorest countries in the world. The government relies extensively on foreign aid to fund its budget and infrastructure development. In 2012, 33.9% of Laotians lived on less than 1.25 USD per day (World Bank, 2012) and about 11% of Lao PDR's 1,104,892 households live under the official poverty line¹. In recent years, agricultural and forestry production has gradually made significant contribution to the improvement of livelihood and poverty reduction of people in Lao PDR. However, adoption of improved production technologies not been well-spread among smallholder producers whilst majority of agricultural products have not been processed to generate added value. As a result, it generated less income. It was reported that current investment on agricultural processing and linking to higher end markets is limited. Ministry of Agriculture and Forestry (MAF) has realized the potential to add value locally before export and was highlighted in the Agricultural Development Strategy to 2025².

Undoubtedly, Lao PDR has made good progress on a number of Millennium Development Goals (MDGs), including halving poverty, reducing hunger, and improving education and health outcomes. However, some MDGs remain off-track, most crucially on nutrition, with an estimated 44% of under-five children (CU5) being stunted. Total fertility rates are high, with a high un-met demand for family planning. Lao PDR still has a high maternal mortality rate and limited skilled birth attendants and could also do more to place gender equality at the center of its national development plans (World Bank, 2018).

According to the National Nutrition Strategies to 2025 and Action Plan to 2020 (NNSAP), food intake in Lao PDR is largely based on rice (accounting for 67%) and lacks of variety and is inadequate in nutrients. Some households are also food insecure, further compounding low intakes of protein and micronutrients.

This undernutrition threatens lives and national socio-economic development and is associated with reduced school enrolment, poses a challenge to the attainment of education targets, and has an impact on development, which is set to lead to a future productivity deficit of more than 20%. Child malnutrition (including fetal malnutrition caused by maternal malnutrition) was the cause of 45% of global child deaths in 2011. The promotion of nutrition is therefore an urgent priority for development in the LPDR.

Based on UNICEF (2018)³, Government of Lao PDR (GoL) has realized this and re-stated during the forth national nutrition forum and national nutrition committee meeting that "Malnutrition is a social and development issue. Although the situation has improved, we need to keep on investing in nutrition because it will play a critical role to meet the criteria for graduating from least developed country status. Creating an enabling environment in which communities can produce and access nutritious food, supporting social and behavior change that promotes healthy practices, and creating a robust and effective nutrition information management system, are key elements for Laos to become a prosperous country with a healthy population". Data from 2015 shows an estimated 330,000 CU5 (36%) are chronically malnourished in Lao PDR.

According to the Lao Social Indicator Survey (LSIS-II, 2017), stunting has decreased from 44 per cent in LSIS-I to 33 per cent. Despite this positive downward trend, significant disparities remain across the 18 provinces. "Strengthening the multi-sectoral approach to combat all forms of malnutrition and nutrition information systems that generate evidence for policy dialogue and prioritized action are critical steps to improve the nutritional status of vulnerable populations".

¹ Based on: Results of poverty reduction for 2011-2013, Poverty Reduction Committee, Prime Minister Office.

² Based on: ADS, 2015. Agricultural Development Strategy to 2025 and Vision to 2030

³ Based on: UNICEF website, 2019. <https://www.unicef.org/laos>

Today, it has been synthesized that malnutrition is a social and development issue. Investing in nutrition will play a key role in achieving targets of the 8th National Social Economic Development Plan and is critical for meeting the stunting reduction criteria for graduating from least developed country status. At the same time, multi-sectoral coordination is required for an effective convergent approach and for scaling up nutrition interventions, for joint implementation of actions, for funds allocation, monitoring, evaluation and reporting (UNICEF, 2018). It is clear that malnutrition is a complex condition that can involve multiple, overlapping deficiencies or excess of nutrients. The causes of malnutrition are multiple, cutting across sectors (food, health, and care) and levels (individual, household, community, society). The figure below illustrates the causes of malnutrition in Laos.

To cope with the malnutrition issues, the National Nutrition Strategies (NNS) has clearly set out 4 strategic directions, 11 Strategic Objectives (SOs), and 29 interventions, of which 22 fall under Priority 1. This ten-year strategic implementation framework aimed at reducing maternal and child malnutrition rates while also improving the nutritional status and food security of the multiethnic people and attaining these strategic targets for 2025. Brief description of strategic framework for NNS is showed in the figure below.

Figure 1: Causes of malnutrition in the Lao PDR

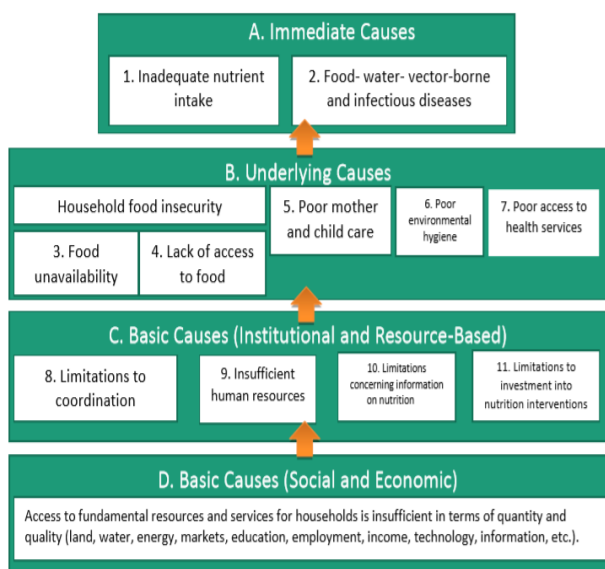
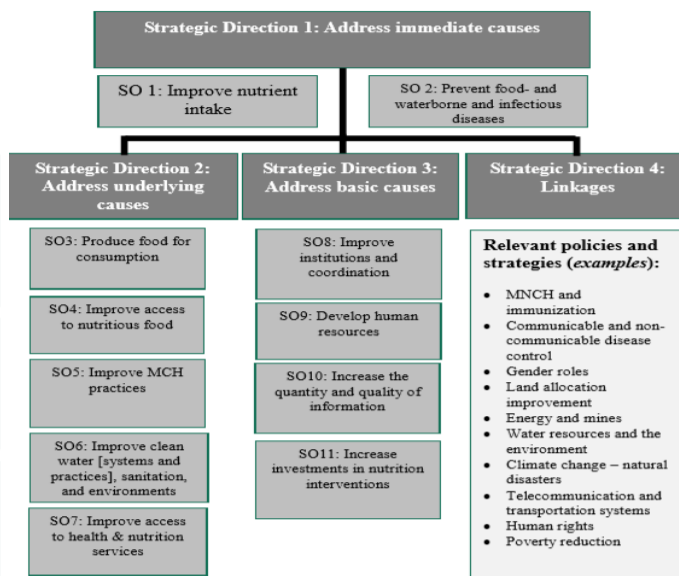


Figure 2: Strategic framework for national nutrition strategies



2.2 Nutrient Sensitive Value Chain Analysis

Nutrition Sensitive Agriculture (NSA)⁴ is a food-based approach to agricultural development that puts nutritionally rich foods, dietary diversity, and food fortification at the heart of overcoming malnutrition and micronutrient deficiencies. This approach stresses the multiple benefits derived from enjoying a variety of foods, recognizing the nutritional value of food for good nutrition, and the importance and social significance of the food and agricultural sector for supporting rural livelihoods. The overall objective of nutrition-sensitive agriculture is to make the global food system better equipped to produce good nutritional outcomes (FAO, 2014).

Nutrient Sensitive Value Chain (NSVC) is a food value chain consists of all the stakeholders who participate in the coordinated production and value-adding activities that are needed to make food products (FAO, 2014). It leverages opportunities to enhance supply and/or demand for nutritious food, as well as opportunities to add nutritional value (and/or minimize food and nutrient loss) at each step of the chain, thereby improving the availability, affordability, quality and acceptability of nutritious food.

Following figures indicate four basic steps to analyze the NSVC as well as its impact pathways through increase supply, increase demand and; therefore, add nutrition value to both producers and consumers and ultimately, change in nutritional status and food system

⁴ Based on: FAO, 2014. Second International Conference on Nutrition, 19-21 November 2014

Figure 3: Basic steps to analyze the NSCV⁵

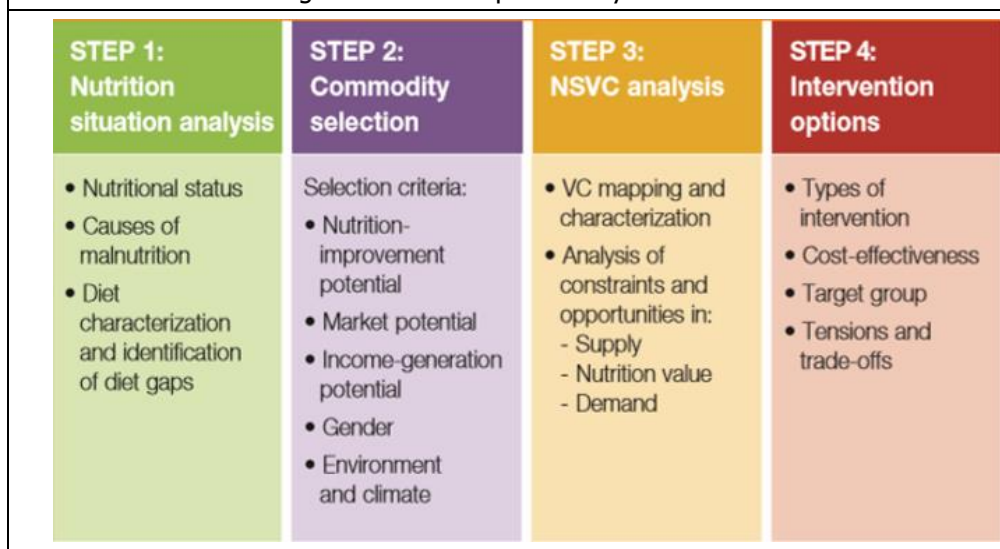
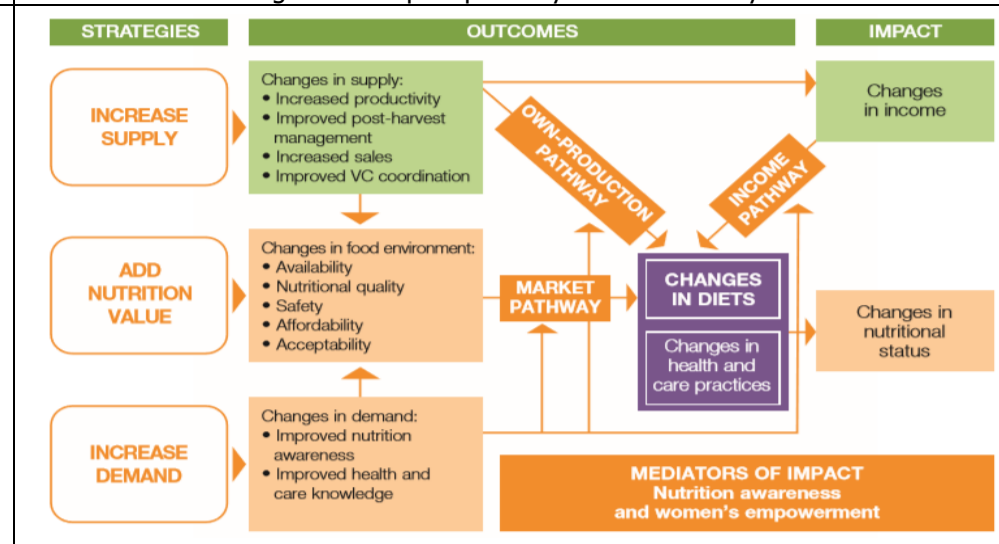


Figure 4: Impact pathways for NSVC analysis



This framework includes four steps:

Step 1. Nutrition situation analysis: to identify the nutrition problem of the target population, and particularly the gaps in the diets.

Step 2. Commodity selection: to identify the commodities that can address the nutrition problem, while also responding to market demand and ensuring income generation for smallholders.

Step 3. Nutrition-sensitive VC analysis: to identify the constraints in supply and demand of these commodities as they relate to the nutrition problem. This analysis differs from a standard VC analysis in that it specifically analyses dimensions that are relevant to nutrition, such as food safety, food loss, nutrition value or barriers to consumption from smallholders.

Step 4. Identification of intervention options: based on the constraints identified, a range of intervention options can be identified for the project to invest in.

Income pathway. The NSVC promotes changes in quantity and quality of production, post-harvest practices, access to markets or changes in VC coordination, with the goal of achieving an increase in sales and profits that will lead to increased income.

Own production pathway. The consumption of nutritious foods by producers out of their own production can be considered the most direct pathway to achieving changes in consumption. Specific actions to stimulate consumption, such as nutrition awareness and behaviour change campaigns, cooking classes or incentives to save a portion of the nutritious foods for household consumption, are needed to ensure that improvements in production lead to improvements in diets.

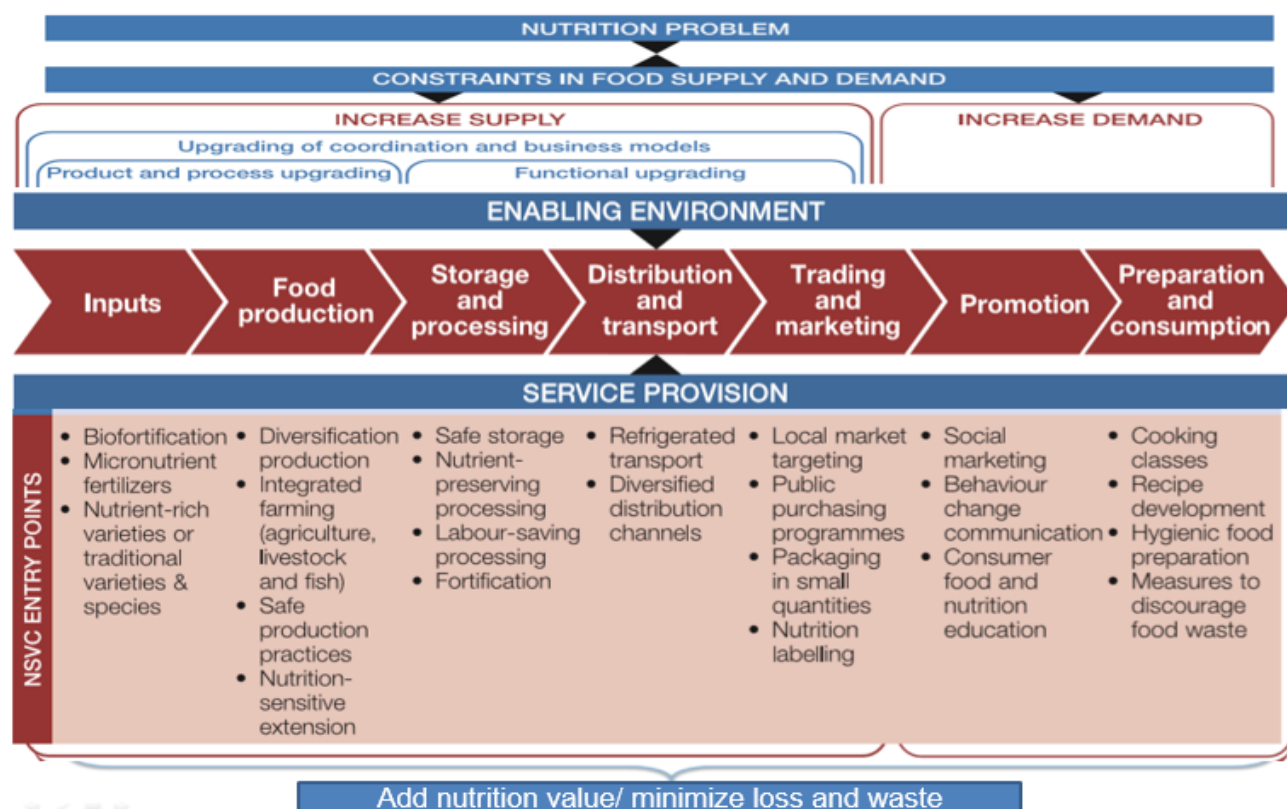
Market pathway. NSVC aims to improve availability, affordability and acceptability of foods in the market (including institutional and other new markets), which can translate into increased consumption both on farm and off farm.

⁵ Based on: IFAD, 2018: Nutrition-sensitive value chains from a smallholder perspective - A framework for project design

While, the NSVC framework is a practical approach to navigate the complexity of food systems and identify investment and policy opportunities to ensure that food value chains contribute to improved food security and nutrition. Opportunities to enhance nutrition outcomes arise at all stages of the value chain, from production to consumption. Adopting a NSVC approach allows for analyzing the roles and incentives of different actors along the chain, and to consider what may be the impact on cross cutting issues such as gender and climate change, as well as what policy and regulatory environment is conducive for VC to contribute to nutrition.

Strategies are often interconnected and interdependent. For example, demand may be constrained by low nutrition awareness (which would require actions to stimulate demand), by low purchasing power that compromises affordability of nutritious products (which could require intervening in the demand and/or supply side of the VC), or both. Therefore, a systemic perspective is needed, as well as a combination of strategies and actions that can take into account the dynamics of both market systems and food systems as a whole (IFAD, 2018).

Figure 5: Strategies and policies for NSVC development⁶



2.3 Brief Overview of AHAN project

Under pillar three of the European Union (EU)’s Partnership for Improved Nutrition in Lao PDR, the Accelerating Health Agriculture and Nutrition (AHAN) project was funded through EUR grant. The project aims to create supportive conditions for enhanced household (HH) through five Specific Objectives (SO) or Outcomes:

- SO1: Improved access to and availability of sufficient and/or diverse foods year round;
- SO2: Improved dietary and care practices among Women of Reproductive Age (WRA) (15-45 years) and CU5;
- SO3: Reduced incidence of selected Water, Sanitation and Hygiene (WASH) related diseases/illnesses linked to undernutrition;

⁶ Based on: IFAD, 2018. Nutrition-sensitive value chains from a smallholder perspective: A framework for project design

- SO4: Improved gender equitable relations at the household level, particularly in decision-making and distribution of workload; and
- SO5: Strengthened multi-sector coordination and support for nutrition.

The integrated multi-sectoral AHAN project, will be implemented by a consortium led by the World Vision and partners including Agronomes et Vétérinaires Sans Frontières (AVSF), Green Community Development Association (GCDA) and the Burnet Institute (BI). The project will target in 12 districts (10 villages each) across three central and southern provinces of Savannakhet (Phine, Sepone, Thapanthong, Phalanxay, Atsaphone and Xonabuly); Saravane (Saravane, Ta Oi, Toomlarn and Lao Ngarm); and Attapeu (Xaysetha and Samakkhixay).

The main objective of SO1 is to ensure the availability of a diversified food all year-round (quantitatively and qualitatively) among project beneficiaries. Activities proposed will intensify and diversify agriculture and livestock production, improve market access for the products, post-harvest crop management to decrease the losses (especially rice), and increase household awareness on the importance of diet diversification, especially for children and women of reproductive age.

To address these nutrition and food security gaps, the project's NSA component will promote the intensification and diversification of crops and livestock production, and will improve productivity and profitability of small-scale agriculture through the establishment of farmer's groups and better market linkages. Enhanced production will feature small animal and insect raising (such as native chickens, frogs and crickets, etc.), home gardening, and improved post-harvest losses of staple crops along with safe processing and storage. These will aim to ensure that households consume food that are adequate, nutritious, diverse, wholesome, acceptable, safe, and affordable.

NSVCs have been proved as an efficient way of maximizing the contribution of sustainable agriculture to improved nutrition. Although inclusive value chain interventions have historically focused on increasing economic returns, the project acknowledges that they also play an important role in shaping food systems as they influence both food supply and demand.

3. AHAN Project NSVCA Objectives, Methodologies and Constraints

3.1 AHAN Project NSVCA Objectives

The overall objective of the Nutrient Sensitive Value Chain Analysis (NSVCA) is to carry out a NSVC survey that could provide concrete evidence-based information to assist the AHAN project team in verifying and refining some activities under SO1. In particular, the NSVCA aims to shed light on increasing household production of more nutritious foods, which they can also consume, as well as, increasing their income through product expansion, market viability, value addition opportunities, quality improvement and input availability to smallholder producers.

Through applying the impact pathways of NSVC establishment and development, the resulting increase in income for households can then, be used to improve their diets through increased purchases of food and non-food items linked to nutrition. Finally, by leveraging the potential of markets for nutrition, NSVC can catalyze improvements in the overall food environment. Acting on demand and supply can contribute to increased availability, affordability, safety, nutritional quality and acceptability of foods in the marketplace. This pathway broadens the impact to the wider set of consumers that can benefit from a more nutritious food system.

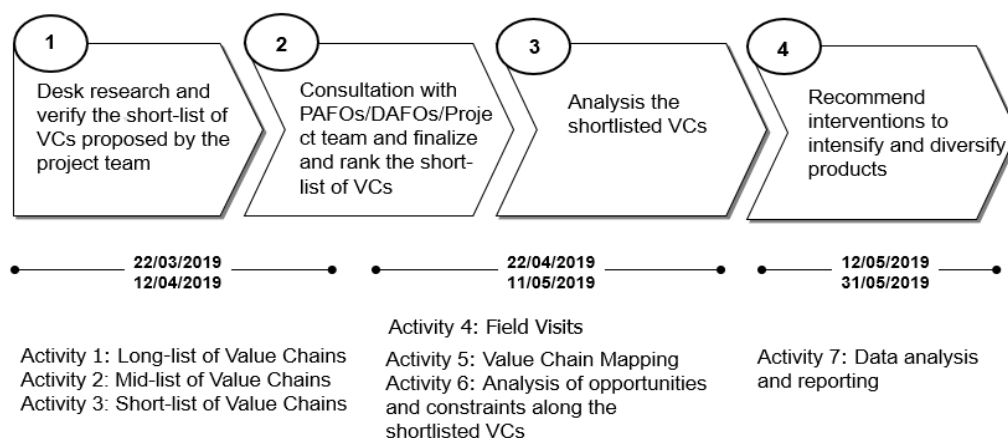
The specific objectives of the NSVCA are to:

- Identify primary and secondary crop options (including productive trees) that are suitable to the local context, are climate resilient and, have high nutrient as well as market value;
- Identify opportunities for value-addition which could be introduced through subsequent activities, such as improved post-harvest and storage;
- Analyze the potential opportunities and constraints along the value-chain for each of the selected crops and the project-identified livestock, with consideration to the product' commercial and nutrition impact to households and communities; and
- Recommend methods for enhancing production and (local) acceptability of the selected crops and livestock.

3.2 NSVCA Methodologies and Process

As stated in the previous chapter, the NSVCA has followed the international approaches and both qualitative and qualitative approaches were used to complete the following main steps and activities:

Figure 6: Time-frame for NSVCA



Activity 1: Long-list of Value Chains

Based on the recent respective Provincial Agriculture and Forestry Office (PAFO) and District Agriculture and Forestry Office (DAFO) annual reports, Provincial Socio-Economic Development Plans and the Provincial Agriculture Development Strategies of the 3 target provinces, a long-list of products were established by the AHAN project team. A list of food crops and livestock with commercial production potential within targeted

districts was highlighted. At the same time, the list has been added through the market observation in each district.

In targeted districts, the initial information collection includes products with category (staple food, pulse, vegetable, fruit, animal protein such as livestock, fish and insect), topography where products are grown or raised (upland, lowland) and Production type (locally-produced, imported, collected from forest). The long-list of products in respective provinces are in the annex.

Activity 2: Mid-list of Value Chains

Results of desk research and discussions with respective PAFOs and DAFOs show that some small animal raising is fitting well with the main objective of project SO1 particularly, to ensure the availability of a diversified food all year-round among project beneficiaries. These include native chicken, frogs and crickets which are mostly suitable for local nutrition improvement and income generation. They were then, directly selected as shortlisted NSVCA for project interventions.

On another hand, other main activities such as home gardening and improved post-harvest losses of staple crops along with safe processing and storage will be interventions of the project; therefore, too short NSVC and rice is not included in the analysis.

Based on the long-listed products, the mid-list of was decided based on the: Firstly, has potential to improve local nutrition; Secondly, availability and locally produced in most target districts in the province particularly, in the targeted districts and villages, and; Thirdly, has economic potential to increase income for local producers or groups and to develop the NSVC. During the field visit, the three top priorities were further discussed, validated and announced during meeting with PAFOs, DAFOs and Focus Group Discussion (FGD) in each visited village. Mid-list products in each province is showed in the annex.

Activity 3: Short-list of Value Chains

After the criteria for selection was finalized with the project team, the simplified mid-list with criteria were sent to each PAFOs, DAFOs and project technical team prior the field visit. During the ranking exercise each person individually fills in the scoring table and then, the team calculates the results by applying the respective weights. The criteria has taken into account the following elements (Details of selection criteria is annexed):

Nutritional improvement. The products selected should have potential to improve nutritional sufficiency and filling an identified dietary gap. They should also contribute to the dietary diversity and be available, and are familiar in target communities.

Income increase. Farmers should have knowledge and experience in the production with some improved technologies adapted. At the same time, they should have potential to increase income and profitability through production and processing. They should also have strong market demands and have potential to scale up and scale out.

Social and environmental impacts. The products selected should have potential to create employment with less workload, including women thru production, processing and trading. They should also have potential to be adopted and participated by marginalized groups, minority and poor in the target villages. At the same time, they should be environmentally acceptable with limited or no use of chemical inputs and increase resilience to climate change.

Institutional impact. The products selected should have favorable local policy support. They should also be sufficient local service providers and private sector linkages including: inputs, transportation, technical advisory and credit, etc.

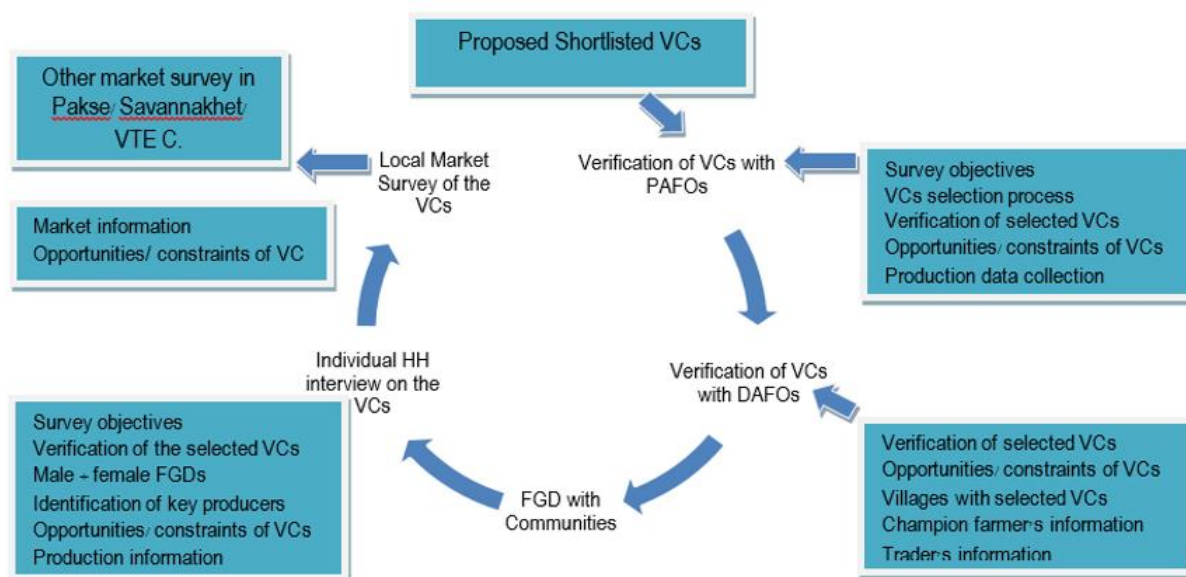
Activity 4: Field Visits

Field visits were conducted between 22nd April and 11th May, 2019 (Details of field survey agenda is in the annex). The field survey team includes a national value chain consultant, AHAN project technical staff and accompanied by PAFOs and DAFOs staff in each surveyed province and district and Savannakhet Provincial Health Office (PHO) for Savannakhet province.

The final process for product selection was decided with PAFOs based on: The team consolidated the score and weight. Non nutritious rich products were not prioritized. Potential for home garden with too short VC crops and post-harvesting for rice were not prioritized Products were categorized into 3 main group: Cereals,

Fruits and Vegetables. PAFOs and the team selected 3 prioritized crops. The team verified the shortlisted crops and livestock with DAFOs and villages.

Figure 7: Field survey process



A total of 49 individual households, 21 focus group discussion in 14 main villages of 7 targeted districts were participated in the discussion and interviews. In addition, 20 local collectors, traders, wholesaler and retailers who are based in surveyed villages, districts, Pakse and Savannakhet were also discussed. Some cross check on the production sites were also conducted by the team. Details of informants during the field survey is showed in the following table.

Table 1: Details of informants during the field survey

District	No. of Villages	Market Distance (km)	Poor HHs (%)	Main Ethnicity	Main cash Crops	HHs in FGD	HHs interviewed	No. of Traders interviewed
Samakexay	4	12	6.53	TaOy, Xuai	Vege. Bean, pumpkin	17 F/26	11	4
Saravan	3	13	14.50	Tatang, TaOy	Cassava, vege.	19 F/41	7	6
Laongam	4	10	8.13	Xuai	Cassava, coffee, corn	10 F/30	8	3
Ta-oy	3	27	30.61	Bru	Corn, vege.	10 F/33	6	2
Xepon	2	10	18.60	Tai, Makong	Banana, cassava, corn	01 F/21	6	1
Atsaphone	2	15	2.56	Bru, Tai	Corn, vege.	06 F/18	4	1
Xonboully	2	15	3.70	Lao Lum	Cron, vege.	29 F/35	7	2
	20	15	9.30			05 F/10	49	20

Activity 5: Value Chain Mapping and Profit Margin Analysis

By using the information gathered during the field visit as well as secondary research, the value chain linkages, mapping and trade flow for each of 3 selected crops and 3 small animal raising in 3 target provinces have been developed. Details of Cost-Benefit Analysis (CBA) with profit margin for each actor along the VCs were also analyzed.

Activity 6: Analysis of Opportunities and Constraints along the VCs

Existing opportunities and constraints along the value chain were analyzed based on the information provided by PAFOs, DAFOs, producers, traders and training centers, etc.. The recommendations for up-grading interventions activities with a special focus on intensifying and diversifying production by targeted villages and collectors or traders to better take advantage of opportunities arising in the selected value chains.

Activity 7: Data Analysis and Reporting

After the initial findings were presented and discussed, the team was focused on detailed data analysis and writing report.

3.3 Main Constraints

Available Data – PAFOs and DAFOs have provided some production information and data; however, some disaggregated figures on smallholder production and big scale commercial plantation was unclear particularly, on corn and banana production. Official data on poultry is not clearly disaggregated native chickens from others. In addition, PAFOs and DAFOs have very limited information on frogs and crickets production, as well as, on moringa. Moreover, information on moringa production and trading is so limited as it is considered new in the surveyed areas.

Due to Time Constraints - only seven districts in three provinces were visited for field verification. At the same time, field survey was conducted during off-season for many products such as frogs, corn and pumpkin; therefore, information from related producers and traders has been a constraint. Moreover, many high-end traders (e.g. Dao Group, Paksong Phathana Company) who required long process for making appointment, are based outside of the targeted provinces.

Field Survey Approach - NSVC is entirely new to PAFOs and DAFOs particularly, those who participated in the survey and information provided was somehow, unclear. On another hand, quantitative information collected was based on the limited number of interviewed producers and traders; therefore, it is more indicative rather than high scientific accuracy.

3.4 Key Assumptions

When official figure on production and trading of selected products is not available, quantitative information was based on information provided by PAFOs, DAFOs, producers and traders with anecdotal evidences. At villages, production figures are based on the information provided by FGDs with cross checked with individual HHs interviewed.

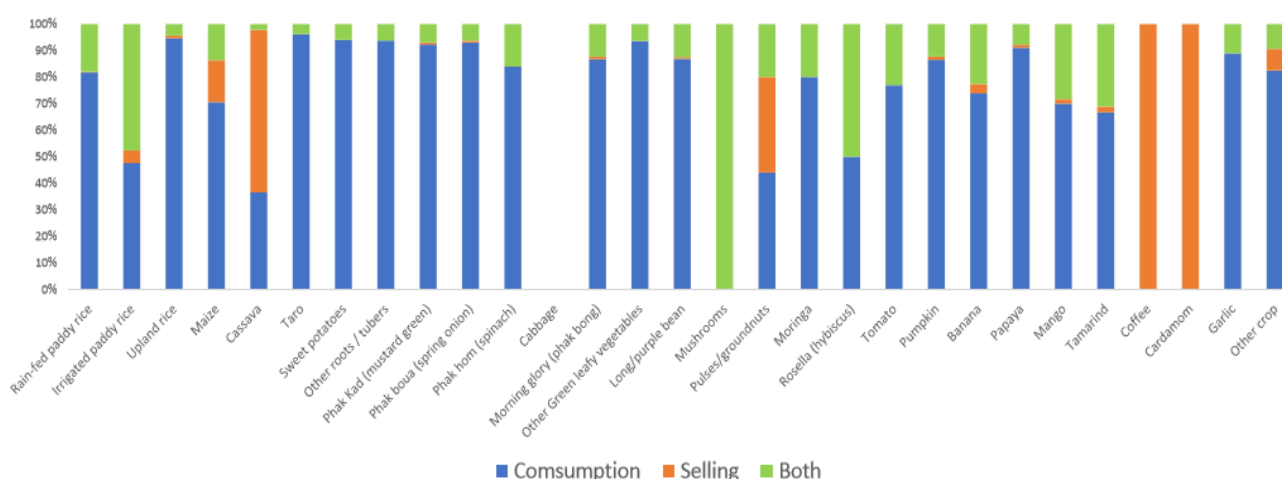
Despite of the poultry data provided by MAF, PAFOs and DAFOs, it was estimated that number of native chickens is about 75% of the total poultry number. Raised frog production is based on the number of metamorphs supplied in each provinces in most cases, with about 20% of mortality. When doing the cost benefit analysis, several assumptions have been made including: 50% of mortality for chickens whilst 8% for improved production technique.

4. Shortlisted Value Chains in Targeted Provinces

4.1 Crops and Income Sources in Targeted Provinces

Results of the FGDs during field survey show that paddy rice and upland rice cultivation are the main crop planted during rainy season in most surveyed villages. While most of the rice produced is for home-consumed, few households sell rice in the last twelve months. Other cash crops planted during the rainy seasons are cassava, banana, corn, coffee and vegetable, etc.. Where water sources are available, vegetable such as long bean, pumpkin, morning glory and cucumber are also cultivated. Some farmers started cultivating mushroom for local and district markets. Results of the filed survey were in line with results of the baseline presented in the figure below.

Figure 8: Crops cultivated and purposes in targeted provinces



Source: AHAN Project, 2019: Draft of baseline survey results

Results of the baseline survey also indicate that livestock sale, bush product sale, skilled wage labor and crop product sale are the main sources of income accounting for 21.6%, 20.1%, 16.3% and 16.2% respectively. Similarly, the results of the NSVCA also show that income from crops, livestock and skilled labor are the main sources accounting for about 30.0%, 22.6% and 20.1% respectively. The figure below presents main income sources of interviewed households in 14 villages. Income from crops comes highest is likely due to: Firstly, the sampling randomization as the NSVCA was trying to interview farmers who have more cropping farming; and Secondly, income from small animals including chicken is considered minimal compared to income from large ruminants which was not NSVCA's focus.

Figure 9: Income sources of the 14 surveyed villages (%)

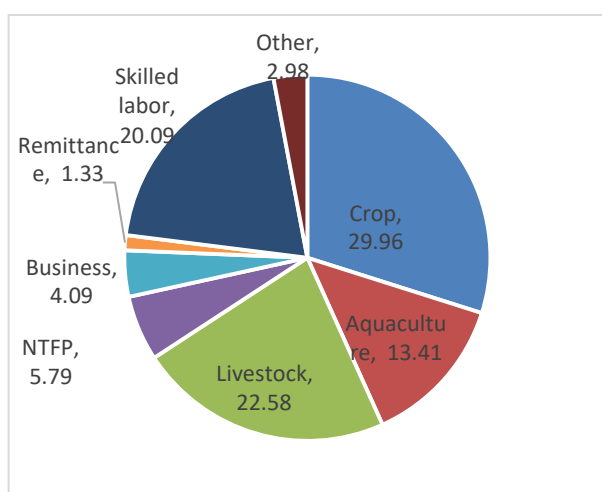


Table 2: List of preliminary and secondary products

No.:	Attapue-	Saravan-	Savannakhet-
1-	Corn-	Chili-	Chili-
2-	Pumpkin-	Banana-	Banana-
3-	Banana-	Pumpkin-	Corn-
4-	Cassava-	Cassava-	Cassava-
5-	Tamarin-	Peanut-	Peanut-
6-	Sweet potato-	Corn-	Long bean-
7-	Soybean-	Soybean-	Mango-
8-	Peanut-	Moringa-	Eggplant-
9-	Spinach-	Tamarin-	Sweet potato-
10-	Long bean-	Papaya-	Pineapple-
11-	Mango-	Sweet potato-	Water melon-
12-	Sesame-	Morning glory-	Lemon-
13-	Morning glory-	Long bean-	Moringa-
14-	Taro-	Tomato-	Spinach-
15-	Cabbage-	Cabbage-	Orange-

Source: AHAN NSVCA field survey, 2019

Based on the mid-list of fifteen products, three most prioritized have been finalized by the team and verified by PAFOs for detailed value chain analysis. The list is showed in the table above that banana and corn were selected for all three provinces whilst moringa was selected by Savannakhet and Saravan provinces, and pumpkin was selected as a third crop in Attapeu province.

4.2 Shortlisted Livestock Production in Targeted Province

Native Chickens

For rural smallholders, raising livestock is an important source of cash income, a means to accumulate assets, and a provider of inputs to crop production. Cattle, buffaloes, pigs, goats and poultry are the most important livestock species in Laos. Improving productivity of village poultry flocks will greatly enhance income and diet of resource poor farmers⁷. In rural areas, smallholders keep native chickens rather than hybrid breeds due to their unique combination of adaptive traits that enables them to better cope with the local environment in which they have evolved. They have acquired important characteristics such as increased disease resilience, heat and cold tolerance and the ability to utilize poor quality feeds through scavenging. These are all attributes essential for achieving sustainable production in "low input - low output" production systems⁸.

Native chickens in Laos are categorized under *Gallus gallus domesticus*. Different villages and households raise different species. Chickens are almost universally raised with farmers recognizing five different types of native or local or indigenous chickens: Kai Ou, Kai Dookdum, Kai Hornchou, Kai Yolk and Kai Chae. Some of these native breeds are small, reproduce easily, can scavenging for locally available natural food, and require limited investment. They thrive on kitchen waste, broken grains, earthworms, snails, insects and vegetation, etc.

Normally, four production systems are reported: free scavenging, semi-free scavenging, semi-intensive and intensive. Because of such low-inputs, low-outputs production system, high mortality rate occurs during early and late rainy season. In some villages, the epidemics mortality causes up to 100% death. In addition, poor farm-managing and feeding results is slow growth that double or more raising period compared to the semi- and intensive production systems.

In targeted provinces, native chicken are raised by farmers to meet many different needs. In remote areas, native chickens are raised for self-subsistence on special occasions with more often, sell when bypass traders, visitors and other household's needs with an estimation of about 70% chickens sold. Chicken meat and eggs are consumed at home in quantities that highly correlates with the number of birds owned and the wealth status of the family. Chicken eggs are rarely consumed by farming families or sell as they put a higher priority on hatching eggs to get more birds. Native chickens are sold to meet immediate needs of the family for cash, food products, clothes, school items and medicines. The native chickens are essential components of several ceremonies and are considered the most important types of poultry. Native chickens are offered to relatives and esteemed visitors and so contribute to the social capital of the family.

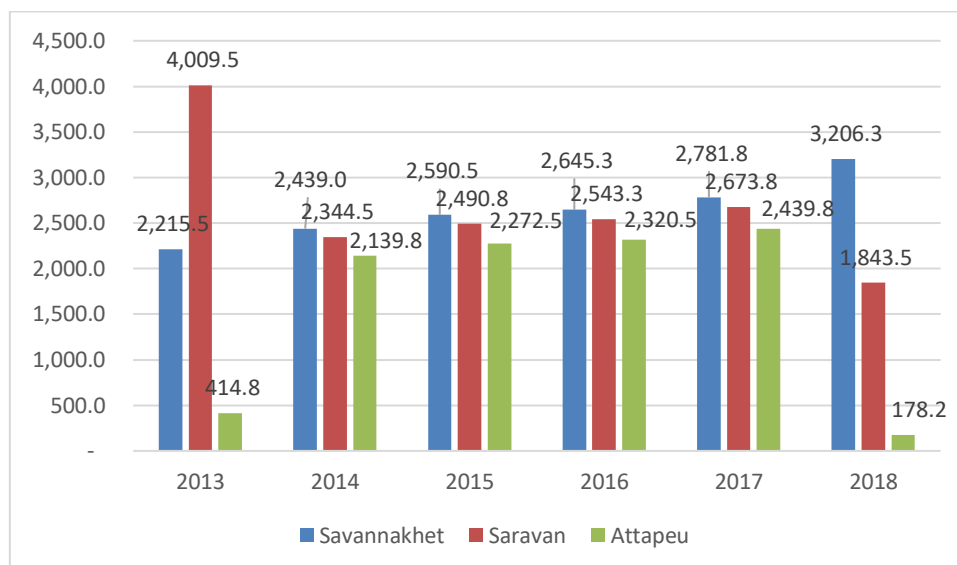
Based on an estimation that native chickens are about 75% of the poultry population as officially reported by MAF, PAFOs and DAFOs, the indicated numbers of native chickens in three targeted provinces in the last six years is presented in the figure below. It could be observed from the figure that number of chickens in Savannakhet province has been increased gradually from about 2.22 million birds in 2013 to about 3.21 million birds in 2018 (about 8.94% annually increased). However, during the same period, the chicken number has decreased in both Savavan and Attapeu provinces with about 10.8% and 11.4% decreased per annum respectively.

In 2018, based on PAFOs annual reports, Savannakhet province demanded about 967.1 MT of chicken meat whilst supply was 1,373.3 MT with a surplus of over 406.2 MT. It was also reported that the province needs chicken meat of about 3.71 kg/person/year. In Saravan province, a total of 1,843,513 native chickens were locally consumed with about 92,378 bird sold whilst a total of 121.7 MT of native chicken was locally consumed in Attapeu province.

⁷ Based on: DLF, 2003. A manual on improved rural poultry production

⁸ Based on: Bett .R.C., and all., 2014. Native chicken production in the South and Southeast Asia. International Livestock Research Institute (ILRI), P. O. Box 30709-00100, Nairobi, Kenya.

Figure 10: Native chicken population in targeted provinces (,000 birds)



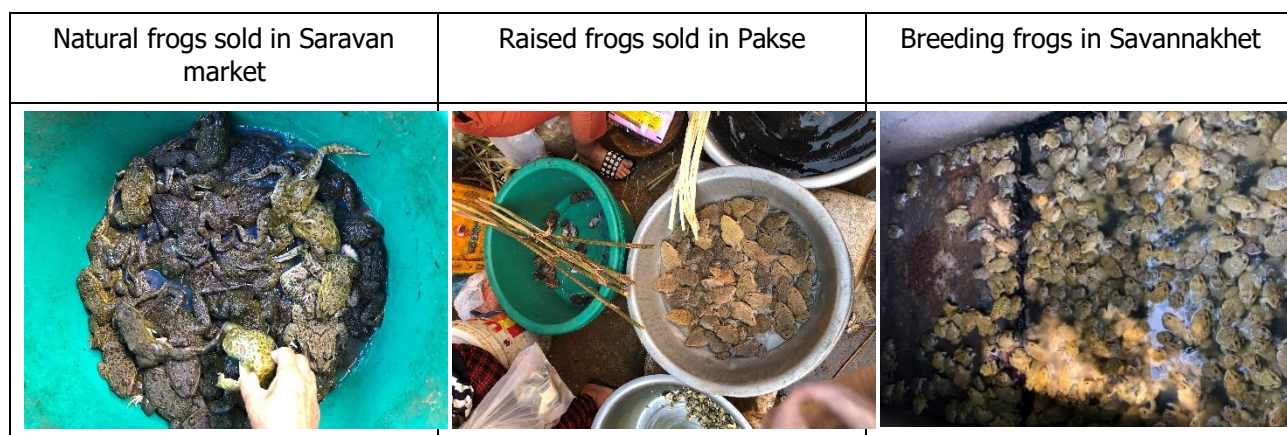
Source: PAFOs Annual Report, 2019 and AHAN NSVCA field survey, 2019

Raised Frogs

Natural frog consumption among local communities in Lao PDR particularly, in targeted provinces is widespread, and many farmers still depend on collecting frogs to either supplement their limited meat (protein) intake or generate additional income. However, the situation remains poorly documented due to a lack of research and less concerned in the subject. The lack of reliable data on this subject from local related offices is clearly a concern. An anecdotal reference shows that there are more than ten frog species in Lao PDR; however, four main species (*Rugulose frog-Hoplobatrachus rugulosus*, *Paddy frog-Fejervarya limnocharis*, *Asian bullfrog-Kaloula pulchra*, *Rana lateralis*) reportedly harvested on a regular basis for local consumption and trade.

During the field survey, farmers reported that nowadays, they are able to collect fewer natural frogs mainly, only in early and late rainy seasons with a total of about 2-5 kg/HH/year. Given that amount of natural frogs is reducing, frog raising has been increasingly popular in big cities and is emerging in smaller districts. Two main frog species raised are paddy frogs and cross-bred frogs. Because of official frog production data is not available, the survey tries to estimate the raised frog production through number of metamorphs supplied in each province.

In 2018, in Savannakhet province, It was estimated that over 100,000 metamorphs were supplied whilst over 75,000 metamorphs were supplied in Saravan province. During the same year, Attapeu PAFO reported that there are about 27 kg of breeding frogs in the province with a potential production of about 35,000 metamorphs with another 15,000 metamorphs imported from other provinces. Based on the estimation it could be projected that the annual raised frog production in Savannakhet, Saravan and Attapeu is about 13 MT, 10 MT and 6.5 MT respectively.



Raised Crickets

Similarly to the natural frog production, the natural cricket collection is declining. Most natural crickets are collected mainly prior to and during early rainy. Results of the FGDs showed that farmers are able to collect about 1-5 kg/HH/year with an estimation of local consumption of about 1-3 kg/HH/year. Some collected crickets are sold in wet markets with about 75-100,000 kip/kg. The price is about 2-2.5 times higher than the raised crickets.

Three main raised cricket species reported are: Thongkhao, Thonglai and Thongdeng. Different markets needs different species, for example, restaurants may demand more Thongkhao as it is smaller size while individual consumers may need Thongdeng which is bigger size. Currently, in targeted provinces, the main cricket producers are government or project related staff or agriculture college students who are more accessible to production techniques, inputs (cricket eggs, materials and feeds), markets, and information. The cricket producers also supply cricket eggs as another source of income from raising crickets. Normally, crickets can lay 1-2 times more than initial eggs raised after 45-50 days raising.

The field survey also observed that there are less than 5 producers in small districts and more than 10 producers in big capital cities with production of about 30-2,500 kg/producer/year. An estimation of about 20% crickets produced by smallholders is for home consumption. More than 7 MT of crickets is imported to meet market demands in Savannakhet.



4.3 Shortlisted Crop Production in Targeted Province

Table 3: Basic nutrient sensitive characteristics of selected crops

Product	Food products	Energy	Protein	Minerals	Vitamins	Dietary diversity	Local availability & familiarity	Processing potential	Farmer interest
Corn	Corn Baby corn	Low	Low	Low High	B1, B2, NIA, C C	Yes	Very high Low	Flour, Milk No	High
Banana	Banana Stem Flower	High	Very low	High	CARTB, A, C	Yes	Very high	Juiced, mashed	High
Pumpkin	Pumpkin Young leaf Flower Seed	Fair Low Very high	Low Low High	Fair High Very high	CARTB, A, C CARTB, A, C CARTB, A	Yes	Very high	Juiced	High
Moringa	Young leaf Flower Fruit Seeds	- - - -	High - Low -	Very high - Very high -	CARTB, A, C, E - CARTB, A, C C, E	Yes	Low	Tea - - Tea	High

Source: The Concise ASEAN Food Composition Table; AHAN NSVCA, 2019

As above-mentioned, sweet corn, local banana, pumpkin and moringa were selected. Based on the Concise ASEAN Food Composition Table (CAFCT), the selected crops have rather high main nutrient, minerals and vitamins. They also have potential to contribute to dietary diversification and value addition through processing. All corn, banana and pumpkin are locally available and farmers have high familiarity with both production and consumption. Although moringa is new to some villages, it is commonly found in most of the

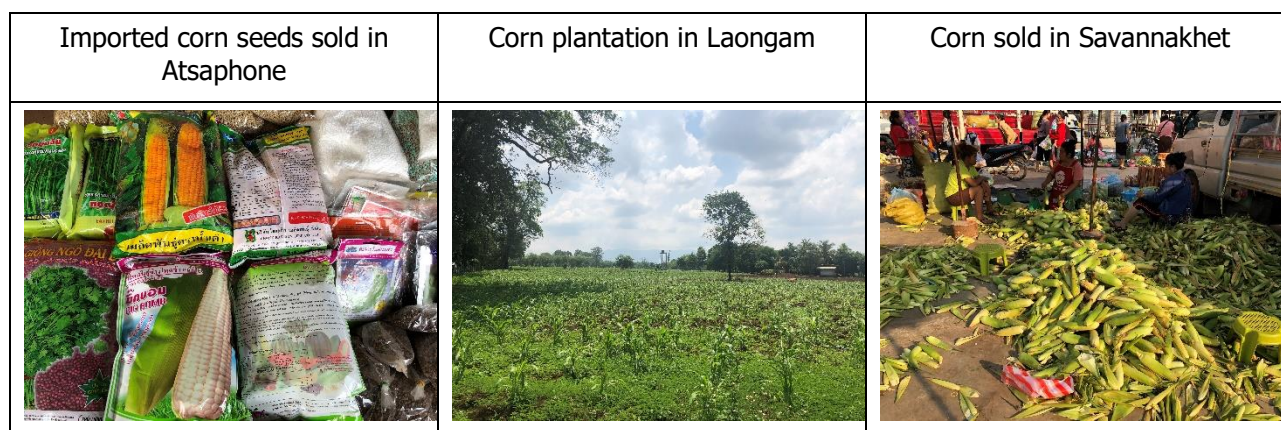
surveyed villages and the majority of farmers discussed had consumed it. Details of basic information about the selected crops are described in the table below.

Sweet Corn

Based on the field survey, three main sweet corn varieties were observed with mostly produced during rainy season. Some villages with good water resource, corn is also produced in dry season for higher price and more local market demands. In mostly cases, corn seeds are from self-heritage. Some imported hybrid corn seeds (which are not reproduced) from Vietnam and Thailand were also observed.

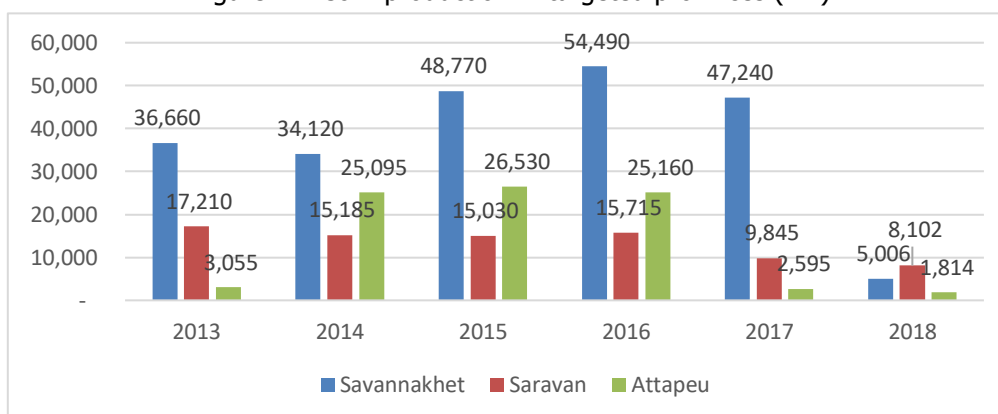
In rainy season, the majority of corn farmers intercrop corn with other crops such as upland rice, chili, pumpkin, eggplant, etc. in home gardens or upland rice areas, mostly for home consumption prior to the upland rice harvesting period. Some famers in surveyed villages buy corn for home consumption from other villagers or from markets during dry season. In some lowland areas, corn is intercropped with cassava. However, yield reported by farmers is considerably low with only about 2.5 MT/ha compared to about 10 MT/ha from official report. Low yield is limely due to poor land preparation, high spacing, low pollination, low quality variety and low inputs.

Consumption of baby corn is not common particularly, in remote villages. When planting, most farmers interviewed put 3-4 seeds rather than 1 resulting in a lot of baby corn produced; however, no awareness on baby corn consumption, farmers just throw them or feed to their livestock. In capital districts such as Pakse and Savannakhet, some baby corns are imported and sold in about five stands with market price of 12-15,000 kip/kg. Corn price is low during rainy season of about 2-3,000 kip/kg but higher demand and price in dry season of about 3-5,000 kip/kg.



In 2018, production of corn has decreased in all three provinces mainly, due to higher price of cassava resulting in the replacement of cassava plantation in corn cultivating areas. This cassava cultivating trend has strongly occurred not only on corn area but also affecting all other crops such as banana and coffee, etc. The figure above also indicates the corn production in three targeted provinces in the last six years has decreased by 86.3%, 52.9% and 40.6% for Savannakhet, Saravan and Attapeu provinces respectively.

Figure 11: Corn production in targeted provinces (MT)



Source: PAFOs Annual Report, 2019

Local Banana

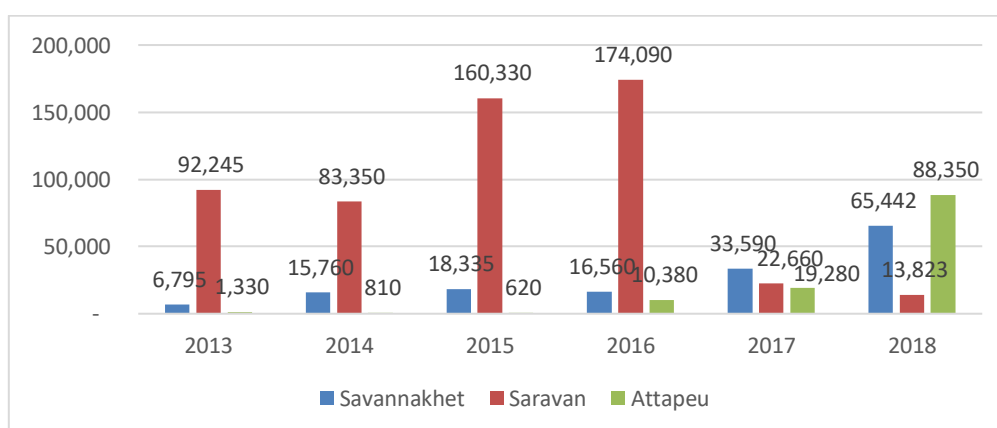
Banana cultivation and consumption is very localized activity in targeted provinces. Almost HHs in the surveyed villages have cultivated banana in forms of home garden or commercial plantation ranging from few plants to several hectare with an average area of about 0.8 ha/HH. However, due to traditional production system as organic by default, the yield is considerably low of about 4 MT/ha. The yield is very much lower (~10-20%) than intensive production system. Lower yield is mainly due to limited improved production technologies such as poor land preparation, limited soil improvement, lack of irrigation, no proper plant renovation, etc. It is also reported that banana diseases such as *Banana Fusarium Wilt* and leaf spot disease has seriously occurred particularly, in Laongam whilst farmers do not know how to control it.

In some high production areas e.g. Laongam and Xepon, banana is locally over-supplied in rainy season; however, export market linkages with Thailand and Vietnam have been well established. It was reported that banana produced Champasack including from Laongam is exported to Thailand at about 7,600 MT in 2018 whilst about 95% of banana produced in Xepon is exported to Vietnam every year. During rainy season, farm-gate price is as low as 500-1,000 kip/kg compared to about 1,200-2,000 kip/kg in dry season. In some area, development projects have been supporting the production and marketing, and some lessons learnt could be capitalized (list of supporting projects is showed in the following charter).



In Saravan province, the banana production was peak in 2016 but started declining in 2017. The banana production reached 174,090 MT in 2016 and reduced to 13,823 MT in 2018 with about 92.1% decreased. On contrast, banana production in Savannakhet province has increased from 6,795 MT in 2013 to 65,442 MT in 2018 with about 863.1% increased in the past five years. The incensement is likely resulting from big banana plantation in Nong and Atsaphone districts. Banana production in Attapeu province also showed negative trend reducing from 26,530 MT in 2015 to 1,814 MT in 2018. Details of banana production in three targeted provinces are described in the figure bellow.

Figure 12: Banana production in targeted provinces (MT)



Source: PAFOs Annual Report, 2019

Pumpkin Production in Attapue Province

As mentioned, pumpkin production and consumption is very common in most surveyed villages. Pumpkin is cooked as food and dessert. Most farmers also consume its young leaf and bud for food. In some villages, more than 50% of HHs cultivate pumpkin in rainy season whilst less than 5% of farmers do in dry season. Only HHs who have access to water source also cultivate pumpkin in off-season. With about 225 MT per year locally produced, it was estimated that only around 20% of local market demands met in Samakixay and Xaysetha markets. Based on the field survey, most farming HHs cultivate pumpkin for home consumption during rainy season but more (about 70%) for sell during dry season. Smallholder farmers sell their pumpkin inside their villages as well as to spot traders along the main road.

In Samakixay and Xaysetha markets, about 5-10 pumpkin stands were observed. Production is high the rainy season with farm-gate price of about 1,500-2,000 kip/kg and about 2,500-3,000 kip/kg in dry season. Market price is about 5,000 kip/kg for Vietnamese pumpkin and 5-8,000 kip/kg for local produced pumpkin. It was estimated that about 300-500 kg of pumpkin is demanded daily. While all farmers interviewed heritage their own seeds. High quality variety and seeds with about 50 MT/ha are available in Thailand (Yak-Giant pumpkin, Pakaithong, etc.).

Based on Attapue PAFO annual report, in rainy season 2018, a total of 35 ha of harvested area with a total production of about 225 MT of pumpkin is produced in the province, of which, 104 MT and 19 MT was produced in Xaysetha and Samakixay respectively.

Different kinds of pumpkin products	Local pumpkin sold in Samakixay	Vietnamese pumpkin sold in Samakixay
		

Moringa Oleifera

Moringa Oleifera (Drumstick) is originated in South Asia with 14 species identified, mostly found in tropical and sub-tropical areas. Laos has the most common variety and is found in almost villages surveyed. With less than 10% of surveyed HHs have access to it, farmers have very minimal production and consumption knowledge about it particularly, on its consumption benefits.

A four-ha moringa plantation in Laongam	Moringa fresh young leaf sold in Savannakhet	Moringa seeds sold in Savannakhet
		

In Laongam, one big moringa plantation farm with about 4 ha was investigated but no operation in the past 12 months resulting from their internal issues. Some high-end Lao and imported products (moringa tea) is emerging in domestic markets (mostly, imported from Vietnam and Thailand). Based on the social media, currently, there is high demand for moringa seeds in Thailand with price 200 Bath/kg.

Some development projects (IFAD/ FNML, PRF) started promoting moringa cultivation in Savannakhet, Saravan and Attapue provinces; however, adaptation is very minimal mainly, resulting from limited understanding on its benefits.

In Savannakhet, one vegetable stands with fresh moringa was observed in wet market with about 10 kg/day sold at about 8-10,000 kip/kg. Moringa seeds are also sold during the weekend at 30-35,000 kip/kg. Moringa is very new to some ethnic villages (e.g. Makong) whilst farmers in other villages showed their interest in it.

5. Value Chain Structure – Main Facilitators

5.1 Agricultural Input Suppliers

Currently, the agricultural inputs such as simple agricultural tools, industrial feeds, materials for establishment farms, etc. are locally available in most targeted districts of three provinces. Industrial feed from Thailand is commonly available in most of the districts. Wholesale price of industrial feed is a bit different from city to city ranging from about 140,000 to 180,000 kip/bag of 30 kg; however, retail price might go up to 180,000-210,000 kip/kg in some districts. Access to high protein industrial concentrate feed imported from Thailand is also difficult in some small towns of Ta-oy, etc.

Currently, there is no commercial native chick producers in most targeted districts. To commercially raise native chickens, a clear strategy to access to native chicks must be prepared as targeted and selected farmers might not have chicks or if they do, chick size and breeds might be different which is likely to monitor and support. To reduce cost of feed, some farmers also feed native chickens with locally available grains such as paddy rice, maize and broken rice. As mentioned above, other feed source prices are also very similar, which is about 2,500-3,000 kip/kg for paddy rice, 4,000-5,000 kip/kg for broken rice, 3,000 kip/kg for milled maize.

However, if farmers to start moving from traditional and scavenging practices to semi- and improved-system, the transition requires more improved inputs such as forage seeds for growing of feeds, healthy breed stock, vaccines for different diseases, etc. rather than simple materials and other inputs. In addition, access to metamorphs, cricket eggs, free-disease with high quality banana seedling, high yield pumpkin seeds, as well as, moringa seeds is likely to be a constraint for smallholder producers as most of them are not locally available particularly, in small districts.

5.2 Technical Extension and Advisory Services

Because of the high potential for improvement, some development projects have been supporting native chicken production and marketing in targeted provinces. Many extension workers and Village Veterinary Services (VVS) have been trained with improved native chicken production technologies. However, many none farmer groups have been reported in most of surveyed districts. However, as farmers move forward to more intensive and market oriented production systems, farmers require more advices on more complicated issues such as animal nutrition, diet formulation, disease and bio-security, market information, etc. Assisting farmers to transform their traditional native chicken production system to market-oriented production requires high quality of extension support by DAFO⁹.

Given that frog and cricket raising is new to many targeted villages, a comprehensive improved production technology package will be crucial. Some development projects have provided a 20-page extension material which is observed to be too excessive. Different kinds of simple extension materials with visual aid would work more efficiently particularly, with ethnic and vulnerable groups. At the same time, it has been proven by some projects that only closer monitoring and supports from project and extension workers, the adaption and adoption of improved technologies would happen. In addition, facilitation and better linkage to private sector for quality inputs and service supply, market and price ensuring and will as enabling environment for local and domestic markets, as well as contract farming, etc. are needed from extension.

5.3 Credit, Market Information and Other Service Providers

Currently, lessons learnt from many projects revealed that many livelihood improvement activities are seriously depended on project's financial supports and ceased when project phased out. Private sector service providers as well as, strategies for ensuring sustainability of improved technology extension support for livelihood development beyond the end of individual projects have not been well developed. In some target districts they have micro-credit which implementing by Lao Women Union (LWU) and other Village Development Fund

⁹ IFAD, 2014. Lessons learnt from the Northern Livestock Development Project (LDP) and Assessment of Livestock Value Chains in northern Lao PDR.

(VDF); however, efficient linkages to smallholders producers for commercial and nutritional improvement have not been observed.

On another hand, despite of the high market demand, market information and credit accessibility have to be improved. Observation during field survey shows that although some active producers are accessible to stake banks, sufficient collateral is needed which hindering smallholder farmers accessing to micro-credit. Some farmers do not have idea for commercial production and being afraid of in-debt is another common reason. While many producers put themselves into a very risky production of monocrops such as cassava, market information for both selected products and highly risky ones should be shared. Where possible, market information sharing platform through simple social media would also be useful.

Other service provisions such as maize milling for processing chicken feed, processing equipment for corn, banana, pumpkin and moringa is not locally available in small districts. To develop these NSVC based on nutritional improvement, a clear activity plan with supporting scheme should be strategized.

Last but not the least, village market place for high production livestock and crops was limitedly observed. In some villages, chicken, corn, banana and pumpkin have been produced over-self-sufficiency but, producers rely on selling within the village or waiting for spot traders without accumulating place. Project's intention to support the improvement of markets is highly relevant but more strategic planning is needed.

5.4 Government and Development Projects

Recently, in targeted provinces and districts, some livelihood and rural development projects include small livestock and crops as one component in agricultural development have been operating. Brief information about is summarized in the table below.

Table 4: Brief information of the project working in the targeted districts and provinces

Projects	Period	Main activities	Areas
Climate Change Adaptation along Rivers	On-goring	Training on vaccination of Newcastle disease	Xonbouly, etc. in Savannakhet provine
IFAD/FNML project	2013-2019	Food and nutrition security and pro-poor market access	Samoi, Ta-oy
International Labor Organization	2019-2021	Native chicken, cassava,	Sepon, Atsaphone
JICA	2019-2024	Promotion of mushroom, greenhouse for vegetables production	Sonbouly
Poverty Reduction Fund	On-going	Fish, frog, chicken, vegetable, moringa	Savannakhet, Saravan provinces
World Education - Rural Livelihood Improvement Project (RLP)	2015-2017		
VFI – Green Learning Center	On-going	Chicken, vegetable, fruit tree's production and processing and marketing	Laongam
World Bank – Mekong Integrated Water Resources Management – Component 3.2 Fisheries Management	3/2017-8/2017	Fish fingerings and metamorphs supply	Saravan, Attapue provinces
Sustainable Land and Forest Management in Highlands in Southern Laos	On-going	Training on feed processing, vaccination and proper chicken penning	Savannakhet province

6. Livestock Value Chains in Targeted Provinces

6.1 Native Chicken Value Chain Analysis

Native Chicken Producers

In all of the surveyed villages, native chickens are raised by most of households. Size of bird folk ranges from several birds to more than 100 birds/HH. Currently, almost farmers in targeted districts raise native chickens in traditional and very extensive scavenging production system. Both men and women are involved in native chicken raising without clear labor division. Many farmers do not have pen for their chickens. Others with simple pens, normally made from locally available material such as bamboo stick, hay or zin roof, etc. On average, farmers spend about 250,000 kip/pen with a total investment cost of about 360,000 kip/HH. Limited number of farmers interviewed buy chicks, industrial feed, rice bran, broken rice and medicine for their chickens with about 930,000 kip/HH/year as available cost on average.

The table below tries to compare the current scavenging system practiced by farmers with improved semi-intensive production system. In improved system, It is necessary to have industrial feed for chicks during the first 4 weeks whilst supplementing feed sources such as broken rice, paddy rice and rice bran, etc. Could be consequently added. Some areas where maize is cultivated and maize mill is available, chicken farmers could mix milled maize with rice bran as a main feed source. Normally, it requires about 5 kg of feed for 1 kg of its live weight¹⁰. To get 0.8-1.2 kg of live weight, instead of raising for 3-4 months, currently, farmers spend at least 5-6 months. With farm-gate price of 30,000 kip/kg, it is more profitable for improved, semi-intensive system.

Table 5: Cost-benefit of current scavenging and improved systems for chicken raising (per year)

Current scavenging system	Improved, semi-intensive system
<u>Outputs:</u> 287 USD (2 cycles/year with 83 chicks x mortality (50%) x average weight of 1 kg for 6 months.	<u>Outputs:</u> 952 USD + 103 USD = 1,055 USD (3 cycles/year with 100 chicks x mortality (8%) x average weight of 1 kg for 4 months. Around 1.2 MT/year of chicken dung).
<u>Inputs:</u> 42 USD (investment cost) + 107 USD (variable cost) + 103 USD (labor cost) = 252 USD/year	<u>Inputs:</u> 142 USD (investment cost) + 507 USD (variable cost) + 109 USD (labor cost) = 763 USD/year
<u>Profit:</u> 35 USD/year	<u>Profit:</u> 1,055 USD – 763 USD = 292 USD/year
<u>Profit margin:</u> 13.9%	<u>Profit margin:</u> 38.2%
<u>Return on Labor:</u> 6.9 USD/day (total of 20 days)	<u>Return on Labor:</u> 26.1 USD/day (total of 21 days)

In remote areas, farm-gate price for native chicken is mostly calculated by bird not by weight. In nearby town areas, farm-gate price is about 25-35,000 kip/kg depending on distances, price negotiating power and marketing seasons. Price goes down to 20,000-30,000 kip/kg during rainy season when local food are abundant, as well as, during epidemics disease outbreak season.

During sufficient chicken production or in case of cash need, farmers will delivery chickens themselves to nearby village trade fairs or district wet markets. In this case, price is normally 3,000-5,000 kip/kg lower than price offered by collectors/traders in the village as farmers have no choice. The cost of transportation is about 20,000 kip/round by tractor which is one of the main mean of transportation to markets for farmers.

In main native chicken producing districts such as Atsaphone, farmers supply around 500 birds to district and neighboring markets such as Atsaphangthong, Seno and Savannakhet whilst market demand in Saravan district is estimated to be around 200-300 birds/day compared to around 100 birds in Samakixay market.

Collectors and Traders

¹⁰ LRC, 2014. Research outcome for Native Animal in Lao PDR.

In closer district town, native chicken are sold more often to local markets or to bypass traders. Chicken traders are both men and women, Lao and Vietnamese (during Tent festival) and travel by motorcycle or truck, etc. In some villages where market linkage has been well established, few village based farmers (collectors) collect native chickens to the market and get profit of about 3,000-5,000 kip/bird. In case of high market demand, district traders will go to villages searching for chickens to supply in the market.

Although there is no village-based local collectors in most surveyed villages, about 5-7 village-based local collectors operate in main chicken producing villages in Atsaphone and Xonbouly. These local traders collect about 100-500 birds/day/district and supply to district-or provincial-based wholesalers, retailers or butchers. Their profit is about 3,000-5,000 kip/bird through means of transportation such as motorbike or truck. These traders not only collect chickens but also other agricultural products produced in their villages.

In small district towns such as Ta-oy, Sepon, Atsaphone and Xonbouly, only few native chicken traders/butchers were observed in the wet markets. While there are about 5-10 retailers in bigger districts such as Saravan, Laongam and Samakixay, the number of chickens wholesaled or retailed by these traders is about 100-300 birds/day whilst market demand is still high with an estimation of about 10-20% of chickens met demand in district and provincial markets.

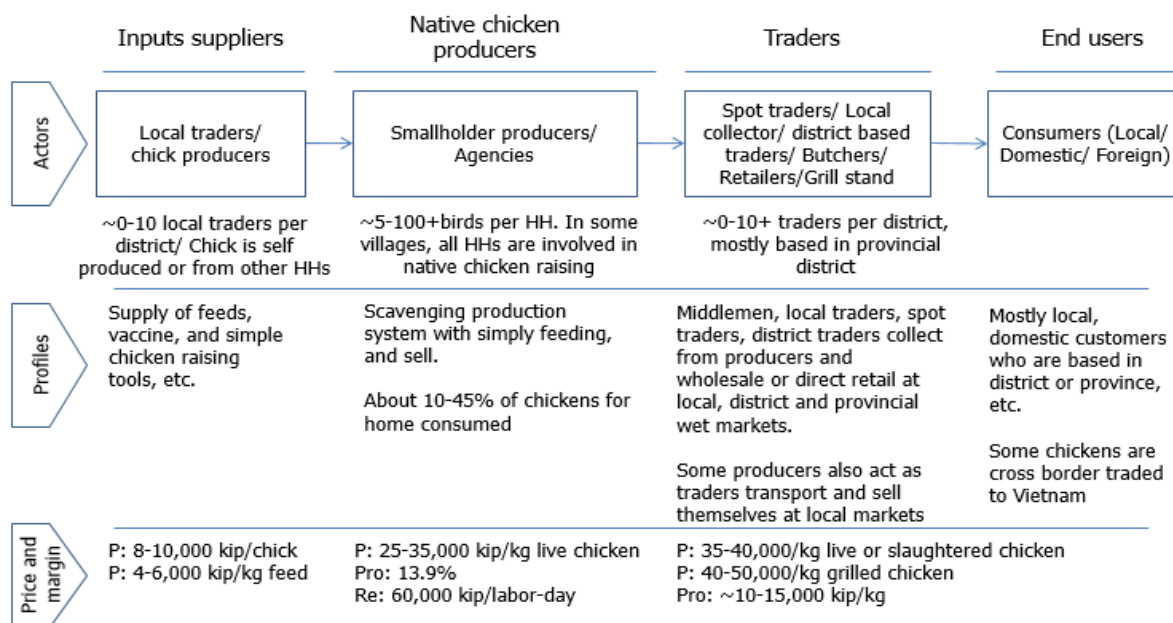
Price is somehow different from district to district ranging from 35,000-45,000 kip/kg. District based collectors get about 5,000-10,000 kip/kg for the profit. To run a poultry trading business, traders do not require specific license. They pay for market place at about 5,000-10,000 kip/day. Some of them only sell native chickens whilst some others sell both native chickens and improved-breeds.

Many traders also consider Sam Sailerd breed as improved local chicken and sell at about 25,000 to 30,000 kip/kg. At the same time, the survey also observed that imported improved bred frozen chickens are commonly found in most big districts particularly, nearby Thai and Vietnamese borders. This imported chicken price is about 20,000-25,000 kip/kg. Some chicken part imported from Thailand is sold in pack at 10,000-15,000 kip/kg.

Value Chain Mapping and Linkages

The value chain of native chicken trading is relatively short and the value added is small. The main value chain actors include input suppliers, producers, collectors, butchers or traders. As there is no intensive commercial native chick farm in targeted districts, most farmers raise native chickens from their own hens and cocks. While some farmers have chicks by hatching in their households, others purchase chicks from other households within or nearby villages at 7,500-10,000 kip/chick.

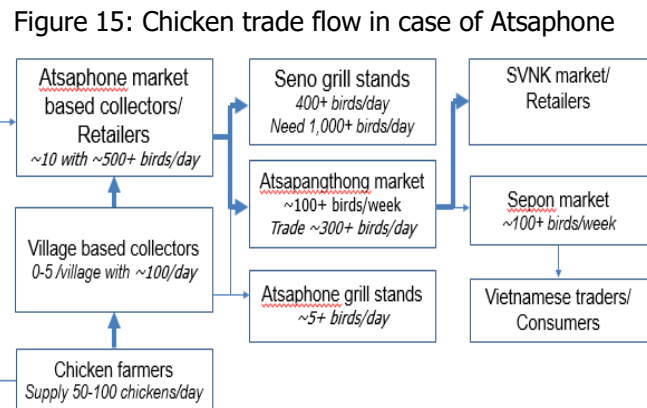
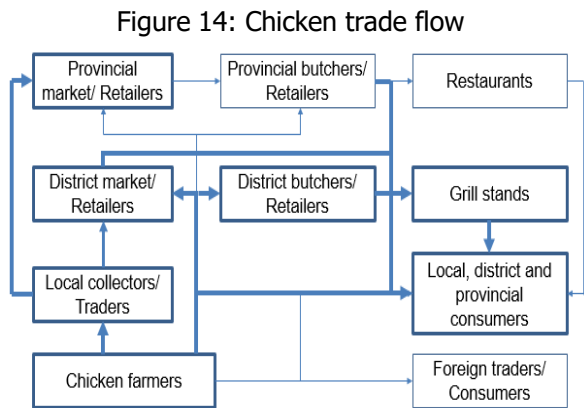
Figure 13: Details of native chicken value chain linkages



Based on the field survey, smallholder producers get profit of about 305,000 kip/year from current free-scavenging system with profit margin of about 13.9% and return on labor about 60,000 kip/day (with a total of 20 days/year). The profit could be dramatically increased with the improved, semi-intensive production systems. While local collectors, district- and provincial-based wholesaler and retailers share profits and get

about 5,000-8,000 kip/bird. Grill stand traders get another 10,000-15,000 kip/bird for their business. Details of chicken value chain linkages are described as following.

Because of the high domestic market demand particularly, during dry season when local natural food sources are not available, farmers are very well connected with traders and markets through different channels. In districts close to the borders, farmers are also linked to Vietnamese chicken traders and consumers. Details of native chicken trade flow and value chain mapping as general and a case of Atsaphone are showed in the figures below.

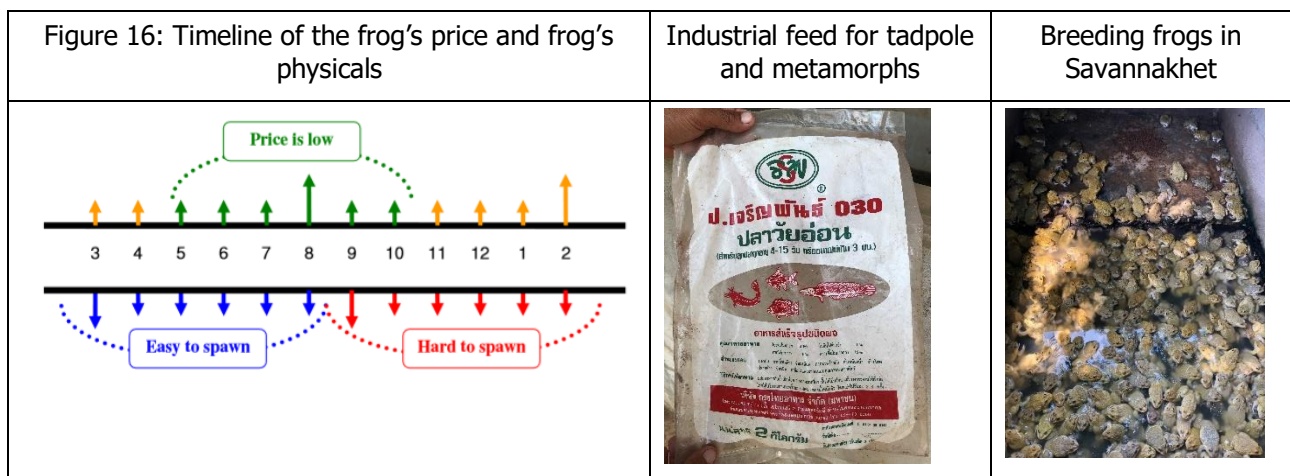


6.2 Frog Value Chain Analysis

Metamorph Suppliers

Along raised frog value chain, metamorph breeders play an important role in promoting frog production and consumption. Although frog breeding is not complicated, it requires some breeding technique and experiences in order to increase the tadpole's survival particularly, during the off-season between late rainy season and dry season. Off-season frog breeding is challenging mainly resulting also from too high investment from high hormone and industrial feed price. Other constraints include proper water quality sources, extreme hot or cool weather condition and labor.

In Pakse, during the off-seasons, more than 100,000 metamorphs are imported from Thailand with market price of 1,000 kip/metamorph. Imported metamorphs are bit bigger size but high mortality due to long distances. Local produced metamorphs price is about 500-1,000 kip depending on raising period. In Pakse, imported metamorphs are sold at 150,000 kip/kg. Most metamorphs are supplied after 1-1.5 months from tadpole growing period.



The field survey also indicates that currently, local metamorph breeders and suppliers are PAFOs or DAFOs staff or Agriculture Vocational Schools who have good technical background and access to metamorph market information. These breeders raise about 150-500 pairs of breeding frogs/year with an estimation of 500

metamorphs per female frog on average. So far, about 0-5 frog breeders operate in surveyed districts providing some 5,000-20,000 metamorphs/breeder/year to various farmers with about 500 metamorphs/farmer. In big capital cities such as Savannakhet and Pakse, a breeder could supply 10,000-50,000 metamorphs yearly. The main breeders supply metamorphs to producers who are based within the province and neighboring provinces.

The main cost for frog breeders are investment cost for raising place, industrial feed (20,000 kip/kg), medicine and hormone, and labor, etc.. Local frog breeders also reported that the mortality is about 40% from tadpole to metamorph growth so that not many breeders are interested in doing that. However, profit is still high with at least 50% of metamorphs sold.

Frog Producers

Because of the declining in natural frogs, frog raising is spilling out from urban areas to smaller district towns. Unfortunately, the field survey did not have chance to meet with on-going frog producer as it is off-season for frog production; therefore, the information collected was based on DAFOs and farmers who used to raise frogs in the last seasons. Some frog producers are metamorphs suppliers who keep some frogs for fattening. Some others raised frogs during 2016-2017 but stopped in 2018 mainly, due to the shortage of metamorph supplied. Some farmers were promoted by the development project but stopped when project's activity finished.

Table 6: Indicated number of frog breeders and farmers in surveyed districts

No.	Samakixay	Saravan	Laongam	Ta-oy	Pakse	SVNK	Sepon	Atsaphone	Xonbouly
Frog breeders	1	1	1	0	5+	5+	0	0	0
Frog farmers	25	1	2	0	10+	10+	1	0	0

Source: Field survey, 2019

Field survey indicates that farmers learned raising techniques from metamorph suppliers and raise about 500 metamorphs/HH. Some farmers used to raise up to 1,000 metamorphs. Some farmers raised in cement pool which are also used to raise catfish. Others raise in plastic-soil pool with mosquito net. On average, farmers spent about 480,000 kip/pool. Price was 500 kip/metamorphs. During raising period, farmers spend 5-10 minutes daily to feed and clean the pool with an average of about 7-10 labor-days/cycle. Industrial feed of about 365,000 kip/HH is another cost for producers which is about 10-15% higher in small districts compared to capital cities.

Farmers interviewed reported that about 65% of raised frogs is for home-consumption. The rest is sold in the village with a price of 30,000-40,000 kip/kg. In this case, frog producers also act as frog retailers. Other farmers sold to Poverty Reduction Fund (PRF) staff who supported the frog raising activity and came to work in the village at 25,000 kip/kg. The cost-benefit of interviewed farmers shows that, with about 500 frogs raised, farmers get profit of about 330,000 kip/cycle which translated into about 26% of profit margin and 22,000 kip/day of return on labor.

Frog Traders

Because of the off-season, the survey did not meet with raised-frog traders in small districts; however, in capital cities, about 5 frog trades were observed. For instance, these frog traders are able to sell about 100-150 kg/day in Savannakhet market when there are not many natural frogs supplied in the market. The price was around 40,000 kip/kg compared to about 30,000 kip/kg during early rainy season when supply of natural frogs is high.

After collecting frogs from producers, together with other aquatics products, traders retail at wet markets and pay about 10,000 kip/day for their stand and get profit of about 5,000-10,000 kip/kg of frog sold. Moreover, to run a poultry trading business, traders do not require specific license.

Value Chain Mapping and Linkages

Currently, in targeted districts, raised frog value chain is rather short associating input suppliers particularly, metamorph breeders, frog farmers and retailers (both live and grilled). Some metamorphs are imported from Thailand whilst other main suppliers are normally based in capital cities of Savannakhet, Saravan, Samakixay and Pakse. Details of raised frog value chain linkages, mapping and trade flow are described in the following figures.

Figure 17: Details of raised frog value chain linkages

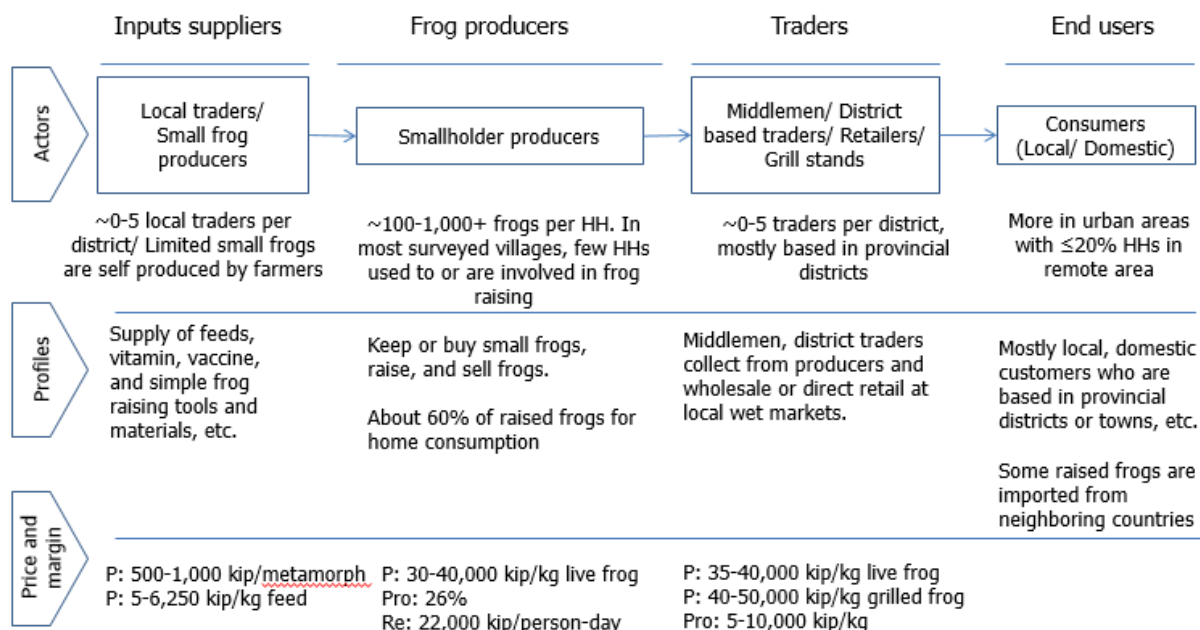
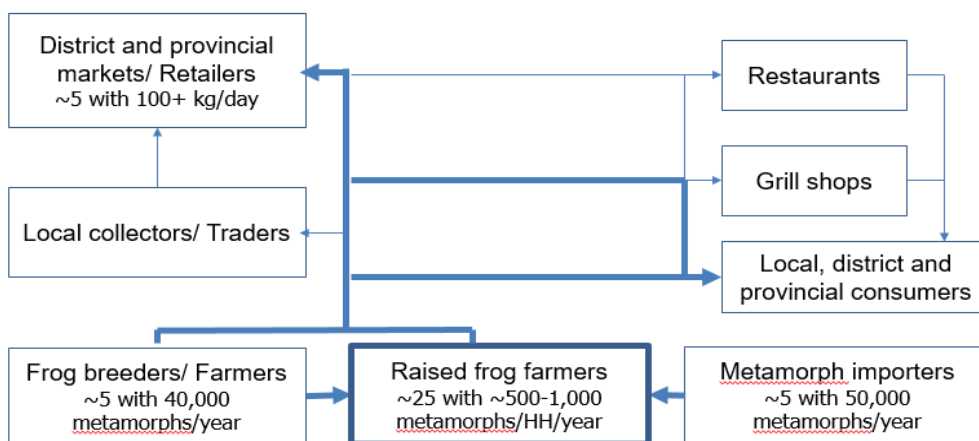


Figure 18: Raised frog trade flow



6.3 Cricket Value Chain Analysis

Cricket Producers

The field survey shows that all three cricket breeds are raised by local producers who mainly are the government or project related staff or agriculture college students who are more accessible to inputs (cricket eggs, materials and feeds), production technique and markets information, etc. About 75% of the cricket producers are female. During the field survey, 0-5 producers were reported in small towns and more than 10 producers in capital cities with production of about 30-2,500 kg/producer/year. An estimation of about 20% crickets produced by smallholders is for home consumption. More than 7 MT/year of crickets is imported to maintain cricket market demands in Savannakhet.

In all three targeted provinces, cricket raising had been boomed in the last five years as a result of active logging business during that period. Cricket was considered as a luxury snack rather than as a food. During initial stage, cricket producers brought cricket eggs from others who are based in Vientiane Capital, Savannakhet, or Pakse. These producers again initially imported eggs from Thailand. Currently, the producers who are based in capital cities of Savannakhet, Saravan and Samakixay can also supply cricket eggs.

Anecdotal information from DAFOs and some cricket producers indicates that currently, there are about 0-5 producers in small towns and more than 10 producers in capital cities with production of ~30-2,500 kg/producer/year. Smallholder producers raise about one to 5 boxes and nearly all producers interviewed raise 5-6 cycles/year. On average, producers spend about 300,000 kip/HH as investment cost, about 280,000 kip/HH for initial cricket eggs and about 200,000 for industrial feed and local vegetables such as pumpkin and cabbages, etc. On average, producers spend about 5 labor-days/cycle/2 boxes for box building, feeding and cleaning of boxes.

With about 80% of cricket sold, producers sell to local clients who are based in the same village or nearby. Some producers sell to friends or colleagues. A bit bigger producers sell in wet markets in capital city as fresh or fried. Retailed price is about 40,000-60,000 kip/kg depending on the quantity ordered. In this case, most of producers also act as wholesalers or retailers.

Based on the cost-benefit analysis, cricket producers can earn a profit of about 1.6 million kip/year with return on labor of about 47,000 kip/labor-day and profit margin of about 33%. Details of value chain analysis is described in the figure below.

Cricket Traders

As above-mentioned, most of producers also act as processors, wholesalers or retailers in wet markets or marketing through social media such as Facebook and What-app, etc. In almost targeted districts surveyed, the supply and demand of cricket is very fragmented that producers could supply very periodically whilst demand is also limited. It was estimated that producers could supply around 20-50 kg/month.

In capital city of Saravan, besides local supply, it was also estimated that some restaurants imported crickets from Savanakhet or Pakse who could supply anytime as per their demands. In bigger capital city of Savannakhet, a producer could supply about 200 kg/month. In addition, about 600 kg/month of crickets is imported from Thailand to maintain his supply. Other 10 cricket producers with about 100 kg/month/producer was also reported in Savannakhet. Price of steamed crickets is very similar in all surveyed districts ranging from 30,000-60,000 kip/kg whilst retail price of fried crickets could be up to 100,000 kip/kg.

Cricket Value Chain Linkages, Mapping and Trade Flow

Figure 19: Details of raised cricket value chain linkages

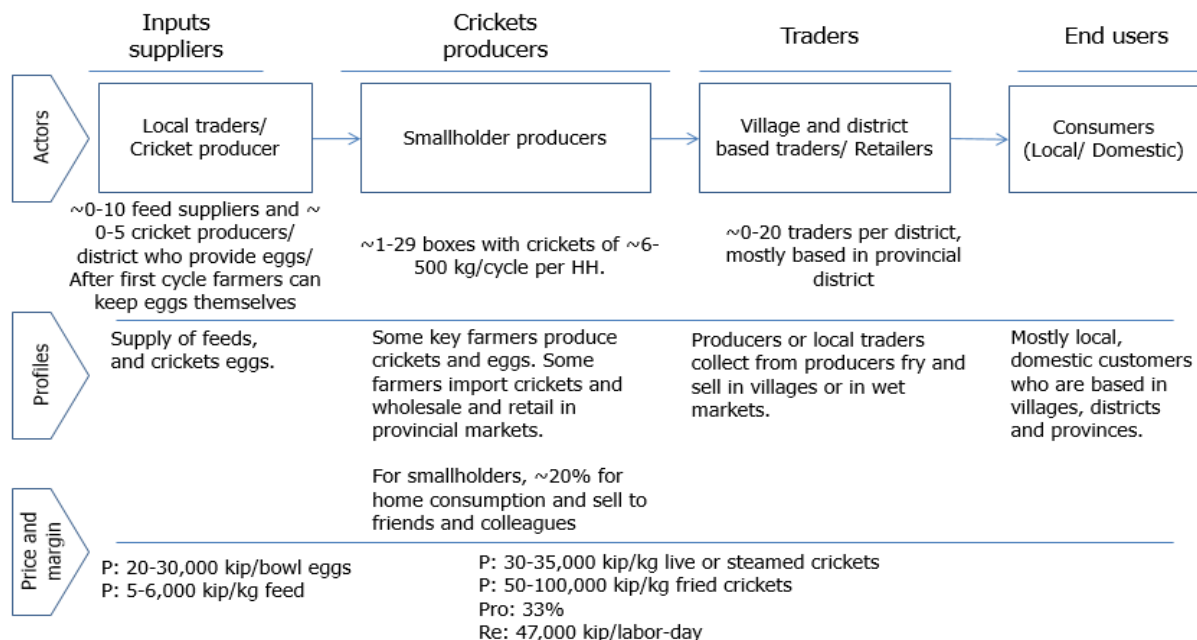


Figure 20: Raised cricket trade flow

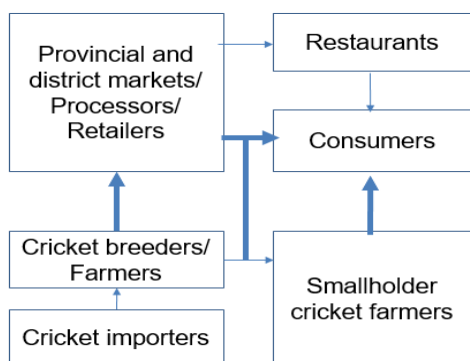
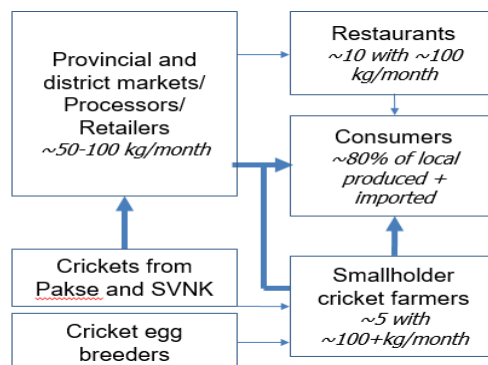


Figure 21: Cricket trade flow in case of Saravan



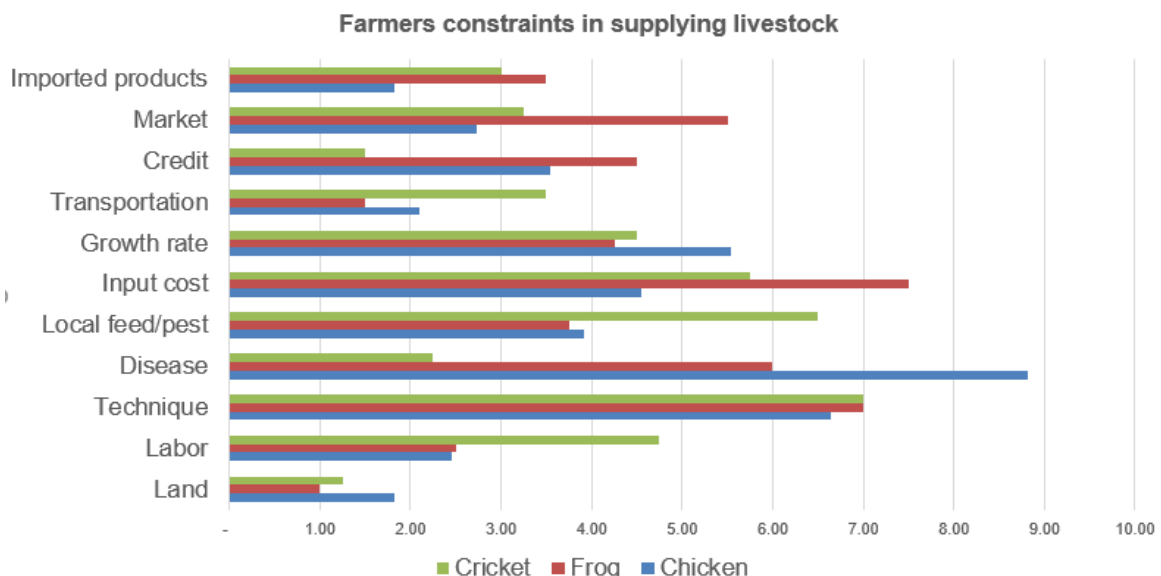
6.4 Opportunities and Constraints for Livestock Value Chains

Opportunities for native chicken VC	Constraints for native chicken VC
<ul style="list-style-type: none"> Inputs for improved, semi-intensive production systems including good quality breeds, feed and forages seeds are available in some districts. Native chickens are good food seekers and could be well adapted for improved system with higher productivity, profit and return on labor. Farmers have experiences with native chicken raising. Good (semi-intensive and intensive) production farms are locally available for cross-visits and to capitalize lessons learnt. E.g. Green Learning Center in Laongam and Lith Farm in Pin, etc. Demand for native chickens is stably high in local, district, provincial markets, and some cross-border markets. Price is higher compared to improved breeds. 	<ul style="list-style-type: none"> Limited local awareness to raise chickens for better food consumption and income generation. Farmers pay less attention and nearly with minimal or without any investment to their chicken raising. Low productivity from free-scavenging production system while limited availability of local natural feed. Some small size breeds with slow growth and low price. Poor farm management and animal health and nutrition management is also resulting in slow-growth, high mortality, and thus, low productivity. Limited local awareness on this. Limited local veterinary services and technique in epidemics disease control. Some villages with VVW are not active. Limited producer groups to share lessons learned and marketing, high transition cost.
Opportunities for frog VC	Constraints for frog VC
<ul style="list-style-type: none"> Amount of natural frog is reducing and farmers are interested in raising it. Good production system provides proxy eating quality to natural frog. Frog raising is a good supplementary activity with minimal investment, space and time. Frog raising and consumption is common in big cities and is emerging in smaller districts with a lot of lessons learnt on production techniques are locally available. Breeds, metamorphs and other inputs for production are available in capital districts even though not year round. Imported metamorphs are available in Pakse and Savannakhet almost in year round. 	<ul style="list-style-type: none"> High price of inputs particularly, the imported industrial feed and not available in some small districts. Local metamorphs are available only in some seasons and in some areas, mainly due too cool water and frog nature, low survival rate and high price of hormone. Good quality water source is another constraint that too low or high pH will also affect frog raising. Lacking proper water is another issue. Too hot weather also affect frog growth. Raised frogs are new to some farmers in many remote villages for both production and consumption senses. Limited local knowledge on production technique. More than 20% of metamorphs may die if proper raising system is not in place.

<ul style="list-style-type: none"> Price is considerable high during DS when there are few natural frogs in the markets. 	<ul style="list-style-type: none"> Difficult sell and low price during wet season when natural frogs and other natural food sources are available.
Opportunities for cricket VC	Constraints for cricket VC
<ul style="list-style-type: none"> Natural cricket is a good menu for Lao people in both urban and rural areas. Good production system provides proxy eating quality with natural crickets. Many recipes could be produced from crickets and; therefore, more food diversification. Cricket raising is an easy, time- and labor-extensive activity with minimal investment, space, with good complementary income source. Women are good in raising and selling crickets. Currently, in small districts, cricket raisers are government and project related staff with interest and technical background. Cross-visits are possible. High demand of raised crickets in big cities e.g. SVNK, Pakse and VTE C. Spill-out effects are anticipated to occur in smaller districts. 	<ul style="list-style-type: none"> Cricket raising is new to most farmers in remote villages for both production and consumption. Technical extension may not available from nearly all DAFOs in targeted districts as it is normally not on their mandate. High price of industrial feeds would have constraints to some farmers. Cricket eggs are not available in some districts and have to provide during the initial stage. Cricket egg hatching also requires some technique. Cricket is locally considered as a luxury snack rather than a food and more accessible to better-off HHS. Without proper penning and housing, crickets might be affected by pest, disease and weather, etc.

During the field survey, farmers have ranked the main constraints faced by them including: three main challenges faced by livestock farmers are: epidemics disease control, production improvement and better quality breeds for native chickens; high input cost, un-stable supply of metamorph and raising techniques including disease control and market for raised frogs; raising techniques, pest and high feed price for cricket raising. Details of other constraints for native chicken, frog and cricket raising are showed in the figure below.

Figure 22: Farmers constraints in supplying livestock



7. Crop Value Chain Analysis

7.1 Corn Value Chain Analysis

Sweet Corn Producers

Corn is commonly produced in many targeted villages particularly, in rainy season. In upland areas, corn is intercropped with upland rice and diverse kinds of vegetables such as chili, pumpkin and eggplants, etc. with very randomized plant spacing. In lowland area, corn is intercropped with cassava, etc. The field survey indicates that on average, farmers produce around 0.48 ha/HH with traditional planting practices. During rainy season, while farmers use either local varieties with heritage seeds or buy imported Thai seeds from local markets. Almost no other inputs are applied with 1-2 weeding. Corn produced by smallholders in rainy season is more for home consumption of up to 100%.

For a bit larger corn cultivation scale, farmers adopted semi-improved with mono-cropping production system including: better land preparation with bunching, closer spacing of about 0.4x1 m, once a week irrigation with some manure and chemical fertilization and weeding. The production is up to 3-4 production cycles/year. For this kind of semi-commercial production producers, about 90% of produced corn is for sale. No report on baby corn production and consumption in most surveyed villages in small districts.

Field survey shows that on average, farmers spend about 214,000 million kip/HH as their investment cost for fencing, tools and materials. Another 240,000/HH is for available cost such as seeds, fertilizer and fuel for weeding and pumping machines. Although, most of producers use their family labor, about 40 labor-days is used to cultivate one cycle of corn with a cost of about 1.8 million kip/HH. The total production cost is about 3.1 million kip/cycle/year. On average, farmers produce 1.5 cycles/year.

Currently, the corn production is very low at about 2.5 MT/ha/cycle compared to the official report of about 10 MT/ha. With farm-gate price of about 3,000 kip/kg, producer could earn about 3.6 million kip/year resulting in a profit of about 1.35 million kip/cycle, 60% of profit margin and 79,000 kip/labor-day. The figure below shows that with the improved production system, sweet corn producers could get much more profit, higher profit margin and return on labor. Details of cost-benefit analysis are compared in the figure below.

Table 7: Cost-benefit of current cultivating system and improved-production system for corn (per year)

Current production system	Improved, semi-intensive production system
<u>Outputs:</u> 415 USD (1 cycles/year with 0.48 ha/HH, 2.5 MT/ha, price of 3,000 kip/kg)	<u>Outputs:</u> 2,069 USD (1 cycle/year/ with 1 ha/HH, yield of 6 MT/ha, price of 3,000 kip/kg)
<u>Inputs:</u> 25 USD (investment cost) + 28 USD (variable cost) + 207 USD (labor cost) + 2 USD (other fixed cost) = 260 USD/year	<u>Inputs:</u> 155 USD (investment cost) + 264 USD (variable cost) + 269 USD (labor cost) = 688 USD/year
<u>Profit:</u> 155 USD/year	<u>Profit:</u> 2,069 USD – 688 USD = 1,381 USD/year
<u>Profit margin:</u> 60%	<u>Profit margin:</u> 201%
<u>Return on Labor:</u> 9.1 USD/day (total of 40 days)	<u>Return on Labor:</u> 26.6 USD/day (total of 52 days)

Sweet Corn Traders

Most of the smallholder producers interviewed also act as wholesaler or retailers of their corn. Many of them deliver and sell their corn in the village or neighboring villages or during village trade fairs with price of about 2,000-3,000 kip/kg in rainy season and 3,000-5,000 kip/kg in and dry season respectively. Many of them deliver their corns by tractor to local festivals, boil and retail them. Except for transportation cost of about 20,000-50,000 kip/trip, and about 5,000 kip/day for stand fee, producers/traders do not pay for another expense.

Some bigger local collectors collect corns from producers and wholesale or retail corn in district or provincial markets at 3,000-5,000 kip/kg. These traders normally collect from bigger farms and come with truck once or twice per week. Their profit is possibly up to 50% of the volume collected particularly, during the dry season.

Local trading of corn is still very marginalized. Almost market demand is for local consumption even though there has been linkages among producers and traders. For example, traders in Savannakhet also go to collect corn from other districts such as Atsaphone, Xonbouly and Atsaphangthong. Corn produced in Savannakhet is also transported, wholesaled and retailed in Saravan markets.

In addition, consumption of baby corn is not common particularly, in remote villages. In capital districts such as Pakse and Savannakhet, some baby corns are imported and sold with market price of 12-15,000 kip/kg. Details of corn value chain linkages, mapping and trade flow is presented in the figures below.

Corn Value Chain Linkages, Mapping and Trade Flow

Figure 23: Details of corn value chain linkages

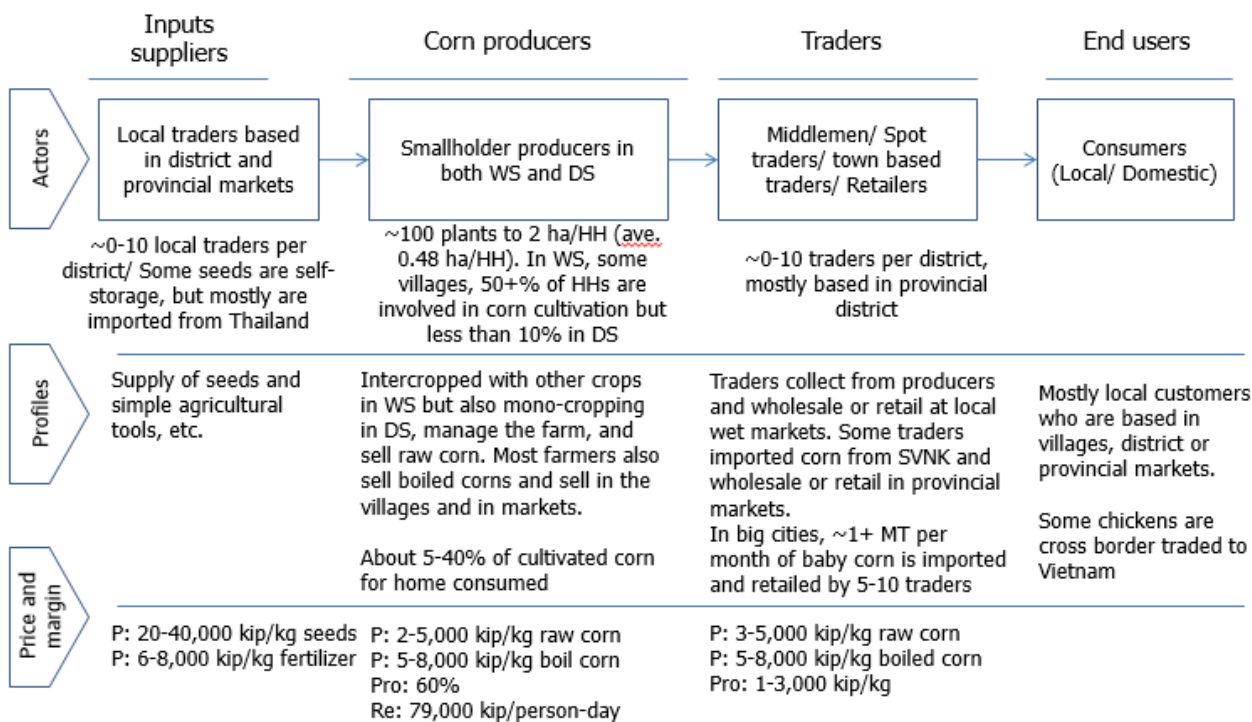


Figure 24: Corn trade flow

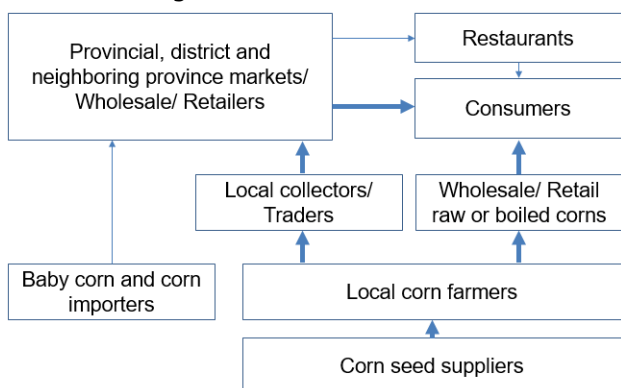
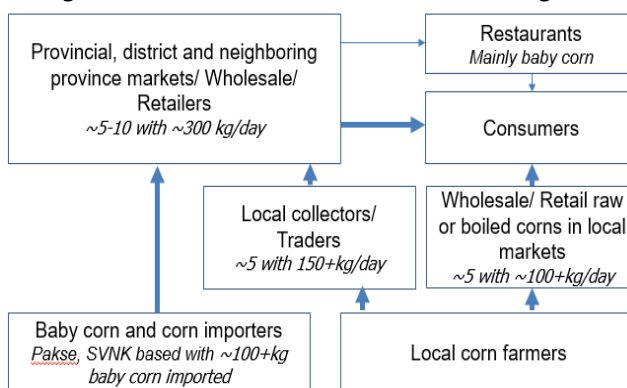


Figure 25: Corn trade flow in case of Laongam



7.2 Banana Value Chain Analysis

Banana Producers

Almost HHs in the surveyed villages have cultivated banana in forms of home garden or commercial plantation ranging from few plants to several ha with an average of about 0.8 ha/HH with yield of about 4 MT/ha.

However, banana production techniques have not been well adopted in the surveyed villages. Most farmers interviewed plant banana based on their traditional practices.

Field survey shows that, with about 0.82 ha, farmers spend about 282,000 kip/HH as their investment cost. Few of them have simple fencing whilst most of them do not have fence which more often are damaged by animals. Variable cost for materials is minimal as most of them do not buy banana seeding and do not apply fertilizer resulting in about 282,000 kip/HH/year. Currently, the main cost for banana production is labor cost of about 2.0 million kip/HH/year (even though most of them use family labor). Land preparation and planting accounts for about 48% of total labor cost. With current production system, farmers get profit at about 1.5 million kip/HH/year with 57% profit margin and 70,000 kip/labor-day as return on labor. Detailed comparison of cost-benefit between current production and semi-intensive production systems is summarized in the table below.

Table 8: Cost-benefit of current cultivating system and improved-production system for banana (per year)

Current production system	Improved, semi-intensive production system
<u>Outputs:</u> 464 USD (per/year with 0.82 ha/HH, 4.0 MT/ha, price of 1,500 kip/kg)	<u>Outputs:</u> 3,879 USD (per year with 1 ha/HH, yield of 22.5 MT/ha, price of 1,500 kip/kg)
<u>Inputs:</u> 32 USD (investment cost) + 32 USD (variable cost) + 228 USD (labor cost) + 2 USD (other fixed cost) = 295 USD/year	<u>Inputs:</u> 548 USD (investment cost) + 239 USD (variable cost) + 794 USD (labor cost) = 1,581 USD/year
<u>Profit:</u> 169 USD/year	<u>Profit:</u> 3,879 USD – 1,581 USD = 2,298 USD/year
<u>Profit margin:</u> 57%	<u>Profit margin:</u> 61%
<u>Return on Labor:</u> 8.0 USD/day (total of 44 days)	<u>Return on Labor:</u> 14.8 USD/day (total of 154 days)

Banana price is fluctuated between rainy and dry seasons and different from place to place. In main banana production area such as Sepon and Laongam, Farm-gate price is about 500-1,200 kip/kg in rainy season and up to 1,000-2,000 kip/kg in dry season. In less banana production district, price is a bit higher at about 2,000-2,500 kip/kg. For smallholder producers, about 50-100% of banana is for home consumption particularly, during rainy season whilst only 5-10% of banana is consumed for larger scale producers. Producers sell their banana through several channels such as: sell to consumers in the same or neighboring villages; sell to bypass consumers; and banana is collected by local, district or provincial traders.

Banana Traders

In small districts, banana trading is still very fragmented that producers sell their banana in the village or along the main road without stable market linkages. Some local traders also buy banana from producers and add value through processing banana chips. The price was add up to about 10,000-15,000 kip/kg through this processing.

Small local traders come from time to time by small truck. In main banana producing areas such as Laongam and Xepon, district based traders come to collect banana in the farm by their own 10-wheel trucks with about 15-20 MT/truck. Sometime, traders come with their workers and selectively pick banana themselves. It was reported that about 5-10 banana traders running business through this channel.

Another main trading channel is that traders transport collected banana to wholesale or retail in markets in capital cities. It was estimated that about 1 MT/day of banana is transported to Saravan market and about 10-20 MT/day is sold to Savanakheth market. Market demand is normally high on the end of lunar days which normally take place in very 7-8 days for Buddhism.

On other hand, local collectors will supply their collected banana to exporters. For example, about 5-7 local traders who are based in Xepon will collect banana from producers and supply to exporters to Vietnam through Dansavanh border. It was reported that about 95% of banana produced in Xepon is exported to Vietnam through this channel. Similar exporting channel is happening through Lalai border in Saravan province. Some local collectors in Laongam also supply banana to exporters who are based in Paksong with about 7,600 MT exported to Thailand in 2018. Details of banana value chain linkages, mapping and trade flow is presented in the figures bellow.

Banana Value Chain Linkages, Mapping and Trader Flow

Figure 26: Details of banana value chain linkages

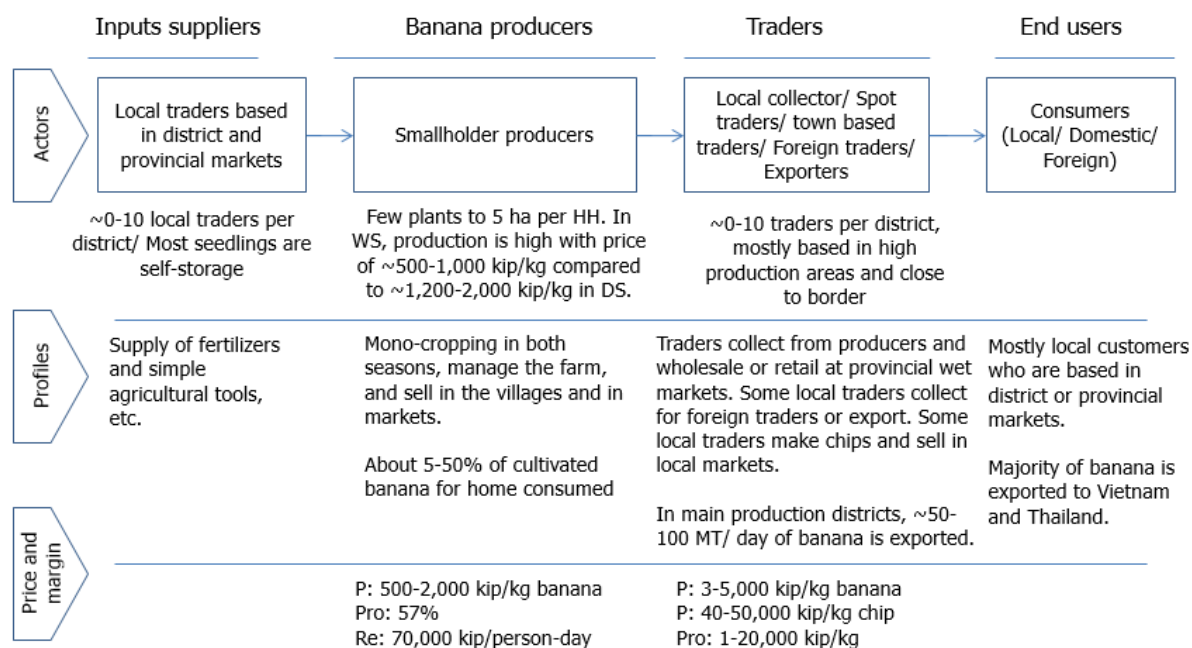


Figure 27: Banana trade flow

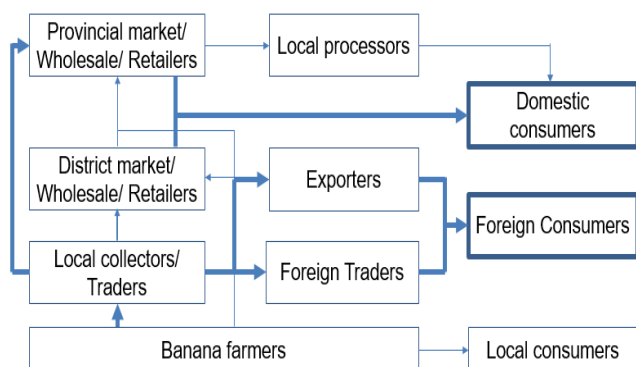
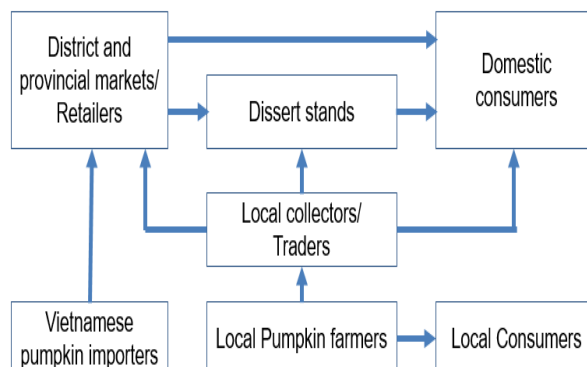


Figure 28: Pumpkin trade flow in Attapue province



7.3 Pumpkin Value Chain Analysis in Attapue

In some surveyed villages, more than 50% of HHs cultivated pumpkin in rainy season but very few do during dry season. Pumpkin is cultivated mainly for home consumption and more for sell during dry season. In Attapue province, the survey did not meet any pumpkin commercial producers whilst very few producers met mainly due to the off-season. Based on the field survey, pumpkin is normally intercropped with others such as upland rice and vegetable, etc. Because of such integrated farming system by smallholder producer, no pest and disease was reported. Farmers reported that about 70% of pumpkin produced in dry season is mainly for sell.

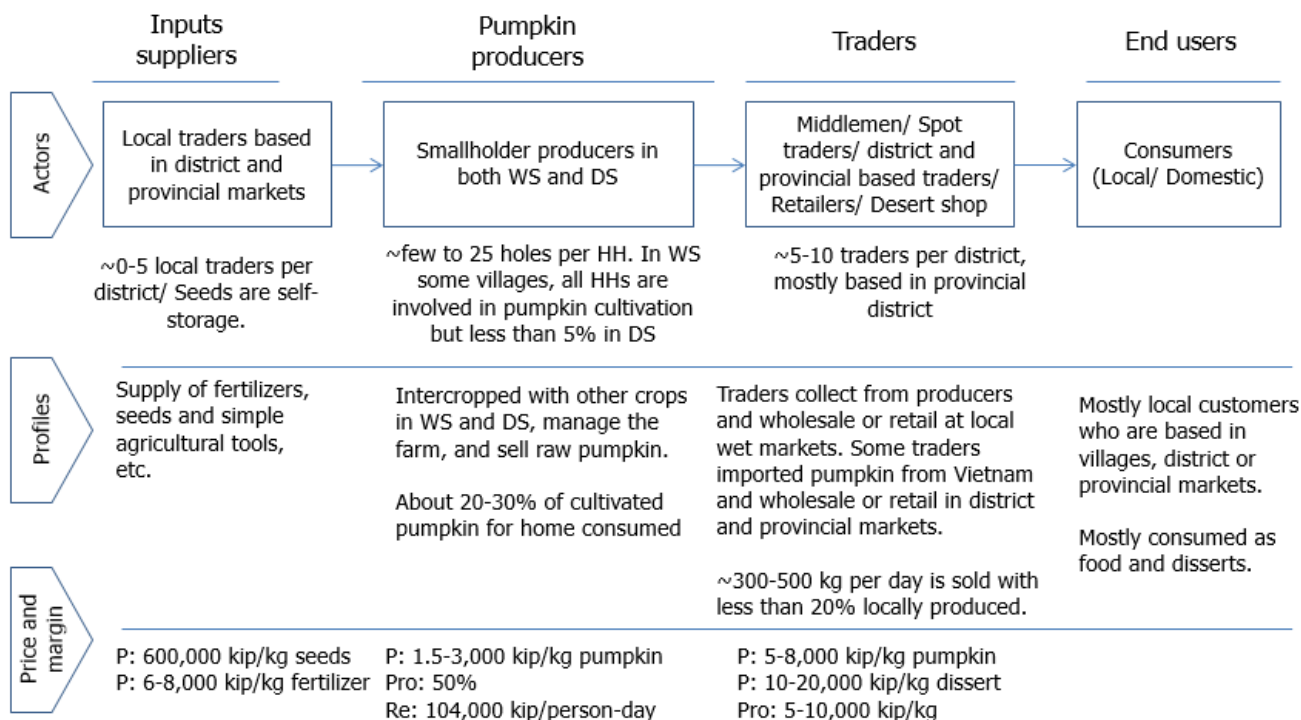
Interviewed farmers reported that about 10-25 holes of pumpkin were planted with at least 2 plants/hole. As it takes about 80-90 days to harvest pumpkin, farmers who have access to water also plant pumpkin for three cycles/year. Normally, farmers keep their own pumpkin seeds and no other inputs are provided.

Lessons learnt from Thai pumpkin farmers show that pumpkin productivity could be improved through better land preparation, adoption of improved with good eating quality variety, proper planting spacing, good farm management through fertilization and sufficient irrigation and weeding, and improved pollination technique. The yield could be as high as 20 MT/ha.

In the surveyed villages, farmers sell their pumpkin inside their villages as well as to spot traders along the main road. During rainy season, when production is high, farm-gate price of about 1,500-2,000 kip/kg and about 2,500-3,000 kip/kg in dry season.

In Samakixay and Xaysetha markets, about 5-10 pumpkin stands observed. Market price is about 5,000 kip/kg for Vietnamese pumpkin and 5,000-8,000 kip/kg for local produced pumpkin. It was estimated that about 300-500 kg of pumpkin is demanded daily. While all farmers interviewed keep their own seeds, high quality variety and seeds with about 50 MT/ha are available in Thailand (Yak-Giant pumpkin, Pakaitong, etc.). Pumpkin is cooked as food and dessert. Most farmers also consume its young leaf and bud for food.

Figure 29: Details of pumpkin value chain linkages in Attapue province



7.4 Opportunities and Constraints for Crop Value Chains

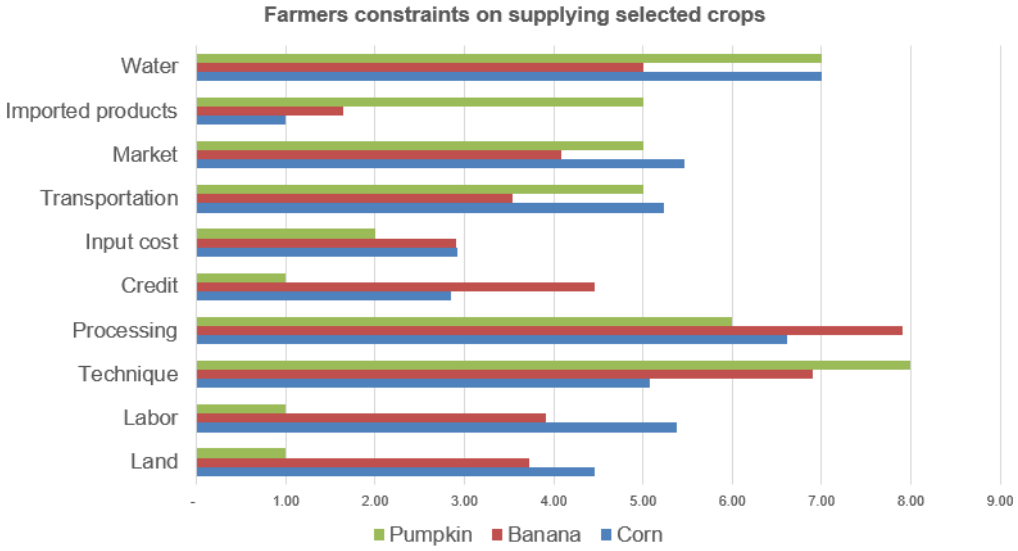
Opportunities for corn VC	Constraints for corn VC
<ul style="list-style-type: none"> Corn is one of the main staple food, snack or dessert in many remote areas with high familiarity and acceptability for production, consumption and sale, as well as animal feeding. Some farmers have access to water during DS and produce off-seasons corn with higher price. Improvement of production, post-harvest, storage, transportation and processing technologies could contribute to more food security, nutrition and income. Baby corn and corn milk, etc. could be easily produced and processed. Despite of low price in WS, there is still demand in local and domestic markets whilst demand in dry season is still high. 	<ul style="list-style-type: none"> Most farmers apply traditional production system with poor and massive quality seeds, poor land preparation, high spacing, and poor cropping schedule resulting in low yield. Fresh or boiled corn is a main sale channel but local demand is not high in rainy season. Most farmers have limited awareness on processing technologies and linking to higher end market. Unreliable water supply in dry season has an impact on the corn production. Lacking of group formation result in limited linking to stable markets and price. The corn value chain has not been well-established in nearly all districts surveyed.

<ul style="list-style-type: none"> • Baby corn is a good vegetable and could improve dietary diversification for farmers. 	<ul style="list-style-type: none"> • Local market place is another constraint for corn production.
Opportunities for banana VC	Constraints for banana VC
<ul style="list-style-type: none"> • Banana production is an easy agricultural practice with high familiarity to local communities for both production and consumption. Banana consumption is good for all ages particular, the infants. • Some lessons learnt for improved production system (semi-intensive or intercropping) could be capitalized with higher profit and return. • Banana market is very localized and farmers can consume it more during rainy season when price is low. Some market linkages have been established and demand is stable. • Some banana produced in targeted provinces has a good reputation for low-chemical inputs due to the farming practice and; therefore, high export market demands. Linking to big traders (Doo, Dao, etc.) and exporters is another opportunity. • Local processing as milk, fried, etc. is possible to add local nutritional value. 	<ul style="list-style-type: none"> • Farmers and local extension workers have very limited knowledge on banana improved production techniques. • Banana disease such as Fusarium is difficult to control once it has break out whilst limited technical advisory on that. • Traditional production practices resulting in low yield result, and thus, low income compared to other crops e.g. cassava. • Constraints in finding disease-free and resistant seedlings with high yield and good eating quality. • In agricultural land limited villages, farmers lack of investment capital for fencing, for new seedlings and for irrigation system. • Poor post-harvesting and transportation results in low price. Traders are willing to pay more for better quality banana but producers could not meet their requirement.
Opportunities for pumpkin VC	Constraints for pumpkin VC
<ul style="list-style-type: none"> • Pumpkin is very much localized crop in all villages for both production and consumption. Production intensification could be improved through GAP. • Local, district and provincial demands for pumpkin are considerably high particularly, in dry season. • There are lot of recipes from pumpkin flower, young fresh leaf and fruit. Pumpkin seeds are high nutrient rich grains whilst mature pumpkin could be stored for year. • Pumpkin milk is easy and could be processed locally with possible fortification. • Pumpkin could be intercropped with other crops. Limited disease on pumpkin is reported. • Some high eating quality and high yield varieties are available in neighboring countries. 	<ul style="list-style-type: none"> • Limited local knowledge on intensification production for pumpkin whilst farmers awareness on it nutritional consumption benefit is also minimal. • High quality variety and seeds with improved production technique has not been introduced and adapted. • The pumpkin VC has not been well-established without linking to high-end markets. No pumpkin commercial production farmers and groups to share production techniques and empower price negotiation. • High completion of imported pumpkin from Vietnam with lower price in Attapue. • Cultivation of pumpkin for high yield during dry season requires good soil and sufficient water source and good farm management.
Opportunities for moringa VC	Constraints for moringa VC
<ul style="list-style-type: none"> • Moringa is a very nutritious rich tree (crop) with simple domestication (by seeds or grafting), fast growth and high production. • In some villages, nearly all households used to consume moringa particularly, its young leaf. Moringa young leaf and seeds are sold in some markets, e.g. Savannakhet. 	<ul style="list-style-type: none"> • No local expertise on moringa production and consumption. While minimal promotion on its nutritious benefit, farmers know very little about it. • Currently, there is almost no demand for moringa in local, district and provincial markets.

- | | |
|---|---|
| <ul style="list-style-type: none"> • There are lot of recipes from moringa fresh leaf and fruit. Moringa seed could be processed locally. It could also be fed to animals. • The promotion of moringa consumption is strongly emerging in neighboring countries (China, Thailand, Cambodia and Vietnam) and internationally, it is also spilling over to Lao consumers and therefore, demand is anticipated to grow. • In Thailand, demand for moringa seeds is huge at 200 Bath/kg. | <ul style="list-style-type: none"> • High value addition thru moringa processing into capsule and tea, etc. may require investment and technologies. • No linkage with existing high-end markets. |
|---|---|

While crop farmers indicate that water sources and facility for dry season corn production, processing technologies and market for rainy season are the main constrains for corn producers; production techniques and disease control as well as, processing technique and access to water sources are the main constraints for banana and pumpkin production. Details of challenges faced by crop farmers are showed in the figure below.

Figure 30: Farmers constraints on supplying selected crops



8. Recommendations for Interventions

8.1 Recommendations for Livestock Value Chains

Technical Interventions

- Given that there is minimal awareness on food security and nutrition, promotion of nutrition awareness from native chickens, raised frogs and cricket's consumption to stimulate both the supply and demand along VCs in targeted villages and districts is strongly recommended. The promotion could be done on any occasions when there are any meetings, through specific nutritional campaigns and distribution of simple and visual materials.
- Consolidate and distribute simple and visual (poster, leaflet, video, etc.) technical improved production model package for native chicken raising with demonstration of improved semi-intensive production system (breed selection, penning, feeding-forage, vaccination and health care, etc.) with selected farmer groups.
- Since frog and cricket raising is new to many farmers, synthesize simple and visual technical production model package for frog and cricket raising could be another entry point. Participatory demonstration of the production systems with selected farmers and groups is recommended
- Select targeted motivated and active farmers and form producer groups. Ideally, the group should be about 5-10 HHs/village from the beginning and scaling out in following years. Women should be encouraged to join as they are considered the main persons to take care of these chickens, frogs and cricket raising. Identifying successful farmers who have adapted and adopted improved production technologies and utilize them as "smart lead farmers" to accompany extension staff in technical trainings.
- Participatory activity planning with selected farmers with clear schemes for necessary inputs supports (good quality breeds, tools, materials and equipment, forages seeds and feed). The physical supports should be not more than 2-3 production cycles. In some villages, farmers are very demanding; therefore a clear activity plan should be strategized from very beginning.
- Provide technical production trainings for native chickens, frogs and crickets to producer groups with clear demonstration of concerned issues. Support some committed and active farmers to be on the job technical trainings are also recommended. Organize study tours and cross visits to improved production sites or technical learning centers such as Green Learning Center in Laongam (chicken), Vocational Training Center in Saravan (frog), Cricket Farm in Savannakhet or in Vientiane Capital (cricket), etc.
- Facilitate in group formation with building the capacity of group committee. Close monitoring the producer groups and timely provide managerial and technical advisory supports. Ideally, each group should be mentored once a week.

Enabling environment

- Provision of sufficient information to propagate and to raise awareness of selected nutritious rich products to targeted commodities through participatory demonstration of diverse food recipes.
- Synthesize NSVC's materials and provide capacity building to extension and field staff to better understand the NSVC approaches and its impact pathway.
- Improve group management through better business planning (raising period and cycling) and linking to markets for better quality supply and price.
- Where possible, utilize social media to share technical experience and market information of the selected VCs.

8.2 Recommendations for Crop Value Chains

Technical interventions

- Promote local nutrition awareness on corn, banana, pumpkin and moringa consumption to stimulate both the supply and demand along VCs in targeted villages and districts.
- Synthesize and distribute simple and visual (poster, leaflet, video, etc) technical improved production model package for corn, banana, pumpkin and moringa. The package should include: cultivating schedule, soil, variety and seed selection, proper land preparation, planting, farm-management (weeding, GAP fertilization and disease control, watering, etc.), harvesting and post-harvesting.
- Select targeted motivated and active farmers and form producer groups (5-10 HHs per village). Women should be encouraged to join for time-saving production and processing practices.
- Identifying successful farmers who have adapted and adopted improved production technologies and utilize them as "smart lead farmers" to accompany extension staff in technical trainings.
- Participatory activity planning with selected farmers with clear schemes for necessary inputs supports (good quality seeds and seedlings, tools, materials). The physical supports should be not more than 2 production cycles. Participatory demonstration of the production systems with selected farmers and groups.
- Provide technical production trainings for corn, banana, pumpkin and moringa to producer groups with clear demonstration of concerned issues e.g. banana *fusarium wilt* disease.
- Organize study tours and cross visits to improved production sites. The survey did not observe any model farms for selected crops in the surveyed villages; therefore, study tours to other provinces or Thailand is also recommended.
- Close monitoring the producer groups and timely provide technical advisory supports. Ideally, each group should be mentored once a week.

Enabling environment

- Provision of sufficient information to propagate and to raise awareness of selected nutritious rich products to targeted commodities through participatory demonstration of diverse food recipes from corn, banana, and pumpkin. Given that moringa is new to many farmers, a comprehensive and sufficient information about its nutritional benefits should be highlighted.
- Synthesize NSVC's materials and provide capacity building to extension and field staff to better understand the NSVC approaches and its impact pathway.
- Improve group management through better business planning (raising period and cycling) and linking to markets for better quality products and price.
- Support the market places in villages or cluster where products have been well developed such as banana, corn, pumpkin. In some stage, organize provincial stakeholders workshops for selected crops to bridge farmers, traders and local enabling facilitators.

9. Analysis of Risks and Main Concerns

Technical extensions: Farmers have experienced very traditional production systems for native chickens, corn, banana and pumpkin, improving in their production practices will require sufficient technical supports with visual and tangible results. For example, banana fusarium disease would be a main concern for promoting banana VC. This will require double efforts from government extension staff who might not have such improved technology background. Introduction of new products such as frogs, crickets and moringa will need much closer technical monitoring and supports; therefore, it requires strong supports from project field technical advisors to cope with these concerns.

Labor risk: The extension of the improved production technology will require more labor intensive for the crop management in particular that might be a constraint some targeted households also mainly resulting from their multiple livelihood activities particularly, from the current cassava plantation in some areas.

Market risk: The farmers have limited information about markets and are concerned about market risk for the food products which are limited in demand, low value addition and profit. Meanwhile, local purchasing power for to improve the demand pathway might be limited. Clear strategies for marketing supports for these selected VCs will help reducing the concerns. At the same time, some farmers might have experienced previous situation where they have been encouraged to grow crops such as coffee and the strong cassava plantation trend may be collapsed in short future. These possible market risks may affect farmer's interest and commitments.

10. Conclusions

Malnutrition is a complex condition that can involve multiple, overlapping deficiencies or excess of nutrients. The causes of malnutrition are multiple, cutting across sectors (food, health, and care) and levels (individual, household, community, society). NSVC is considered as one of the a core element and has been proved as an efficient way of maximizing the contribution of sustainable agriculture to improved food security and nutrition. Although the value chains of selected livestock and crops in targeted provinces and districts are still at very beginning stages, starting interventions that could influence food supply and demand will contribute to better food system in the future.

NSVC is a new concept in targeted areas, local stakeholders at provinces and districts have limited understanding about it whilst communities awareness on production for household food security and nutrition improvement is minimal. Capacity building of the associated stakeholders would be another entry point.

Farmer's main concern is market, however, farmers have limited understanding and capacity to minimize their production risk through better management of their resources (land, water and labor, etc.). Poor market information and linkages push them at higher risk (e.g. cassava plantation).

Currently, selected livestock and crop VCs are at various developing stages. For example, native chicken is rather low supply with high demand in all districts whilst banana is over-supplied Xepon and Laongam, thus, the site-, product-, and season-specific intervention approach should be applied when designing activities.

Some lessons learnt from other development projects could be capitalized; however, a sustainable result-based to improve supply and demand and therefore, the better food environment and system. In addition, Clear farmer selection, concrete intervention plan and sufficient technical monitoring and support is crucial and is one of the core elements to improve the NSVC.

Table 9: Summary of demand and supply for shortlisted value chains

	Chicken		Frog		Cricket		Corn		Banana		Pumpkin		Moringa	
	S	D	S	D	S	D	S	D	S	D	S	D	S	D
Samakixay	L	H	L-	L	L+	L	L	L	M	M	L-	H		
Saravan	L	H+	L-	M	L+	L+	L	M	M	H				
Laongam	L	H	L-	L	L	L	M+	M	H	M				
Ta-oy	L	M	L-	L	L	L	L	L	H	M+				
Xepon	L	M+	L-	L	L	L	L	M	H+	H				
Atsaphone	L+	H+	L-	L	L-	L	M+	M	L	L				
Xonbouly	L	H	L-	L	L-	L	M+	M	L	L				

Note: Level of supply and demand is described as: Low = Low; M = Medium, and H = High

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12. Annexes

Annex 1: Mid-list of products in target provinces

Table 1: Mid-list products in Savannakhet province

No.	Product	Category	Topography	Production type	XBL	ASP	PLX	Ph	SP	TPT
1	Sweet corn	Staple	Low, Up	Local	√	√	√	√	√	√
2	Cassava (local v.)	Staple	Low, Up	Local	√	√	√	√	√	√
3	Sweet potatoes	Staple	Low, Up	Local	√		√		√	√
4	Peanut	Pulse	Low	Local	√	√	√	√	√	√
5	Eggplant	Vege.	Low	Local	√	√	√	√	√	√
6	Chili	Vege.	Low	Local	√	√	√	√	√	√
7	Yard long bean	Vege.	Low	Local	√	√	√	√	√	√
8	Horseradish	Vege.	Low	Local						
9	Spinach	Vege.	Low	Local		√	√			
10	Banana	Fruit	Low, Up	Local	√	√		√	√	√
11	Watermelon	Fruit	Low	Local	√	√	√	√	√	
12	Lemon	Fruit	Low, Up	Local	√	√				√
13	Orange	Fruit	Low, Up	Local, Im		√				
14	Mango	Fruit	Low	Local, Im	√	√	√		√	√
15	Pineapple	Fruit	Low	Local		√			√	

Table 2: Mid-list products in Saravan province

No.	Product	Category	Topography	Production type	District			
					Saravan	Laongam	Tomlan	TaOi
1	Sweet corn	Staple			√	√	√	√
2	Cassava (local V.)	Staple			√	√	√	√
3	Sweet potatoes	Staple			√	√	√	√
4	Peanuts	Pulse			√	√	√	√
5	Soybean	Pulse			√	√	√	√
6	Cabbage	Vege.			√	√	√	√
7	Morning glory	Vege.			√	√	√	√
8	Chili	Vege.			√	√	√	√
9	Tomato	Vege.			√	√	√	√
10	Pumpkin	Vege.			√	√	√	√
11	Yard long bean	Vege.			√	√	√	√
12	Horseradish	Vege.						
13	Banana	Fruit			√	√	√	√
14	Papaya	Fruit			√	√	√	√
15	Tamarin	Fruit			√	√	√	√

Table 3: Mid-list products in Attapeu province

No.	Product	Category	Topography	Production type (From)	District	
					Xaysetha	Samakhixay
1	Sweet corn	Staple	Low	Thahin Market	√	√
2	Cassava (Local V.)	Staple	Low		√	√
3	Sweet potato	Staple	Low	Paksong	√	√
4	Taro	Staple	Low		√	√
5	Soy bean	Pulse		Vietnam	√	√
6	Peanut	Pulse		Paksong		
7	Sesame	Oil		Paksong	√	√
8	Cabbage	Vege.		Paksong	√	√
9	Morning glory	Vege.	Low	Xengai village	√	√
10	Yard long bean	Vege.	Low	Naxaithong village	√	√
11	Pumpkin	Vege.	Low	Xaisy village	√	√
12	Spinach	Vege.		Paksong	√	√
13	Banana	Fruit	Low	Kasaeng village	√	√
14	Mango	Fruit		Thailand	√	√
15	Tamarin	Fruit		Thailand	√	√

Annex 2: Crops production in targeted provinces

Table 4: Corn production in targeted districts of Savannakhet province

	2013	2014	2015	2016	2017	2018
Province	17,130	16,370	19,265	23,905	21,605	5,006
Sepon	885	495	120	1,515	1,015	446
Atsaphone	1,280	1,260	2,754	1,590	1,590	419
Pin	660	690	986	1,035	1,035	510
Phalanxay	655	955	538	1,395	1,395	307
Thapangthong	755	640	825	940	940	232
Xonbouly	3,375	2,695	2,842	2,525	1,525	210

Table 5: Corn production in targeted districts of Saravan province

	2013	2014	2015	2016	2017	2018
Province	12,550	10,605	9,790	11,285	5,425	8,102
Saravan	800	1,010	993	2,475	805	
Laongam	5,100	5,525	5,970	2,000	3,120	3,152
Tomlan	-	10	60	10		
TaOy	5,115	2,050	1,182	125	325	

Table 6: Table: Corn production in targeted districts of Attapeu province

	2013	2014	2015	2016	2017	2018

Province	2,905	4,365	4,195	3,190	2,355	1,814
Samakixay	491	206	570	460	80	
Xaysetha	400	920	207	7	156	

Table 7: Banana production in targeted districts of Savannakhet province

	2013	2014	2015	2016	2017	2018
Province	6795	15,760	18,335	16,560	33,590	65,442
Sepon	0	8,565	2,590	1,901	3,960	-
Atsaphone	975	972	1,188	745	1,590	7,839
Pin	0	934	2,400	1,803	3,720	3,724
Phalanxay	410	-	935	383	800	874
Thapangthong	50	280	-	80	170	-
Xonbouly	150	-	495	131	255	1,944

Table 8: Banana production in targeted districts of Saravan province

	2013	2014	2015	2016	2017	2018
Province	92245	83,350	160,330	174,090	22,660	13,823
Saravan	12970	13,932	22,898	28,420	2,520	
Laongam	75906	66,687	134,705	137,835	6,650	6,448
Tomlan	127	15	11	20	480	
TaOy	1800	-	-	4,515	7,020	

Table 9: Banana production in targeted districts of Attapue province

	2013	2014	2015	2016	2017	2018
Province	1330	810	620	10,380	19,280	
Samakixay	84	106	24	268	468	
Xaysetha	132	144	36	4,220	7,220	

Annex 3: Criteria for shortlisted products

Table 10: Criteria for shortlisted products

	Selection Criteria	Point	Weight (%)
1.	Nutrition Improvement		30
1.1	Is nutritional product	1-10	10
1.2	Improve dietary diversity	1-10	10
1.3	Locally available	1-10	5
1.4	Familiarity in local community	1-10	5
2.	Income Increase		30
2.1	Locally produced with improved technologies	1-10	5
2.2	Potential to increase income and profitability	1-10	5
2.3	Have the possibility for value addition thru processing	1-10	5
2.4	Strong local and provincial market demands	1-10	5
2.5	Potential for market growth including export markets	1-10	5
2.6	Possibility of scaling up and scaling out	1-10	5
3.	Social Impact		10
3.1	Are likely to create employment and participation of marginalized, minority and poor, including women	1-10	5
3.2	Are not impacting negatively the work load of household (especially women)	1-10	5
4.	Environmental Impact		10
4.2	Increase resilience to climate change	1-10	5
4.3	Produced with limited negative impact on the environment	1-10	5
5.	Institutional Impact		20
5.1	Favorable local policy support	1-10	5
5.2	Have access to inputs to produce the crops	1-10	5
5.3	Have access to transport to reach markets	1-10	5
5.4	Availability of advisory and microfinance, etc. services	1-10	5
	Total		100

Note: Point 1= Least extent; 5= Moderate; 10= Most extent

Annex 4: Criteria for village selection for field survey

Table 11: Village and household selection

	Criteria for selection
Village	<p>Village 1: close to the district market with active commercial production system with good market linkages. Being medium or better-off village compared to other targeted villages. Having producer group for potential shortlisted is an advantage. Could be a lowland village.</p> <p>Village 2: Some distance from district center but accessible in both seasons. Commercial production and production system is limited but has potential to develop the nutrient sensitive value chains. Being ethnicity and poor or medium compared to other targeted villages. Could be an upland village.</p>

Household	<p>In each village, about 10-12 producing households (half are women) should be invited to the discussion, of which 3-4 are better-off households, 3-4 are medium and 3-4 are poor HHs. In case of a mixture between Lao Loum and ethnicity, a proper proportion of ethnicity should be invited.</p> <p>If there is a producer group, group committee and active group members should be invited. If there is a local collector or processor based in the village, he/she should also be invited.</p>
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Annex 6: Work plan and field survey agenda

Activities	Days	Date	Location	Outputs	Output due	Sources	WHO (support from the team)
Step 1: Verify the short-list of VCs							
Activity 1: Desk Research	3.0	25-29/03	VTE	Detailed activity plan	29/03	SO1 project document, Baseline survey, Long-list of crops, PAFO+DAFO reports, Provincial+district maps, etc.	Kamkeo, Vathana Douangdenh, Aimeric, Erene
Activity 2: Design criteria and tools	4.5	01-12/04	VTE	Final detailed criteria, methodology	02/04	Comments from project core team	Core team
				Data collection tool	08/04		
				Field work agenda confirmed	10/04	Comments from provincial team	Provincial team
Step 2+3: Field survey							
Activity 3: Finalize the short-list Activity 4: In-depth analyze the shortlisted VCs	19.0	23-24/04	ATP	Final shortlisted VCs Information collected from selected districts in 3 project provinces List of stakeholders of shortlisted VCs		PAFOs, DAFOs, farmers, groups, collectors, processors, traders (wholesalers, retailers), transporters, Projects (VFI, PSI, etc.)	Douangdenh Soulinthone
		25/04-02/05	SRV				Douangdenh Soulinthone
		03-11/05	SVNK				Douangdenh Phouthasack
Step 4: Recommend interventions			VTE				
Activity 5: Data entry and analysis	1	12-13/05	VTE	Initial results of the NSVCA	13/05		
Activity 6: Presentation of initial findings	0.5	15/05	VTE	Draft of PPT	14/05	Comments from the team	All participants
Activity 7: Draft and final report	12.0	15-26/05 31/05	VTE	Draft report Final report	24/05 31/05	Comments from project core team	Core team
	40.0						

Core Technical Team: Irene, Kamkeo, Aimeric, Duangdenh (2232 2203), Sunnti (5520 4455)

Provincial Team: Souksavanh SVNK (5406 8688), Phanmaly SRV (5541 2157), Phitthiphong ATP (9687 2343), Soulinthone (5505 0473), Phouthasack (2803 5806)

Day	Time	Activity	Who
Mon. 22 Apr.	08:00-09:15	From VTE C. to Pakse (QV305)	Vong + ???
	09:30-12:30	From Pakse to Attapeu (be picked at airport) DD, PTS, SLT arrive in Attapeu	Vong DD, PTC and SLT
	13:30-17:00	In-class training and discussion on the tools	Field survey team
		Overnight in Attapeu	
Tue. 23 Apr.	08:15-09:30	Meeting with Attapeu PAFO	ATP FST
	10:00-11:00	Meeting with Samakhixay DAFO	
	12:30-17:00	Data collection in Layaoneua in Samakhixay	ATP FST + PAFO, DAFO
		Overnight in Attapeu	
Wed. 24 Apr.	08:00-12:00	Data collection in Hom in Samakhixay	
	13:00-16:00	Meeting with collectors, traders in Samakhixay	ATP FST + PAFO, DAFO
	16:00-18:30	From Attapeu to Saravan	FST
		Overnight in Saravan	
Thu. 25 Apr.	08:15-09:10	Meeting with Saravan PAFO	
	09:20-10:00	Meeting with Saravan DAFO	
	11:00-12:00	Meeting with VFI in cricket producers and traders in Saravan	
	14:00-17:30	Data collection in Leansamphan village in SRV district	SRV FST + PAFO, DAFO
		Overnight in Saravan	
Fri. 26 Apr	08:30-12:00	Data collection in Napaly village in SRV district	
	13:00-17:00	Meeting with collectors and traders in SRV district	SRV FST + PAFO, DAFO
		Overnight in Laongam district	
Sat. 27 Apr.		Data collection in Nongtakai and Keppuang villages in Laongam districts	SRV FST + PAFO, DAFO
		Overnight in Saravan district	
Sun. 28 Apr		From Saravan to Ta-oy, meeting with traders in Ta-oy district	Vong and FST
		Overnight in Ta-oy district	
Mon. 29 Apr.	08:00-12:00	Meeting with Ta-oy DAFO, data collection in Pachucheng and Porsen villages in Ta-oy district	SRV FST + PAFO
	13:00-15:00	Meeting with traders in Samoi district	SRV FST + PAFO, DAFO
	13:00-17:00	From Samoi to Saravan	
		Overnight in Saravan	
Tue. 30 Apr.	08:30-11:30	From Saravan to Laogam, meeting with moringa company in Tabang village	
	15:30-18:00	From Laongam to Pakse	SRV FST + DAFO
		Overnight in Pakse district	
Wed. 1 May		Data entry and analysis	Vong and FST
		Overnight in Pakse district	
Thu. 2 May	08:30-09:30	Meeting with Champasack PAFO	Vong and FST
	09:30-12:00	Meeting with input providers in Pakse	
	16:00-17:30	Data entry and analysis	
		Overnight in Pakse	
Fri. 3 May	08:00-12:00	From Pakse to Savannakhet	
	14:00-15:00	Meeting with Savannakhet PAFO	
	15:00-17:00	Meeting with traders in Savannakhet	Vong and FST
		Overnight in Savannakhet	
Sat. 4 May		Data entry and analysis	Vong and FST
		Overnight in Savannakhet	

Sun. 5 May		Data entry and analysis, meeting with traders in Savannakhet	Vong and FST
Mon. 6 May	08:00-12:00	From Savannakhet to Xepon district	SVNK FST + PAFO
	13:00-14:00	Meeting with Xepon DAFO	
	14:15-17:00	Data collection in Huaychaenh village in Xepon district	
		Overnight in Xepon district	
Tue. 7 May	09:00-11:30	Data collection in ALangyai village in Xepon district	SVNK FST + PAFO, DAFO
	12:30-15:00	Meeting with collectors and traders in Xepon and Dansavanh	
	15:00-18:30	From Xepon to Atsaphone district	
		Overnight in Atsaphone	
Wed. 8 May	08:00-10:00	Meeting with Atsaphone DAFO	SVNK FST + PAFO
	10:30-17:30	Meeting with villagers in Donekong and Phontoum villages	SVNK FST + PAFO, DAFO
		Overnight in Atsaphone district	
Thu. 9 May	08:30-12:00	Meeting with ILO team, meeting with traders in Atsaphone, from Atsaphone to Xonbouly district	SVNK FST + PAFO, DAFO
	13:00-16:00	Data entry and analysis and meeting input providers and traders in Xonbouly	
		Overnight in Xonbouly	
Fri. 10 May	08:00-10:00	Meeting with Xonbouly DAFO	SVNK FST + PAFO
	10:00-16:00	Meeting with villagers in Nongbouluang and Donexang	SVNK FST + PAFO, DAFO
	16:18:30	From Xonbouly to Savannakhet	
		Overnight in Savannakhet	
Sat. 11 May	08:30-12:30	From Savannakhet to Pakse	Vong
	17:40-18:50	From Pakse to VTE	Vong
		Overnight in Savannakhet	

Persons: Thiphavong (Vong), Douangdenh (DD), Phouthasack (PTS), Soulinthone (SLT), Field Survey Tam (FST)

Locations: Attapeu (ATP), Saravan (SRV), Savannakhet (SVNK)

Annex 6: Key farmers and traders interviewed

Name	Product	Role	Village	District	Province	Phone No.
Mrs. Kongsy	Corn	Producer	Kepphueang	Lao Ngarm	Saravane	-
Mrs. Kitui	Corn	Producer	Len	Lao Ngarm	Saravane	-
Mrs. Juay	Corn	Producer	Pajujeun (New)	Ta-oy	Saravane	30 9986 472
Mrs. Lai	Corn	Producer	Hom	Samakexay	Attapue	
Mr. Tum	Corn	Producer	Napaly	Saravan	Saravane	
Mr. Lan	Corn	Producer	Kepphueang	Samakixay	Attapue	-
Mr, Yan	Corn	Producer	Phorchang	Ta-oy	Attapue	-
Mrs. Bounna	Corn	Producer	Huaycheng	Xepon	Savannak het	-
Mr. Tham	Corn	Producer	Alangyai	Xepon	Savannak het	-
Mrs. Lam	Corn	Producer	Donkong	Atsaphone	Savannak het	-
Mr. Bounmy	Corn	Producer	Phontoum	Atsaphone	Savannak het	30 9372 071
Mrs. Khunkeo	Corn	Producer	Nongbouluang	Xonnabouly	Savannak het	-
Mr. Inthava	Corn	Producer	Beungxang	Xonnabouly	Savannak het	9986 7030
Mr. Khamsith + Mrs. Kod	Pumpkin	Producer	Hom	Samakexay	Attapeu	30 9854 466
Mr Bounnan	Banana	Producer	Layao-Nuea	Samakkhixay	Attapeu	5876 3366
Mrs Ngaxai	Banana	Producer	Hom	Samakkhixay	Attapeu	2229 0994
Mr Somhack	Banana	Producer	Leuansamphanh	Saravane	Saravane	9184 7937
Mrs. Phit	Banana	Producer	Napaly	Saravane	Saravane	-
Mrs Jane	Banana	Producer	Pajujeun (New)	Ta-oy	Saravane	30 4825 937
Mr. Sinxay	Banana	Producer	Len	Laongam	Saravane	9517 0180
Mr. Thou	Banana	Producer	Ketpherng	Laognam	Saravane	0
Mr. Thou	Banana	Producer	Pajujeun (New)	Ta-oy	Saravane	0
Mrs. Bounna	Banana	Producer	Huaycheng	Xepon	Savannak het	
Mr. Bai	Banana	Producer	Alangyai	Xepon	Savannak het	9233 6780
Mr. Tou Silanon	Banana	Producer	Nongboulung	Xonnabouly	Savannak het	-
Mr Hounda	Chicken	Producer	Layao-Nuea	Samakkhixay	Attapeu	30 9578 507
Mr Hongmanee	Chicken	Producer	Napaly	Saravane	Saravane	30 9492 861
Mr Amphone	Chicken	Producer	Pajujeun (New)	Ta-oy	Saravane	9614 0216
Ms. Kingsavan	Chicken	Producer	Layao-Nuea	Samakkhixay	Attapeu	9914 9466
Mr Lan	Chicken	Producer	Layao-Nuea	Saravane	Attapeu	0
Mr. Man	Chicken	Producer	Phorsern	Ta-oy	Saravane	0
Mr. Panom	Chicken	Producer	Huaycheng	Xepon	Savannak het	30 9016 785
Mr. Sonexay	Chicken	Producer	Phontoum	Atsaphone	Savannak het	0
Mr. Pang	Chicken	Producer	Donekong	Atsaphone	Savannak het	0
Mr. Touan	Chicken	Producer	Buengxang	Xonabouly	Savannak het	0

Mr. Bouala	Chicken	Producer	Nongboualouang	Xonabouly	Savannak het	0
Mr. Seouy	Frog	Producer	Nongtakai	Lao Ngarm	Saravane	
Mr. Bounneon	Frog	Producer	Layao-neua	Samakixay	Attapue	9534 2359
Mr. Seuy	Frog	Producer	Nongtakai	Lao Ngarm	Saravane	
Mrs. Jeak	Frog	Producer	Alangyai	Xepon	Savannak het	-
Mrs. Phou	Cricket	Producer	Hom	Samakkhixay	Attapeu	30 4481 587
Ms. Kaison	Cricket	Producer	Samaki	Samakkhixay	Attapeu	5658 3573
Ms. Inthasone	Cricket	Producer	Vatkang	Saravan	Saravan	9615 3622
Mr. Phon	Cricket	Producer	Buenxang	Xonbouly	Savannak het	30 9399 826
Mrs. Pailin	Cricket	Producer	Phonmuang	Xepon	Savannak het	9992 2211
Ms. Phit	Chicken	Trader	Houytone	Xepon	Savannak het	30 9553 043
Ms. Song	Corn	Trader	Saravan market	Saravan	Saravan	9152 7197
Ms. Pakaikham	Chicken	Trader	Kamakixay market	Samakixay	Attapue	9882 5945
Mr. Sivixay	Chicken	ILO Advisor		Atsaphone	Savannak het	5588 0456
Mr. Yoo	Banana	Trader	Savannakhet market	Savannakhet	Savannak het	5651 9002
Mr. Lith	Chicken	Producer	Lith Farm	Pin	Savannak het	9556 3165
Mrs. Kanthong	Frog	Metamorph supplier	Kanthong Farm	Savannakhet	Savannak het	2277 9657
Mr. Laheoy	Banana	Trader		Collector	Sepon	5536 9498
Mr. Joy	Frog	Metamorph supplier	Vocational School	Saravan	Saravan	9852 8389
Mr. Phamma	Moringa	Trader	JS Farm	Tabang	Laongam	2208 4707
Mr. Ngean	Banana, Pumpkin	Trader	Dao Group	Pasong	Champasack	5973 8888
Mr. Jo-ee	Cricket	Producer, trader		Savannakhet	Savannak het	2371 2028