



The 3rd Lao Census of Agriculture 2019 / 2020

Volume II



Vientiane Capital

**The National Supervising Commission on the 3rd Lao Census of Agriculture
2019/2020**

Report on Census findings
3rd Lao Census of Agriculture 2019 / 2020
(LAC III 2019 / 2020)
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This work is a product of the Lao Statistics Bureau, the Ministry of Agriculture and Forestry, and the Food and Agriculture Organization (FAO). The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of the Food and Agriculture Organization, its Board of Executive Directors, or the governments they represent.

Foreword

The Census of Agriculture is conducted every ten years. The first census in 1998/1999, second in 2010/2011 and the third in 2020/21. The main objective of this census is to monitor the changes in the structure of the agricultural sector in the last ten years; and other factors that contribute to agriculture development, such as infrastructure development, labor, machinery and equipment, and other factors of production. In addition, the census data will be used to produce indicators related to the agriculture sector to monitor the NSEDP 2021-2025 and the Sustainable Development Goals.

The 3rd Lao Census of Agriculture 2019/2020 (LACIII) was approved by Prime Minister H.E Thongloun SISOULIT (No. 46/PMO, dated 31/5/2017). A census steering committee was established (Agreement No. 82/PMO, dated 01/12/2017) for the overall management of the census. The committee is chaired by Deputy Prime Minister, Minister, Ministry of Financial, and contains the Head of Lao Statistics Bureau (Official in-charge); Deputy Minister, Ministry of Agriculture and Forestry, and Deputy Minister, Ministry of Finance. Steering Committees were also established at the provincial and district levels. An Agricultural Census Office (ACO) was created in the Lao Statistics Bureau (LSB) to implement the census. At the provincial and district level, the deputy of provincial governor was assigned as the head of provincial steering committee, director of planning division was deputy head of provincial steering committee, the director of statistics office is officer-in-charge, the director of agriculture and forestry division and financial division are members of the committee. The committee and census office at the district level has the same structure.

The Lao Census of Agriculture 2019/2020 covers 17 provinces and 1 municipality, districts and villages. All farm households were captured during the listing exercise and after then large sample was selected the survey was conducted. This report is the second volume of Lao Agriculture Census report and follows the release of Volume 1 in 30 June 2021; and includes a detailed interpretation of the census findings. Users of this report will have in depth understanding on the holding pattern change, the production behavior, the variety and sale of agriculture production, the modernization of equipment usage; and will emphasize further on agriculture holding characteristic, agriculture land holding, the production of crop, yield, livestock, and forestry, irrigation and agriculture input like labor, food security to support the monitoring of NSEDP, SDG, the food security program, gender program, and land-use program. The report also shows the census finding in 2019/2020 compared with the last 2 censuses in 1998/1999 and 2010/2011. The report is designed in 13 chapters: chapter1 on overview, chapter2 on agriculture Holdings and Land Tenure, chapter 3 on Cropping Pattern Change, chapter 4 on Livestock and Poultry Production, chapter 5 is about Fisheries, chapter 6 is forestry, chapter 7: Use of Machinery and Equipment, chapter 8: irrigation, chapter 9 is on labor and income, chapter 10 Environment (Waste) Management Practices, chapter 11: Natural Disaster and Household Food Security, chapter 12 is about Village Infrastructure and Access to Facilities and chapter 13 Sustainable Development Goals.

We hope that this report will provide invaluable data and information to the policy makers and other users for further study and investigation to improve the National Social-Economics Development Plan (NSED) and as same as agriculture development in Lao PDR. I would like to thank the entire team who worked hard to carry out the census and develop this report. My sincere thank goes to the census enumerators and supervisors who made possible the grand activity. I also thank all farmers who provided the information during data collection period.

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We would like to extend our thanks to the Food and Agriculture Organization (FAO) for the great support throughout the census period particularly the technical assistance and other support on census implementation.

We believe that the findings of this report will provide useful insights to policy makers. We hope that the report lays a foundation for further investigation on related topics across the agriculture sectors. In addition, we hope the household, all agencies and other users will continue support on develop statistics system by providing the reliable information as the Lao citizen.

Phonesaly SOUKSAVATH



**Head of Lao Statistics Bureau
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Acronyms and Abbreviations

ACO	Agriculture Census Office
CAPI	Computer Assisted Personal Interviewing
Cs-Pro	Census and Survey Processing System
DB1	Data Base 1
DB2	Data Base 2
FAO	Food and Agriculture Organization of the UN
FAORAP	FAO regional office for Asia and the Pacific
FAOSTAT	FAO Statistics
GDP	Gross Domestic Product
Ha	Hectare
ISIC	International Standard Industrial Classification
LAC	Lao Agriculture Census
LSB	Lao Statistics Bureau
Lao PDR	Lao People's Democratic Republic
MAF	Ministry of Agriculture and Forestry
NSEDP	National Socio Economics Development Plan
SDG	Sustainable Development Goals
UNSD	United Nations Statistics Division
WCA	World Census on Agriculture

Executive Summary

The Agriculture Census of Lao PDR for the first time in 1998/99 and has since been conducted in every ten-year intervals. The third Agriculture Census was carried out in 2019/20 by Lao Statistics Bureau, Ministry of Planning and Investment in collaboration with the Ministry of Agriculture and other concerned stakeholders. The entire project period was from 2018 to 2020. The Agriculture Census the major statistical activity of the Government of Lao PDR that provides structural data on agricultural land, irrigation, crop production, forestry, livestock, aquaculture, fishery, machinery, equipment, agricultural service, labor utilization, food security, and environment. Technical assistance for the preparation and implementation of this Census was supported by Food and Agriculture Organizations of the United Nations. Based on the Lao Statistics Law and the decision of the Prime Minister on the third Lao Census of Agriculture (LAC) 2019/2020, the entire census operations were conducted. The LAC essentially develops a sample frame for conducting various thematic agricultural surveys in the days to come. Moreover, this will help to develop business registers in agriculture sector. The third LAC will play an important role in the improvement of various sectors of the economy, which are used to measure short-term and long-term changes in the economy.

This report documents and analyses the findings of the third LAC 2019/20 and also make a comparison to the results of previous censuses to some extent. Major dimensions of this analysis includes cross-sectional analysis across the three regions: north, central, and south; 17+1 provinces: Phongsaly, Luangnamtha, Oudomxay, Bokeo, Luangprabang, Huaphanh, Xayabury, Xaysomboun, Xiengkhuang, Vientiane Province, Borikhamxay, Khammuane, Savannakhet, Sarvane, Sekong, Champasack and Attapeu and Vientiane Capital; three types of villages: urban, rural with road access, and rural without road access; and four types of landscape: mountain, plain, plateau, and mixed. However, in some context, a chronological comparison has also been made using the information of three consecutive Agriculture Censuses of the Lao PDR. The analysis mainly focuses on the themes key to the agriculture sector in the Lao PDR. Major themes under consideration of the analysis includes the composition and structure of farm households; land use, cropping patterns and agricultural performance; livestock and poultry production; forestry, aquaculture and fisheries; village-level infrastructure and development constraints; and gender dimensions of the agricultural sector. This executive summary presents some of the main findings of each chapter of this report, as well as key points specific to each theme.

Chapter one discusses the background overview of the agriculture sector of the country, including the objective, scope, coverage, sampling strategy, data processing techniques, and a quick review of the first and second Agriculture Census of Lao PDR. As discussed in this chapter, the third LAC was much more comprehensive as compared to the first two censuses and significant improvements were made in data collection since the entire data collection was conducted using tablets. Though this census is based on sampling procedure, all 644 thousand farm households were enumerated in the listing operation. However, a well representative random sample of 40

thousand (6.3%) farm households was enumerated to collect the detailed information. Village-level data were also collected from village heads in all 8 416 villages throughout the country.

The second chapter documents and analyses the information on agriculture holding and land tenure as reported by the farm households during the census enumeration period. Basically, this chapter discusses the various characteristics of the variables related to farm households such as age and sex distribution of the head of the household, education attainment and distribution of land parcels according to holding. As presented in this chapter, the number of farm households in the Lao PDR has not changed over 20 years. The number increased sharply in between 1998/99 and 2010/11 and again came down to the same level after ten years. This is mainly due to a change in the definition of farm households during the present census of 2019/2020¹. Looking at the gender perspective, the LAC 2019/20 showed that among the total farm households in Lao PDR, almost 90% are headed by males and the remaining 10% are headed by females. The households with single ownership are almost 99% while remaining 1% of the households have multiple ownership.

The educational status of the farm population reveals that people in Lao PDR are still left behind from the access to education since almost 28% of the farm population have never attended school and only about 31% have primary level education, about 14% of the population have achieved the lower secondary level of education while only about 6% of them have got secondary education. A negligible number of people (only about 3217 persons) have received training and more than half a million of the population have attained only kindergarten or other degrees. Among all, females are more underprivileged of getting basic education since the proportion of female not attending school is 32% while that of male is only 19%.

The land distribution in Lao PDR looks almost homogenous among the farm population but seems heterogeneous among the regions and provinces. About 22% of the farm households have less than 1 hectare of land. Farmers having 1 to 2 hectares of land are about 31%, while almost 24% of the farmers have 2 to 3 hectares of land and farmers having more than 3 hectares of land are almost 22%. On the other, the southern region has more medium to large sized farmers compared to north and central. Similarly, the highest number of small holders having their land less than 1 hectare reside in Savannakhet, while the highest proportion (56%) of these small holders reside in Huaphanh province in the north. The highest number of large farmers having more than 3 hectares of land are also in Savankhet, while the highest proportion of them are in Xaysomboun compared to other categories.

There is a big gap between males and females owing agricultural land 92% land is owned by males while only 8% by females. Female ownership of agricultural land was reported to be

¹ The definition of 'agricultural household in 2019/2020: refers to the agricultural land ownership of 0.1 hectare or more; 05 cattle or more; 10 pigs and goats or more; and 50 poultries or more. The definition of 'agricultural household in 2010/2011' refers to the agricultural land ownership of 0.02 hectare or more; 05 cattle or more; 10 pigs and goats or more; and 50 poultries or more. If based on the 2010/2011 definition, agriculture holding is about 851 thousand household in 2019/20.

varied across the regions and provinces. South and Central regions both have similar female ownership rates while north has the lowest female ownership in land. Among the provinces, Savannakhet has the highest proportion of female ownership on land followed by Khammuane and Saravane. The lowest proportion of land owned by females has been observed in the province Xaysomboun. In the similar fashion, there is a big gap between males and females in the decision-making process. Only 13% females decide on agricultural activities in the Lao PDR.

Chapter 3 of this report documents and analyses the information on crop production, factors of crop pattern changes, agricultural practices and extension services. Comparing the three LAC results, it is found that the area under various crops increased between 1998/99 and 2010/11 but decreased between 2010/11 and 2019/20. The reason of the decrease in area under most crops is mainly due to the changed definition of farm households in 2019/20. In addition, the commercialization of agriculture might be another cause to shrink the area under different crops. Area under temporary crops varies from 8740 hectares in Xaysomboun province to 197200 hectares in Savannakhet province and that of permanent crop varies from 50 hectares in Khammuane to 39900 hectares in Champasack. Growing temporary crops is almost indifferent to the smaller and larger farmers but in case of permanent crops, larger farmers were more attractive because 38,430 farm households with farm holding size three hectares and more were involved in cultivating permanent crops while only 8,400 farm households with farm holding size below one hectare cultivated the permanent crops in 2019/20. Therefore, it can be said that farm holding size is one of the determinants of making decision to grow different crops.

More than 100 types of temporary crops were reported to be grown in the Lao PDR. However, rice dominates all the temporary crops and most rice is grown in the lowland while upland agriculture is shifting crop system cultivation. A total of 603 thousand farm households grew rice in 2019/20 which was decreased by 1.5% as compared to the second round LAC 2010/11. The second major temporary crop in Lao PDR was maize followed by millet, cassava and chili. Cassava was reported as one of the major temporary crops during first and second LAC periods but the cultivation of the cassava sharply fell in 2019/20 since growers and area under cassava crop decreased respectively by 21 percent and 26.5 percent between 2010/11 and 2019/20. Commercial crops are planted mainly in the irrigated lowland system. The majority of farmers in Lao PDR followed mixed farming depending upon the topography of the land. Rubber, coffee, banana are major permanent crops occupying a large land area. But the number of growers and area under coconut, tamarind, papaya sharply fell between 2010/11 and 2019/20. The number of growers of mango sharply fell down between 2010/11 and 2019/20 while the area under mango went little up in that period. The average area per grower for permanent crops was almost similar to that of temporary crops.

The LAC 2019/20 reported that cultivation in the Lao PDR is mainly aimed for both consumption and selling purposes depending on the types of crops. However, most crops were mainly produced for the selling purpose 2019/20. Tobacco, mushroom and Chinese cabbage were

produced only for sale. Similarly, crops such as hard corn, mungbean, sugarcane, water melon, cabbage, pineapple, lettuce, red beans, cotton, ginger, black beans, soybean and sesame were mainly produced for sale. Permanent crops such as coffee, tea, and lemon were grown mainly for sale, while mango was grown mainly for consumption and sale.

Regarding market access, households in town areas reported relatively lower distance than that of the rural areas. In town, a household needs to move 8 kilometers on average to reach the nearest market point while rural with road access need 12 kilometers, and rural with no road need 13 kilometers. Majority of households (about 72% of total farm households) sold agricultural produce. Proportionally, about 85% farm households sold agricultural produce inside their village or town while a small number of households (15%) sold the produce outside of their village.

In 2019/20, 168,484 farm households (26% of total farm households) took on some form of agricultural loan. The proportion of farm households taking loans ranged from 66 % (Oudomxay) to 9% (Savannakhet). Farm households obtain loans mainly from public banks, village development funds, agricultural extension banks, other banks, microfinance. Besides these sources some households also received loan from other sources. Basically, farm households seek a loan to purchase agricultural inputs, farm equipment, livestock, land and to construct farm building and other infrastructure. Majority of farm households borrowed money to buy livestock followed by buying crop inputs.

Chapter 4 documents and analyzes the findings of LAC 2019/20 on livestock and poultry in the Lao PDR. The LAC 2019/20 reported that livestock is the second-largest agricultural activity in the Lao PDR since 515,554 households (80%) have livestock or poultry. The proportion of households with livestock or poultry ranged from 65% to 93% by province. Cows, buffaloes, goats, pigs are the major livestock and chickens, duck are major poultry in the Lao PDR. The LAC 2019/20 enumerated 2165 thousand cows, 541 thousand buffaloes, 509 thousand pigs, 406 thousand goats, and 13972 thousand poultry in 2019/20. The majority of farm households farmed chicken lat followed by cows in 2019/20. The number of cow owners remained unaltered between 2010/11 and 2019/20 while owner of goat farming increased and owner of buffalo, pig and poultry decreased during that period. On the other, between 2010/11 and 2019/20, the number of chicken lat, cows, buffalo and goat increased while that of buffalo, pig, breeding chicken and duck decreased. Overall, the average number of livestock per farm household increased between 2010/11 and 2019/20.

Chapter 5 reports on fishery and aquaculture sub-sectors. Fishery and aquaculture is one of the important secondary occupations in the Lao PDR. A total of 309,800 (48%) farm households engaged in fishing activities in 2019/20 which was slightly decreased as compared to the first and second LACs. Similarly, the number of households engaged in aquaculture also dropped to 54,000 (8.4%) in 2019/2020 from 68,200 in 2010/2011. Farm households also sell aquaculture produce

as the LAC 2019/20 reported that 12.8 percent of total aquaculture households received a total of 3,6 million Kip income by selling aquaculture produce during 2019/20.

Chapter 6 discusses on forestry sub-sector in the Lao PDR. Interestingly, in the third round of LAC, almost all farm households planted forest in 2019/20. Rubber is being more popular followed by a tick in recent time for plantation in the Lao PDR. A total of 52,611 farm households planted rubber in 91,852 hectares of land and 18,845 farm households planted teak in 11,611 hectares during 2019/20. In 2019, a total of 165,412 cubic meters wood were produced, of which rubber accounted for 77,581 cubic meters and the teak accounted for 53,107 cubic meters. The production of other plants was very low as compared to rubber and teak. Among 18 provinces, Luangnamtha reported the highest amount of wood production while Huaphanh reported the lowest. Non-timber forest products such as medicinal plants, fibre and bark, fruits, vegetables, mushrooms, bamboo shoots, honey, aquatic animals, wild animals, tubers, khem grass, paper mulberry bark, cardamom, melba nuts, benzoin, resins, oleoresins is also very common in the Lao PDR. The third round LAC reported that 69% of farm households engaged in collecting non-timber forest products in 2019/20. Non-timber forest production activities were aimed mainly for consumption and some households (24%) also sold the produce to raise their income. The LAC 2019/20 reported that a total of 206,885,912,809 kips were earned by selling the non-timber forest productions in 2019.

Chapter 7 reports on the use of machinery and equipment in agriculture sector. Farm households in Lao PDR have been increasingly used modern tools and machinery in farm operations. A majority (81%) of the total farm households in Lao PDR are using some machinery in 2019/20. Proportion of households using machinery and equipment respectively in north, central and southern regions of Lao PDR were found to be 69.2%, 87.5%, and 88.6%. By province, the proportion of farm households using machinery in the agriculture sector ranged from 94% (Xiengkhouang) to 49% (Luangprabang). The maximum used machine was two-wheel tractors used by 390,938 farm households, followed by lawn mower used by 192,962 farm households in 2019/20. Rural villages with road access reported the highest proportion of farm households using machinery, while rural villages without road access reported the lowest.

Chapter 8 discusses the irrigation system of Lao PDR based on the results of the LAC 2019/20. The agriculture system of Lao PDR depends both on rain-fed and irrigation facilities. Dry season cultivation depends on irrigation and households using irrigation range from 6 percent (Chapasack) to 57 percent (Xiengkhouang). A total of 174 thousand farm households used irrigation and of them a majority (29%) belonged from the group having more than 3 hectares of agricultural land. The main source of irrigation is ponds/rivers/lakes contributed 95% of total irrigation in the Lao PDR. Weir is the main type of irrigation accounted about 52% including temporary weir system in 2019/20.

Chapter 9 documents and analyzes labor and income in the agriculture sector. A total of 642,991 (98.83%) farm households reported labor out of 644,098 total farm households in the Lao PDR during the reference period. These farm households comprised a total of 2,412,023 workers in 2019/20. Almost 50 percent workers were female in 2019/20 showing that male and female in Lao PDR are equally involved in agricultural activities. The majority of the agricultural workers (72%) were engaged in crop cultivation as their main activity, while only 6% accepted livestock as their main activity. As secondary activity, majority of workers (89%) accepted non-agricultural activities followed by crop cultivation (6%). Relatively more time was used in livestock farming than in crop cultivation in the Lao PDR. On average a farmer worked 10 months for livestock, 8.6 months for fishing, 8 months for forestry, and 6.2 months for growing crops in a year. Similarly, farm workers worked a maximum number of days in a month for raising livestock followed by cultivation. In cultivation, farm worker worked relatively the highest number of hours a day, averaging 6.1 hours. The average number of hours spent doing livestock, fishing, and forestry was respectively 3.6, 4.5, and 4.2 hours.

The LAC 2019/20 reported that 151,867 (24%) farm households had some members employed in agriculture during 2019/20. Therefore, the agriculture sector importantly contributed to the generation of household income in the Lao PDR. The third round LAC reported that farm employment contributed 6% household income, earning a total of 452,025,075 Kip in 2019/20.

Chapter 10 analyzes the environment management system and good practices in the agriculture sector. Among the total farm households who cleared area for farming in 2019/20, almost 86% of them sliced and burned the waste, 14% of them cleared the area without burning the waste. Most plant waste (66%) was managed naturally, 25% was managed by burning and about 10% was managed by keeping safe. Livestock waste was managed naturally by 22% farm households while 5% store the waste and only one percent card and spilt the waste in 2019/20.

Chapter 11 reports the natural disaster and food security in the Lao PDR. The LAC 2019/20 showed that more than half of the farm households in Lao PDR were affected by one or more types of natural disasters during the census reference period 2019/20. In 2019/20 drought affected most farm households (74%) followed by pests (35%). In 2019/20, flood- affected 24%, storm-affected 13%, animal diseases affected 8%, and other disasters affected 14% of farm households. Rural villages without road were mostly affected by the natural disaster followed by the rural villages with road access. Overall, plateau villages seem to be more prone to the natural disaster while flood alone mostly affected the plain villages. Obviously, natural disasters have caused a significant loss on the productivity of different crops in 2019/20. Among the 332,853 farm households who were affected by one or another type of natural disaster, only 3% of them have reported that there was no loss in the agriculture productivity and 19% of them have reported that the natural disasters have caused more than 40% loss in their agriculture productivity.

One-third farm households reported that they experienced or are worried about food insecurity in the past 12 months of the enumeration day of LAC 2019/20. Almost 25% of people didn't eat balanced diet over the 12 months. Unfortunately, about 11% of people were compelled to be fasted in some days over the last 12 months due to food scarcity. About 9% ate less food or stayed hungry due to unavailability of sufficient food. Food insecurity was severe among 4% who stayed fully fasting for at least a day during last 12 months.

Chapter 12 documents and analyzes the village infrastructure and facilities in the Lao PDR. As discussed in this chapter, only 17% of villages are categorized as urban among more than 8400 villages in the country. The remaining 83% of villages are further categorized as rural with road access and without road access. Seven percent of rural villages are not connected to the roads.

More than 80% of the villages have at least a primary school, 11% of them have elementary school. All villages (100%) in urban, 92% villages in rural with road access, and only 72% of rural without road access have electricity. Only 27% of households used supplied water while 35% used ground water, 16% used wells with lid, 11% used wells without lid, 27% used rives/dam/reservoir, 17% used rain and 49% used other sources for drinking water in 2019/20. Among about 6900 rural villages in Lao PDR, 6% of those villages have permanent markets, 12% of them have agriculture input shops, 23% have financial institutions, 27% have agriculture machinery shop, 78% have shop, 54% have water user group, only 34% have an irrigation system. About 60% rural villages have some sort of development projects.

Chapter 13 examines the information collected during LAC that will go on to support the compilation of farm-based the sustainable development goals (SDGs) indicators. Though LAC 2019/20 was not aimed to directly measure the SDGs, but most information collected in the LAC are useful to compute measure some SDG indicators. For example: Goal 2 specifies end hunger, achieve food security and improved nutrition, and promote sustainable agriculture with. Therefore, Goal 2 related indicators can be proxied from the LAC 2019/20. As discussed in the chapter 13, it is found that about 12% of the population in Lao PDR experienced shortage of food during the census reference period.

In summary, the information collected in the LAC 2019/20 provides a detailed agricultural status of the country as well as assists in comparing the progress towards the agricultural sector as compared to the previous agricultural censuses. The comparison also assists in measuring the commercialization of the agricultural sector and also the economic transformation in the country. The results of the LAC 2019/20 show that the agricultural system is moving towards commercialization on one hand, and on the other, households are gradually shifting to adopt other than agriculture sector in the recent years. As a result, both farm households and agricultural land decreased but average area of holding increased in 2019/20 as compared to 2010/11. In addition, use of machinery and tools in agriculture has been increasing and thus it can be said that mechanization is being increased in the Lao PDR. Commercial farming like poultry and plantation

such as rubber, teak also increased to support the evidence of commercialization in the agriculture sector in the country. Farm households consume and sell their agricultural produce indicates agriculture not only supports the subsistence but also helps to raise household income in the Lao PDR. There was wider adoption of modern farming practices, such as increasing use of purchased inputs such as fertilizer and rapid increase in the mechanization of farm operations.

The agriculture system in the Lao PDR also suffers from many challenges such as natural disaster and obstacles like low price of produce, lack of labor and improved varieties, lack of irrigation facilities and other infrastructures. However, various emerging development projects will drive the agriculture sector to the desired destination to enhance household income as well as national income. The improved agricultural system will promote export of the country to earn foreign currency. It is expected that the findings of the LAC 2019/20 will be an important agricultural information hub not only for the policy-makers but also for the researchers and international communities. The data collected in the LAC 2019/20 will encourage both researchers and policy-makers to enhance further analysis that can guide better policy formulation in order to mitigate the problems and challenges and use the opportunities for the development of the agriculture sector and the development of the country.

Report on Lao Agriculture Census 2020 (LAC 2020)

Chapter 1: Overview

The Lao PDR is one of the landlocked countries situated at the central part of Southeast Asian region. It shares borders with Viet Nam on the east, Myanmar on the northwest, Thailand on the west, China on the north and Cambodia on the south. Area of Lao PDR is 236,800 square kilometers. Administrative division of this country comprises 18 provinces, 148 districts, and 8,421 villages. Population is approximately 7,231,000 in 2020, with average population density of about 27 person per square kilometer (Pop 2015). The population growth rate has been falling over the last 30 years because of lower birth rates and outward migration as people move to neighboring countries for employment and other economic reasons. Between 2005 and 2015, the annual population growth rate was 1.5 percent, down from 2.1 percent in the previous decade. Lao PDR is still predominantly a rural country despite moderate increases in urbanization over recent decades. In 2015, 67 percent of people in the country lived in rural areas, down from 73 percent ten years earlier.

The Government has made considerable gains in fighting poverty. The poverty rate in Lao PDR has dramatically declined from 46 percent in 1992 to 18.3 percent in 2018/2019. Poverty is more acute in rural areas, where living conditions have improved but many people still lack access to basic infrastructure and employment opportunities. During 2019 to 2021, Lao PDR are facing remarkable challenge and issues such as the COVID-19 crisis, the world economic recession, fiscal and financial issue, high foreign debt and also the effect of climate change. To address these challenges the National Social-Economics Development Plan IX (2021-2025) was endorsed including the transition to graduate from least development country to developing country and achieving SDG 2030 agenda. The agriculture development is included in many programs particularly promotion of modern cultivation and commercial production, substitute import, promotion green development and food security.

This chapter provide an overview on economic trend and structure pattern that has been rapid change over past 3 decades and the contribution of agriculture sector in national development. It then sets the background for a detail census process since 1997/1998, it will emphasize the development of census methodology of the 3rd rounds.

1.1 Background

Lao PDR is a developing country committed itself to building a socialist economy and moves with the ultimate aim of turning into an open-market economy. The country has been gradually undergoing structural transformation moving from primarily agrarian economy toward industrial and service sector economy. However, at the moment, agriculture can be considered as a main stay of the economy since this sector has comprised 15.20 percent Gross Domestic Production (GDP) in 2019 and contributes more than 50 percent of employment.

The country has a strong economic growth over the past 30 years and consider as a high growth economy among ASEAN countries (40 year book). The average GDP growth during 2001-2010 was 7.3 percent and continuously showed significant increase in 2011-2020 with an average of 6.8 percent. Table 1.1 shows the economic structure transformations from basic economy to market economy with diversity productions, in 1990 the agriculture sector contributed 60.7 percent of GDP, in 2001-2010 it was drop to 30.4 percent, and in 2011-2020 it decreased to 17.5 percent. With the decrease in agriculture sector, the Industry and Service sector have been remarkable increased to 30.6 percent and 41.8 percent respectively in 2011-2020. On the other, even though the share of agriculture in GDP has been declined over the period, the agriculture growth increased constantly overtime. It is noticed that agriculture sector in Lao PDR has been contributing the Lao economy continuously.

Table 1.1: GDP growth and share from 1990-2020

	1990	1991-1995	2001-2010		2011-2020	
Sectors	AVG Share	growth	AVG Share	AVG growth	AVG Share	growth
Agriculture	60.7	4.1	30.4	3.5	17.5	2.6
Industry	14.4	12.3	23.2	11.6	30.6	9.4
Service	24.1	6.8	39.0	8.5	41.8	6.5
GDP	-	6.4	-	7.3	-	6.8

Sources: social-Economic data 40 years, Ministry of Planning and Investment, year book 2010-2020, www.laois.lsb.gov.la

Table 1.2: Change in agriculture share of GDP and value added from 1990-2020

	1990	1991-1995	2001-2010		2011-2020	
Sectors	AVG Share	growth	Share	AVG growth	Share	AVG growth
Agriculture	60.7	4.1	30.4	3.5	17.5	2.6
Crop	36.7	-0.2	19.0	3.2	11.5	3.1
Livestock	20.8	7.1	3.9	11.4	2.2	8.8
Forestry	3.2	40.7	4.0	6.0	1.5	-7.7
Fishing	-	-	1.7	3.8	2.7	0.4
GDP	100	6.4	100	7.3	100	6.8

Sources: social-Economic data 40 years, Ministry of Planning and Investment, year book 2010-2020, www.laois.lsb.gov.la

Agriculture is the main occupation and source of food for Lao population. Table 1.2 shows the share of value added in agriculture sector over last 30 years. Crop is main contributor in agriculture sectors with 36.7 percent of GDP in 1990, it was significantly dropped to 11.7 percent in 2011-2020. However, crop maintains an increase of average 3 percent annually since 2000. In

addition, livestock also plays an important role in agriculture sector, despite its small share of GDP average 2.2 percent in 2010-2020, but it still have high growth about 8.8 percent in an average.

Table 1.3 presents the proportion of agriculture export in total export from 1991 to 2020. It has been shown that agriculture also contribute remarkably to national income. In 1990 wood product covered almost 50 percent of total export and it dropped to 1 percent in 2020 due to the government order on prevent the forest and promote the green growth. Coffee has also shown incredible support to the national income which covered average 2 percent of total export since 1991. In addition, other agriculture and forestry products such as cassava, rubber, tea and other industrial crops are significantly increase to 21 percent in 2020 with more diversified export products.

Table 1.3: Proportion of export by main products from 1991-2020

Sector/Year	1991	1995	2010	2015	2019	2020
Wood product	42	28	14	3	1	1
Coffee	3	4	1	2	2	2
Agriculture and Forestry Products	4	4	4	4	17	21
Electricity	22	8	18	17	25	31
Mineral products	0	0	39	22	18	16
Other	29	55	24	52	37	29
Total Export	100	100	100	100	100	100

Source: Custom Department, Ministry of Finance and estimated by Lao Statistics Bureau

Agriculture sector significantly contributes also in the national labor force market. Labor Force Survey 2017, has shown that working-age population contributed 68.8 percent of total population, and 11.6 percent are working in the agriculture sector, and 79 percent of working age population live in rural areas. Most agricultural holdings engage in agricultural activities to produce for their own consumption purpose. The Lao Expenditure and Consumption Survey (LECS) 2018/2019 has shown that household whose head works in agriculture as their main job are poor about 24.6 percent, even though it was decreased about 7.3 percent compare to 2012/2013.

In conclusion, the agriculture sector is the main sector that government consider in order to promote food security and poverty eradication in rural areas of the Lao PDR. The NSEDP 9th (2021-2025), state that the agricultural sector is a potential sector that can be further leveraged to maximize the benefits of the trade privileges that Lao PDR enjoys, as well as to generate more income and jobs for the people. Focus must be given to the following areas: (1) Agricultural production must be closely linked to the production chains of the processing industry to serve domestic and international demands; (2) Produce crops and livestock that already have a market and support the needs of new markets; (3) Shift from single-crop farming to diversified or multi-crop farming (mixed crop system) especially high-yield crops; (4) Promote Good Agricultural Practices (GAP) and organic farming for domestic consumption and tourism attraction; (5)

Improve the efficiency of agricultural production with the use of modern tools, new techniques and science innovations, and new varieties of crops, and transform traditional and fragmented farming practices into production groups or the new cooperative production model, using modern technology (Smart Farming); (6) Create access to credit and markets; (7) Develop strong agricultural infrastructure resilient to natural disasters; (8) Identify areas and types of farming and animal husbandry that are suitable to the potential of each locality and the actual needs of the market; and (9) Establish higher food safety standards.

Based on the 9th NSEDP above, the agriculture and forestry is also associated with Sustainable Development Goals following: ending poverty (Goal 1); ending hunger (Goal 2); gender equality (Goal 5); clean water and sanitation (Goal 6); responsible consumption (Goal 12); life below water (Goal 14); life on land (Goal 15); and lives safe from UXO (Goal 18).

Hence, the Agriculture and Forestry Development Plan 2025 and Vision 2030 was adopted in order to extend the 9th NSEDP and SDGs with 4 working programs and 3 pillars: Food Security Program, Agriculture and Forestry Commodity Production Program, Forest and Forest Resource Management Program and Rural Development and Poverty Reduction Program.

1.2 Lao Agriculture Census

The Lao Statistics Bureau (LSB) is the agency for official statistics that implements various data producing activities under the statistics law 2017. The LSB has been contributing the data for various sectors including social and economic arena. In line with this responsibility, LSB, Ministry of Planning and Investment carried out the third Lao Agriculture Census (LAC) 2019/2020 collaborating with the Ministry of Agriculture and Forestry. The nationwide agriculture survey mainly shows the total number of farm households, the number of acquisitions of agricultural land, plant varieties, livestock species, aquatic animals, purpose of agricultural production and agricultural assets etc. Agriculture census basically provides the structural statistics in agriculture and to some extent the current agriculture statistics as well. More specifically, the agricultural survey is conducted to shed light on the basic structure of crops, livestock, fisheries and forestry, which is the main statistical data for policy formulation and development plans related to agriculture sector of the country.

Agriculture census in Lao PDR was first conducted in 1998/99 by Agricultural Census Office (ACO). Thereafter, ACO conducted second Agricultural Census in 2010/11. The third Agriculture Census was carried out in 2019/20 by Lao Statistics Bureau, Ministry of Planning and Investment in collaboration with the Ministry of Agriculture. This census was technically supported by Food and Agriculture Organizations of the United Nations. Based on the Lao Statistics Law and the decision of the Prime Minister on the third Lao Census of Agriculture 2019/2020, the entire census operation was conducted. In addition, the Ministry of Agriculture and Forestry of Lao PDR has also developed a plan for 2016-2025 in line with the Sustainable Statistical Development Strategy 2016-2025 and Vision 2030, which identify and conduct national

agricultural statistics surveys every ten years. Lao Agriculture Census is one of the large-scale surveys implemented throughout the country aiming to provide basic structure on land, farm households associated with crops, livestock, fisheries and other relevant information. The entire census operation was carried out by National Statistics Center in collaboration with the Ministry of Agriculture and Forestry, the Ministry of Finance, the Ministry of Home Affairs, the Ministry of National Defense, the Ministry of Health, Ministry of Natural Resources and Environment, and the Ministry of Information, Culture and Tourism. The project period was from 2018 to 2020.

The Lao Agriculture Census is the major statistical activity of the Lao PDR which is implemented by covering the entire country using appropriate sampling technique. It is based on the data collection process from the primary source say a farm household. A farm household is considered as a census unit for the enumeration. Basically, it is the whole process of collecting, compiling, processing, analyzing, and publishing agricultural data related to agricultural infrastructures as well as the agricultural produce. Agricultural Census is a well-structured statistical operation providing timely, reliable, accurate and detailed information on the size of agricultural units of different categories. It mainly covers the data collection on agricultural land, irrigation, crop production, forestry, livestock, aquaculture, fishery, machinery, equipment, agricultural service, labor utilization, food security, and environment. Lao PDR Agriculture Census 2019/2020 will be a major data source on agricultural activities in the country. The LAC essentially develops a sample frame for conducting various thematic agricultural surveys in the days to come. Moreover, this will help to develop business registers in agriculture sector. The third LAC will play an important role in the improvement of various sectors of the economy basically the areas, which are used to measure short-term and long-term changes in the economy.

The main purpose of the survey is to collect information on agricultural infrastructure. The information includes number of farm house, number of components in each farm, number of livestock, number of units using agricultural machinery and equipment, fertilizer and manpower used in agriculture. Moreover, the survey aims to collect data on agricultural land use, land tenure, land area growing various crops, irrigation facilities, fishing, planting trees and receiving agricultural income and others. The other general objectives of the survey are as follows:

- To design surveys and conduct specific surveys in the lower reaches of the system,
- To monitor changes in agricultural infrastructure in the last ten years,
- To collect basic socio-economic infrastructure data at the village level,
- To serve the province by providing the list of agricultural statistics and production of important agricultural statistics,
- To provide information for the National Socio-Economic Development Plan and the agro-agricultural development plan at the national level, local and country level,
- To serve the Lao PDR Sustainable Development Assessment,
- To provide the basis for the other relevant research both for public and private.

Scope and Coverage of the Survey

The scope of the National Agricultural Census includes all agricultural producers. All agricultural producers in the land of the Lao PDR, regardless of whether the people are Laotian or not were included in the scope of LAC. The main character of the enumeration unit is that the agricultural household must be a resident of Lao PDR who has been in the Lao PDR for more than 6 months during the census reference period. Agricultural producers; single-family, group-based, unit-based business units are either individuals or groups, all were included in the scope of the survey. The household will be enumerated or not depends upon whether it covers agricultural production activities in the area of Lao PDR from the central level to the local level. The LAC 2019/2020 has collected information on total land holding and agriculture land holding by the farm household in the reference period (2019). Similarly, household level survey covers data on irrigation facilities available both in dry and wet season. The survey includes the information on different type of crops, their production with the area covered by them. Moreover, information on livestock, fishery, aquaculture, forestry, machinery and equipment, agriculture extension services, labor utilized, food security, land management and environment were collected. Agriculture extension service includes information on production activities, technical advice and skill, agricultural loan, agricultural market relevant to the farm household. In addition, village level information was also collected using village form during the LAC 2019/2020.

There are 18 provinces in Lao PDR and all provinces are covered in the LAC 2019/2020. By nature, the LAC is a sample survey since it aims to enumerate 60,000 farm households from 3,700 villages. Therefore, instead of agricultural tenure, only the representative household will be surveyed to collect detailed agricultural activities. In addition, nationwide agribusiness units were surveyed to monitor agribusiness activities that contribute to the economy and use of raw materials and machinery in the production process.

The enumeration unit in the LAC was considered as a farm household. A farm household was defined as the household that operates agricultural activities such as growing crops, keeping livestock and birds, engaging on fishery and aquaculture activities and so on, that contribute to the agricultural produce. Moreover, agribusiness units were also considered as enumeration units of the LAC 2019/2020. For the village level information, the respective selected villages are the enumeration unit of the LAC 2019/2020.

Sampling Design and Data Processing

LAC 2019/20 was a survey based on sampling technique. ICAR (Indian Agricultural Statistics Research Institute), New Delhi developed the sampling design for LAC 2019/2020 under the study entitled “Technical assistance on the sampling strategy of the 2019/20 Lao Agriculture Census” supported by the Food and Agriculture Organization of the United Nations (FAO). Based on this study, the sampling design used in LAC 2019/2020 was stratified two stage random sampling design that can be overviewed as:

Lao PDR administratively consists of 18 provinces followed by 148 districts and further followed by 8421 villages. Within each district, the total number of villages were grouped into two strata as urban and rural. Further, the rural villages were sub-stratified either as large villages and small villages or villages with access to roads and villages without access to roads based on the criterion responsible for heterogeneity of the villages. However, the urban villages need not be sub-stratified. Similar, but updated, village frame which was used in LAC 2010/11 was used for the selection of villages which contained information on the village name, village code, village type and number of households in the village.

Having all data collected from listing operation, detail enumeration, and village enumeration, LSB proceeded its survey activities towards data processing. Basically, data processing refers to the activities of data editing, coding, data entry, consistency checking, tabulation activities of the census information. Since the census field operation was carried out by using tablets, activities like data entry, coding, consistency checking are not necessary. These activities were kept in view at the time of developing the software. As a result, the software automatically checked the data consistency and undertook the coding and obviously data entry activities were carried out simultaneously at the time of interview. Therefore, e-census module not only saved the resources but also helped to ensure the data quality. A technical team of LSB thoroughly reviewed the data for editing and generated the required tables. It is important to note that LSB followed the International Standard Industrial Classification (ISIC) Rev. 4 to codify the economic activities of the enumeration units.

The data entry application was designed using CSPro 7.4 in such a way that entered data could be uploaded to the central server at Vientiane. It is also important to mention that the entered data at field were also supervised in the different tiers by the staff of LSB including respective supervisors and village chiefs. Therefore, it could be claimed that the data so far presented in this report are flawless and accurate to the extent possible.

1.3 Development of Census Methodology since 1998/99 to 2019/2020

The first Lao Agriculture Census 1998/99 covered 141 districts and was undertaken in two parts: a complete enumeration and a sample survey. A total of 798,000 households were enumerated completely to collect basic data about agriculture, whereas the sample enumeration was applied to collect more detail information. For the sample enumeration, 42,028 households (5.3% of total households) were selected from the 2,454 sampled villages. Data were collected in two phases: 1998 wet season and 1998/99 dry season. Agricultural Census Steering Committee was responsible to control the overall agriculture census 1998/99. An Agriculture Census Office comprised of staffs from Ministry of Agriculture and Forestry, and the National Statistics Centre of State Planning Committee implemented the census. According to the first LAC 1998/99, there were 668,000 agricultural households with 4,058,000 farm population. A total of 1,048,000-hectare land was occupied by agriculture and the average size of agricultural holding was found to be 1.62-hectare. Majority of land (73%) was occupied by temporary crops followed by fallow

(11%). Permanent crops only covered 8 percent land, and forest covered only 5 percent land. The predominant crop around the whole of Lao PDR in 1998/99 was rice: 614,000 agricultural holdings grew rice, 77 percent of all households in the country.

The second Lao agriculture census was carried out in 2010/11 in an interval of 11 years from the first Lao agriculture census. The Lao Census of Agriculture 2010/11 covered the whole of Lao PDR, including all 143 districts in the country. Basically, there were three parts in the second Lao agriculture census: village component, household component and sample farm household component. The village component consisted of a survey of all villages in the country to collect data from village heads on rural infrastructure and services. This component included village level information on village infrastructure, socio-economic conditions and environmental factors from 8,662 villages. Household component collected basic data on crops and livestock from all households and the sample farm household component collected detail information on agricultural production activities from the sampled 41,660 farm households. Household component enumerated a total of 1.1 million households under the census and 783,000 households (63.64%) were found to be farm households. Out of these farm households, 41,660 households were randomly selected for a more detailed survey on agriculture related topic such as crop production, information on livestock, agricultural labour, fishery, forestry, agricultural practices, farm management etc.

The third Lao agriculture census was carried out in 2019/20 in an interval of ten years from the second Lao agriculture census. Lao Statistics Bureau in collaboration with the Ministry of Agriculture and Forestry carried out the third Lao agriculture census. This census was entirely carried out using Computer Assisted Personal Interview technique which is a remarkable achievement in the history of agriculture census in Lao PDR. Lao agriculture census was one of the large-scale surveys that covered the information on basic agricultural structure and production statistics of crops, livestock, fisheries, food security, forestry, farm labour, irrigation, machinery, environmental situation and other relevant information. From the coverage point of view, the third Lao agriculture census also covered the entire country with 18 provinces, 148 districts, and 8,416 villages. Out of 1,241,000 total households, a total of 644,000 households were found to be farm households. And of the total farm households, a well representative sample of 60,000 households (9.3%) were selected to collect the detail information.

Table 1.1.4: Comparison of the methodology and definition from 1998/1999 to 2019/2020 censuses

Methodology Development	1998/1999	2010/2011	2019/2020
Agriculture holding definition	Household that have agriculture land 0.02 ha+ Holding cattle/buffalo 2+, pig 5+ and pouty 20+	Household that have agriculture land 0.02 ha+ Holding cattle/buffalo 2+, pig 5+ and pouty 20+	Household that have agriculture land 0.1 ha+ Holding cattle/buffalo 5+, pig 10+ and pouty 50+
Sample	2,454 villages 42,028 households	2,620 villages 41,660 households	2,522 villages 40,421 households SRSWOR
Listing	Conduct at the same time with sample survey	Conduct at the same time with sample survey	Listing June-July 2019 Conduct separately from sample survey
Data collection schedule	February to March 1999	February to April 2011	November to December 2020
Data collection method	PAPI	PAPI	CAPI

Source: Lao Statistics Bureau

Agriculture sector is one of the most important economic sectors of the Lao PDR. This sector contributes almost 20 percent to the national economy. Moreover, majority of people are engaged in agricultural activity. Agriculture sector significantly support the livelihood of most household in the Lao PDR. Moreover, this sector significantly creates jobs and significantly contribute to the labor market. To promote this sector, better agricultural policy process is must. Evidence based decision making will lead the better policy that always demand data with greater accuracy. The third-round census of agriculture is the most important agricultural data source that provides information on basic agricultural structure and production statistics of crops, livestock, fisheries, forestry. In addition, the Lao Agriculture Census 2019/20 provides information on food security, farm labour, irrigation, machinery, environmental situation and many more that are required for the policy process.

Chapter 2: Agriculture Holdings and Land Tenure

An agricultural holding is an economic unit of agricultural production under single management comprising all livestock kept and all land used wholly or partly for agricultural production purposes, without regard to title, legal form or size of holding. Single or management jointly by two or more individuals or households or by a juridical person such as a corporation, cooperative or government agency. The holding's land may consist of one or more parcels, located in one or more separate areas or in one or more territorial or administrative divisions, providing the parcels share the same production means, such as labour, farm buildings, machinery or draught animals. The agricultural holder is defined as the civil person, group of civil persons or juridical person who makes the major decisions regarding resource use and exercises management control over the agricultural holding operation. The agricultural holder has technical and economic responsibility for the holding and may undertake all responsibilities directly, or delegate responsibilities related to day-to-day work management to a hired manager (WCA 2020, FAO).

The analysis follows the convention by which the 17+1 provinces have been classified into three geographical regions: Northern region, Central region and Southern region. The Northern region includes seven provinces, i.e. Phongsaly, Luangnamtha, Oudomxay, Bokeo, Luangprabang, Huaphanh and Xayabury occupying 35.2% of the total farm population in 2019/20; the Central region also includes seven provinces including newly formed Xaysomboun, Vientiane Capital, Xiengkhuang, Vientiane Province, Borikhamxay, Khammuane, and Savannakhet occupying 43.5% of the farm population in 2019/20; and the Southern region comprises only the four provinces of Sarvane, Sekong, Champasack and Attapeu which is a residence of about 21% of the total farm population in 2019/20 according to the results from LAC 2019/2020.

This chapter highlights the analytical report on land tenure of agriculture holding in the country. Mainly, this report presents the analytical findings of the information gathered in the LAC 2019/2020. However, in some cases the results from LAC 2019/2020 is compared to the results of previous two agricultural censuses: LAC 1998/99 and LAC 2010/11. In this way, changes on land tenure during the inter-census period is assessed which also help to examine the progress of the agriculture households on land related subsectors. Moreover, the available information on land characteristics of agriculture households including their age distribution disaggregated with sex, level of education of the head of the household, type of the holding, area of land within the households are used to discuss the cross-sectional variability on the various indicators related to these subsectors across the country. This chapter discusses on the various characteristics of the variables related to farm households such as age sex distribution of the head of the household, education attainment and distribution of land parcels according to holding. Overall, the analysis helps to discuss the major issues and challenges affecting these subsectors and that would be the inputs for policy makers and other stakeholders.

This chapter is presented in three subsections: a. number of agricultural holdings enumerated by type of holding, sex of holder and their educational attainment, b. number of agricultural holdings by size and area (ha) of holding, group of parcels, type of land use, sex of holder and c. area (Ha) of parcels in agricultural holdings by size of parcels, land tenure, terms of rental, sex of holder etc.

This has to be noted here that in the third round of LAC, the definition of farm household has been changed as compared to the second round of LAC. For example, a household was considered as a farm household if it holds 0.1 ha or more agricultural land in 2019/20 but the threshold was only 0.02 ha in 2010/11. By virtue of this changed definition of farm household, some small households were excluded from the sample and hence their number, farm population, holding size and other characteristics were not counted. On the other, in line with the government policy, agriculture system of Lao PDR might be changing to commercial production rather than subsistence agriculture in the past.

2.1 Farm Households by Type, Sex of the Holder and Educational Attainment

The data from three agricultural censuses have been presented in the Figure 2.1 which reveals that the number of farm households in Lao PDR has not changed over the last 20 years. The number increased sharply between 1998/99 and 2010/11 and again came down to the same level after ten years. This is mainly due to change in definition of farm households during the LAC 2019/20.

This is worth mentioning here that if the new threshold is applied for the farm households during 2010/11 census, the holding size goes down to 762.4 thousand instead of 783 thousand.

Figure 2.1: Farm households over the years in LAO PDR by regions

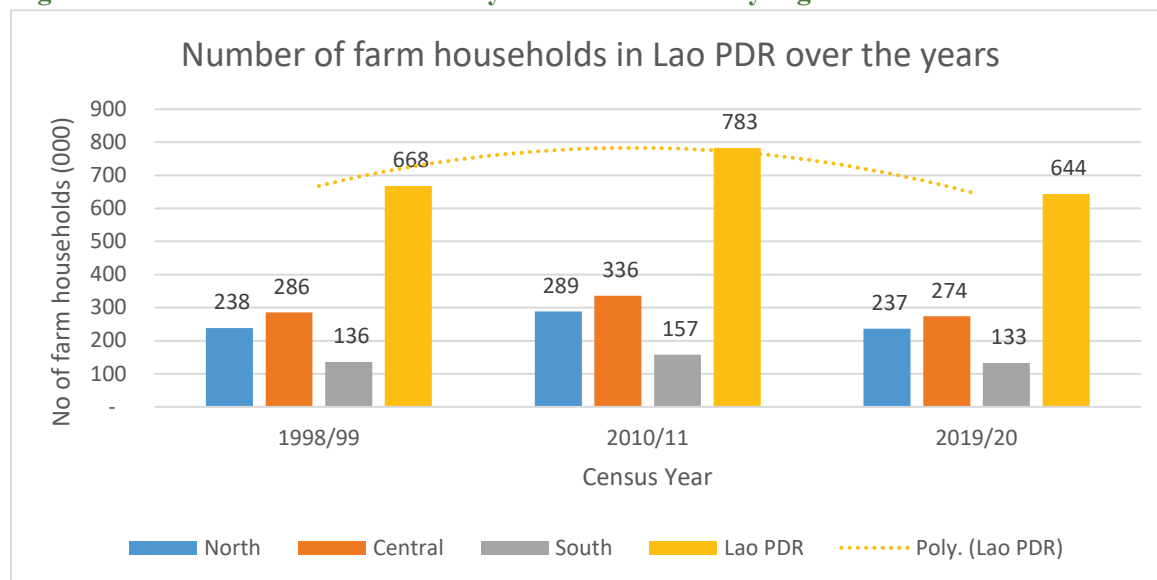


Table 2.1: Farm households by gender and type of household, 2019/20

Province	Male		Female	
	Single household	Multiple households	Single household	Multiple households
North	219,750	2,689	14,017	141
Central	232,932	2,544	37,564	407
South	116,989	1,002	14,536	143
Lao PDR	569,671	6,235	66,117	691

Source: LAC 2019/20

There are a total of 1,241,420 households in the Lao PDR as reported by the third round of LAC 2019/20. Majority of households (64%) reside in the rural areas comprising 61% having road access and rest of 3% having no road access. Remaining 36% households reside in the urban areas (Table 2.2). Out of the three major geographical regions in the Lao PDR, the Southern region has relatively more households in rural areas followed by the Northern region. Comparatively, the Central region is more urbanized as there are 43% households residing in the urban areas and rest of the two regions North and South have respectively 30% and 27% urban households (Table 2.2).

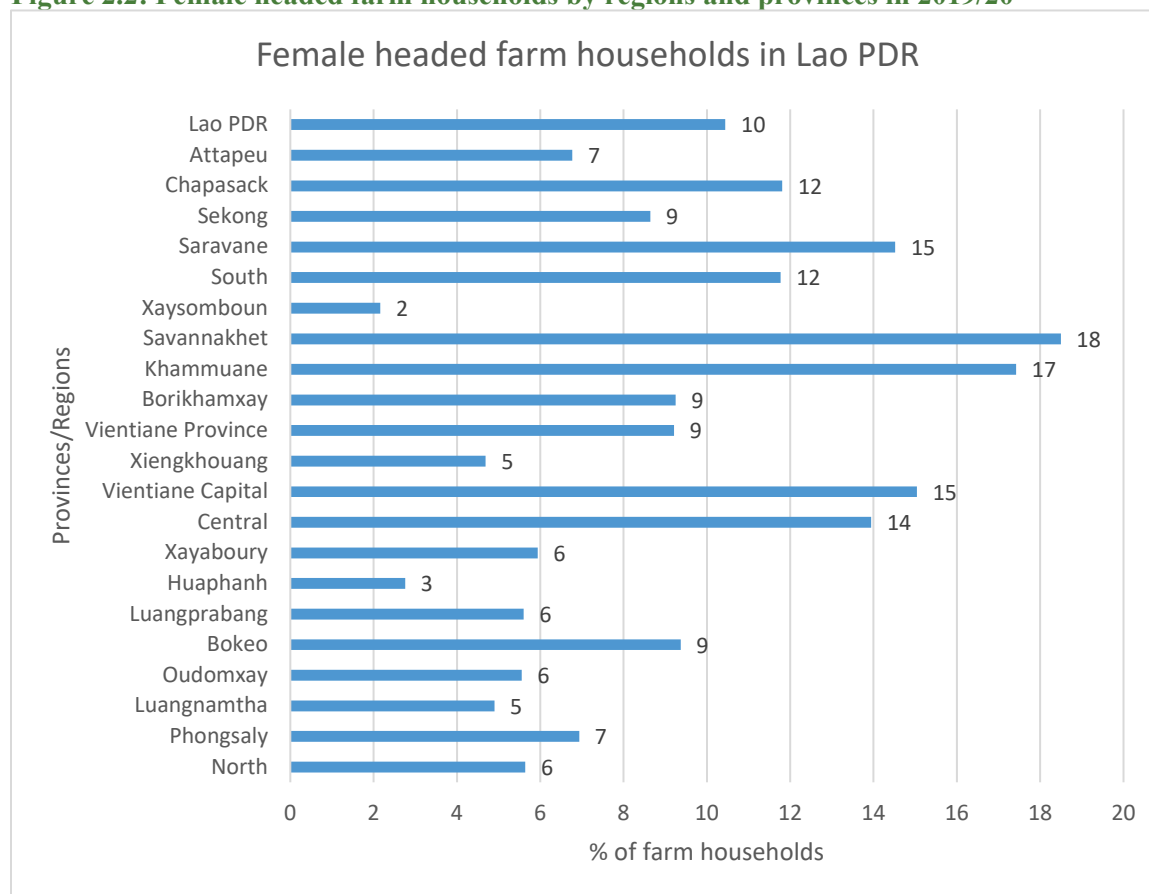
Table 2.2: Number and percentage of households by village type/region and province

Province	Village type						Total
	Town		Rural with roads		Rural without roads		
	Number	%	Number	%	Number	%	
North	111,761	30	240,444	65	18,739	5	370,944
Central	265,538	43	338,242	55	11,223	2	615,003
South	70,035	27	174,890	68	10,548	4	255,473
Lao PDR	447,334	36	753,576	61	40,510	3	1,241,420

Source: LAC 2019/20

Among the total farm households in Lao PDR almost 90% are headed by males and remaining 10% are headed by females as shown in Table 2.1 and Figure 2.2. The households with single ownership are almost 99% while remaining 1% of the households have multiple ownership.

Figure 2.2: Female headed farm households by regions and provinces in 2019/20



Source: LAC 2019/20

The highest proportion of female headed farm households are located in the province Savankhet followed by Khammuane and Saravane. The lowest proportion of farm households headed by female are located in the provinces Xaysoboun followed by Huaphanh and Luangnamtha as shown in Figure 2.2.

The sex ratio, which is defined as the ratio of male population to the female population in an area or country expressed in 100. Though household head was dominated by male population, the sex ratio of farm population is only 100.5 which indicates slightly higher number of males (1,751,460) compared to their female counterparts (1,742,150) in the Lao PDR in 2019/20. The sex ratio of farm population is consistent with the overall sex ratio (100.53) of Lao PDR.

The LAC 2019/20 reported that the dependency ratio (estimated as the ratio of population below 15 years and above 65 years with the population aged 15 to 65 years) of farm population in Lao PDR is 54.2 in 2019/20 with slight deviation among male and females equaling to 54.7 and 53.8 respectively.

The province wise sex ratio as well as dependency ratio over the last three censuses has been presented in Table 2.3.

Table 2.3: Sex ratio and dependency ratio of farm population over the years by provinces.

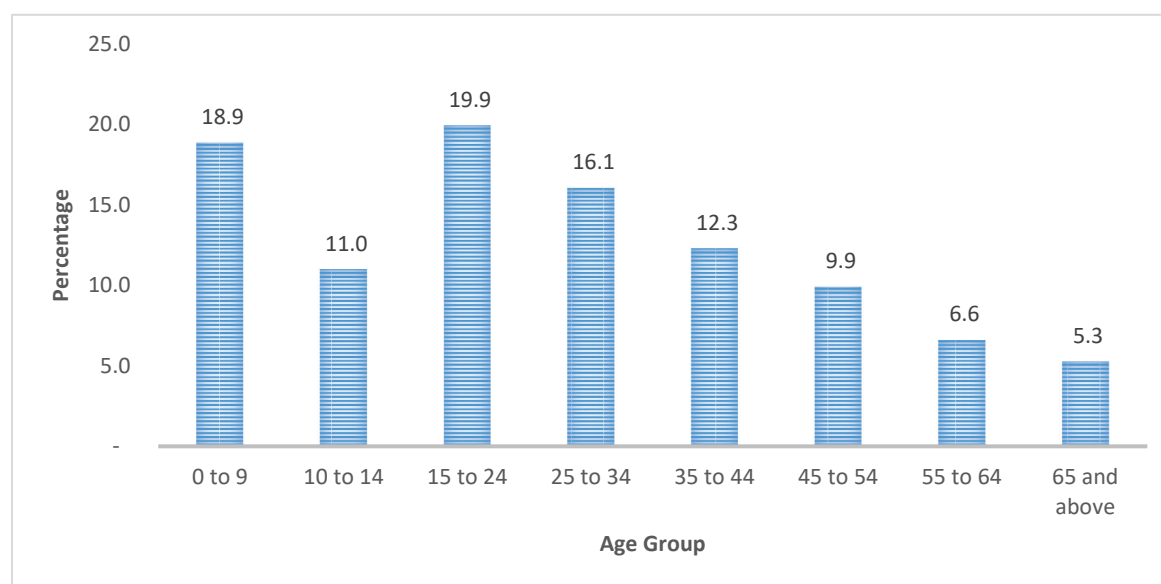
Provinces	Sex Ratio			Dependency Ratio		
	1998/99	2010/11	2019/20	1998/99	2010/11	2019/20
Phongsaly	96.3	102.2	105.4	93	69.7	63.1
Luangnamtha	93.8	100.5	101.0	77.8	59.8	52.4
Oudomxay	98.9	101.9	100.3	91.2	69	56.5
Bokeo	99.8	101.8	98.2	79.3	65.5	61.9
Luangprabang	97.2	101.6	103.6	101.7	68.5	56.2
Huaphanh	103	103.8	103.6	105.6	72.4	61.5
Xayaboury	96.7	101.7	101.2	84.7	48.2	42.8
Vientiane Capital	99.6	104.8	97.8	59.1	35.1	44.9
Xiengkhouang	99.7	102.2	104.2	118.5	65.7	61.2
Vientiane Province	102	106	102.6	76.2	55.4	51.6
Borikhamxay	99.6	102.9	102.1	93.1	57.2	53.5
Khammuane	93.6	97.4	98.4	91.6	60.7	48.2
Savannakhet	96.1	99.1	97.6	86.2	54.9	52.4
Xaysomboun	na	na	106.3	na	na	66.9
Saravane	95.2	96.9	98.5	95.3	70.4	57.5
Sekong	94.8	97.8	104.4	86.4	79.3	68.6
Chapasack	94.1	98.4	99.7	83.5	58.5	52.0
Attapeu	94	105.3	99.6	87.5	69.1	63.9
Lao PDR	na	na	100.5	na	na	54.2

Source: Lao Statistics Bureau

The highest sex ratio in 2019/20 is observed in the province Xaysomboun followed by Phongsaly and Sekong, while the lowest sex ratio is observed in the province of Savannakhet followed by Vientiane Capital and Bokeo.

Figure 2.3 illustrates the distribution of farm population by broad age groups. The highest proportion of farm population are between 15 to 24, followed by children below ten years of age and by 25 to 34 years age interval. Obviously, lowest proportion of population fall under the age group 65 and above.

Figure 2.3: Age distribution of farm population in LAO PDR in 2019/20



Source: LAC 2019/20

Table 2.4: Age sex distribution of farm population by region in 2019/20

Region	Age Group								Total
	0 to 9	10 to 14	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and above	
North	233,172	137,185	240,089	198,185	156,000	117,789	83,366	64,511	1,230,298
%	19.0	11.2	19.5	16.1	12.7	9.6	6.8	5.2	100
Central	280,105	162,085	299,444	251,147	186,136	157,338	101,576	80,287	1,518,118
%	18.5	10.7	19.7	16.5	12.3	10.4	6.7	5.3	100
South	145,935	85,266	157,214	111,522	87,722	71,507	46,241	39,777	745,185
%	19.6	11.4	21.1	15.0	11.8	9.6	6.2	5.3	100
Lao PDR	659,213	384,537	696,747	560,854	429,858	346,635	231,183	184,576	3,493,601
Percentage Distribution of the farm population									
Total	18.9	11.0	19.9	16.1	12.3	9.9	6.6	5.3	100
Male	19.2	11.1	19.9	15.9	12.4	9.7	6.7	5.0	100
Female	18.5	10.9	20.0	16.2	12.2	10.1	6.5	5.5	100

Source: LAC 2019/20

Almost 30% of the farm population in Lao PDR are less than fifteen years old and slightly more than five percent of the population are more than 65 years. The pattern is slightly different among male and females. About 30.3% of the total males are less than 15 years old whereas this percentage is almost 29.4% for females. While only about 5% of the male population are older than 65 and above the female population for more than 65 and above is 5.5% of the total farm population. These results show that there are more elderly females than males and are consistent with other results.

2.2 Education of the Farm Population

Education plays a vital role in the decision making of the farm population about their crop selection, cultivation techniques, other farming practices and marketing skills. Among the total number of farm population of about 3.5 million, about 28% have never attended school and about 31% of them have only primary level of education. About 14% of the population have achieved the lower secondary level of education while about 6% of them have got secondary education. About 4% of the farm population in Lao PDR in 219/20 have attained Intermediate and slightly more than 1% percent of them have received Bachelor's degree and above. Negligible number of people (only about 3,217) have received training and more than half a million of the population have attained only kindergarten or other degree. Sex wise disaggregation of level of education of farm households are presented in the Table 2.5.

Table 2.5: Proportion of farm population by level of education in regions 2019/20

Level of Education		Lao PDR	North	Central	South
Not attending school	Total	27.78	27.29	26.92	30.35
	Male	19.23	19.16	18.80	20.24
	Female	31.79	31.80	30.63	34.14
Primary school	Total	30.80	31.32	29.84	31.90
	Male	11.08	11.00	10.88	11.65
	Female	30.40	30.71	29.55	31.64
Lower secondary	Total	13.80	13.33	15.33	11.45
	Male	19.89	19.53	19.75	20.78
	Female	12.39	11.60	14.26	9.85
Upper secondary	Total	6.19	5.81	7.12	4.91
	Male	15.94	15.90	16.56	14.72
	Female	5.01	4.55	5.91	3.95
Intermediate / Higher	Total	3.66	3.66	3.84	3.29
	Male	12.37	12.86	12.14	12.02
	Female	2.84	2.76	3.08	2.50
Bachelor's degree or higher	Total	1.23	1.32	1.43	0.68
	Male	9.72	9.35	10.16	9.44

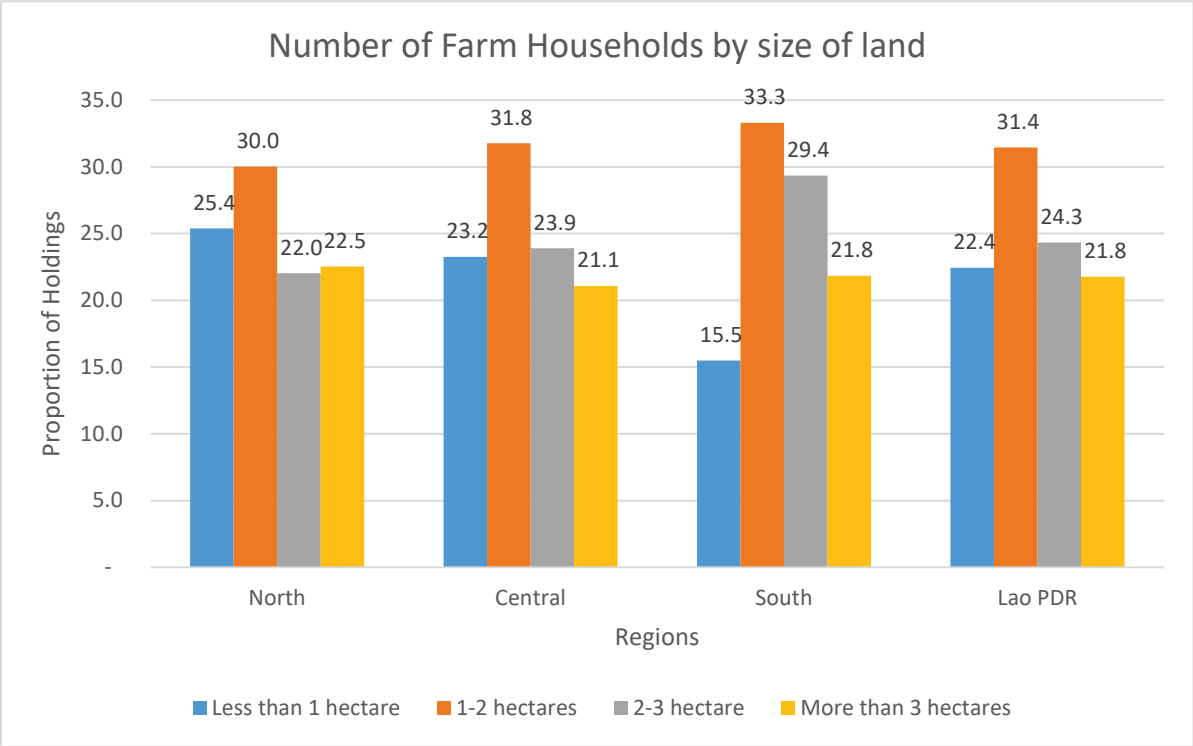
	Female	0.96	1.03	1.14	0.46
Through training	Total	0.09	0.16	0.06	0.05
	Male	6.74	6.94	6.81	6.24
	Female	0.10	0.18	0.06	0.04
Other	Total	16.45	17.11	15.46	17.37
	Male	5.03	5.26	4.91	4.91
	Female	16.51	17.38	15.37	17.41

Source: LAC, 2019/20

2.3 Farm Households by Size of Land

Following chart and table illustrate the number of farm households by size of their land.

Figure 2.4: Farm households by size of land in 2019/20



The land distribution in Lao PDR looks almost homogenous among the farm population. About 23% of the farm households have less than 1 hectare of land. Farmers having 1 to 2 hectare of land are about 32%, while about 25% of the farmers have 2 to 3 hectare of land and farmers having more than 3 hectares of land are almost 22% as shown in above figure.

The regional distribution of size of land is not much homogenous as compared at the national level. The southern region has more medium to large sized farmers compared to north and central. The highest proportion of farmers having less than 1 hectare of land are residing in northern region followed by central and south, where only 15.5% of these type of farm households are residing. The highest proportion of farmers having 1-2 hectare of land are residing in south

followed by central and north. Similarly, the farmers having 2-3 hectares of land are mostly in south followed by central and north. The large farm households having more than 3 hectares of land are residing in north followed by south and central regions.

Table 2.6: Number and percentage of farm households by size of land, 2019/20

Province	Less than 1 hectare	1-2 hectares	2-3 hectare	More than 3 hectares	Less than 1 hectare	1-2 hectares	2-3 hectare	More than 3 hectares
	Numbers				Proportions			
North	55,050	65,031	47,776	48,845	25.4	30.0	22.0	22.5
Phongsaly	6,574	6,350	3,616	2,728	34.1	33.0	18.8	14.2
Luangnamtha	3,547	7,450	6,089	5,042	16.0	33.7	27.5	22.8
Oudomxay	7,669	10,463	7,638	9,096	22.0	30.0	21.9	26.1
Bokeo	4,293	6,792	3,777	2,468	24.8	39.2	21.8	14.2
Luangprabang	5,324	13,451	13,261	14,887	11.3	28.7	28.3	31.7
Huaphanh	16,718	9,168	2,958	1,002	56.0	30.7	9.9	3.4
Xayaboury	10,924	11,356	10,435	13,622	23.6	24.5	22.5	29.4
Central	59,383	81,150	61,036	53,857	23.2	31.8	23.9	21.1
Vientiane Capital	8,873	5,093	2,307	2,751	46.6	26.8	12.1	14.5
Xiengkhouang	5,105	7,277	4,870	5,252	22.7	32.3	21.6	23.3
Vientiane Province	11,062	9,072	6,865	10,737	29.3	24.0	18.2	28.5
Borikhamxay	4,408	7,758	8,434	7,065	15.9	28.0	30.5	25.5
Khammuane	9,874	14,650	8,833	3,900	26.5	39.3	23.7	10.5
Savannakhet	19,417	35,973	28,568	20,208	18.6	34.5	27.4	19.4
Xaysomboun	645	1,326	1,159	3,944	9.1	18.7	16.4	55.8
South	18,966	40,814	35,964	26,760	15.5	33.3	29.4	21.8
Saravane	5,641	12,749	12,221	9,794	14.0	31.6	30.2	24.2
Sekong	2,752	5,592	3,258	1,888	20.4	41.5	24.2	14.0
Chapasack	8,086	17,095	16,434	12,374	15.0	31.7	30.4	22.9
Attapeu	2,487	5,378	4,050	2,704	17.0	36.8	27.7	18.5
Lao PDR	133,399	186,995	144,776	129,462	22.4	31.4	24.3	21.8

Source: Derived from LAC 2019/20

Table 2.5 presents the number as well as proportion of farm households by their size of land according to the provinces. Highest number of small holders having their land less than 1

hectare reside in Savankhet, while the highest proportion (56%) of these small holders are residing in Huaphanh province in north. The highest number of large farmers having more than 3 hectare of land are also in Savankhet while the highest proportion of them are in Xaysomboun as compared to other categories.

2.4 Land Tenure and Decision-making Rights by Sex of the Household Head

Among the total agricultural land in the Lao PDR, only about 8% is owned by females and remaining 92% is owned by males. There is a significant difference among provinces and regions of Lao PDR on land tenure. Among the regions South and Central regions both have the similar female ownership while north has the lowest female ownership of land. Among the provinces, Savannakhet has the highest proportion of female ownership on land followed by Khammuane and Saravane. The lowest proportion of land owned by females has been observed in the province Xaysomboun, which is just one percent among the total and followed by the provinces Huaphanh and Xiengkhouang, Oudomxay and Luangnamtha.

Figure 2.5: Land tenure by female ownership among the regions and provinces in 2019/20

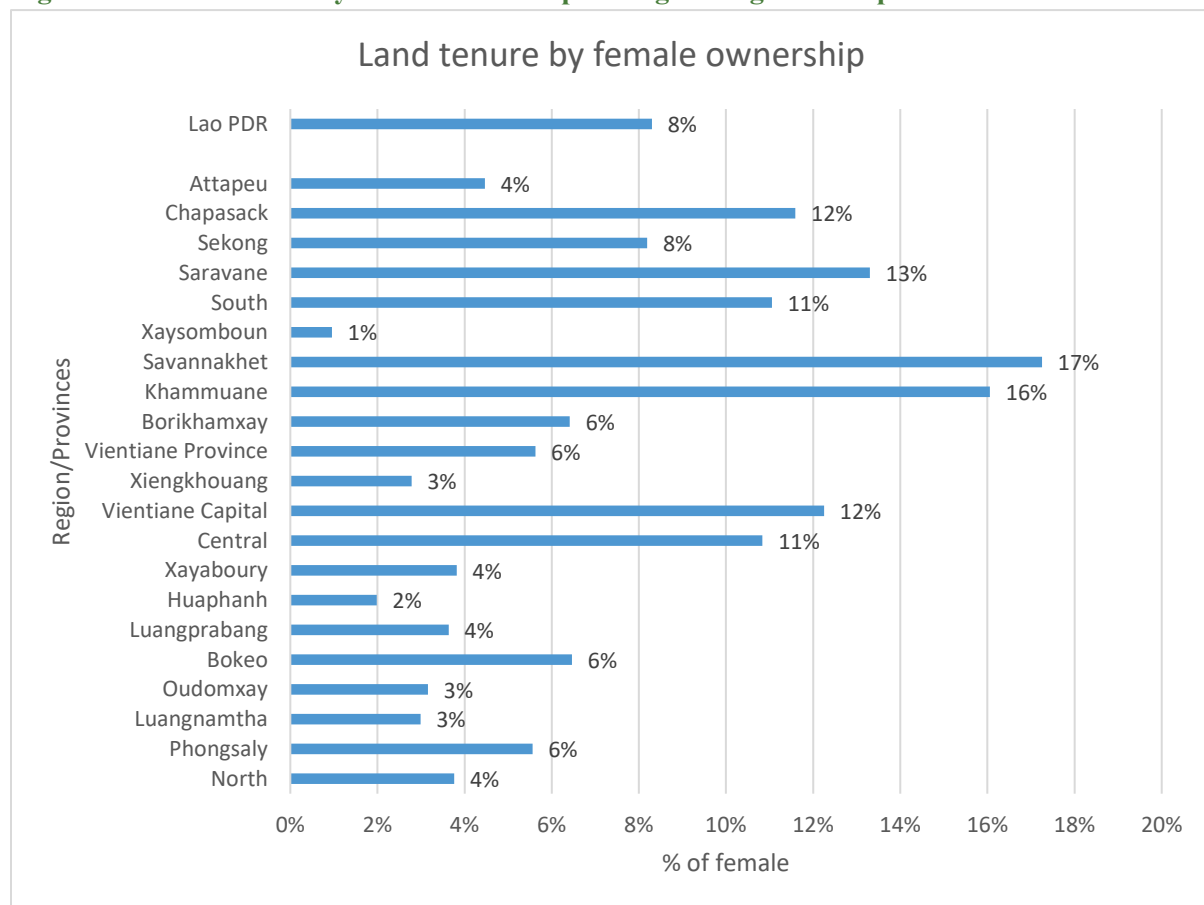
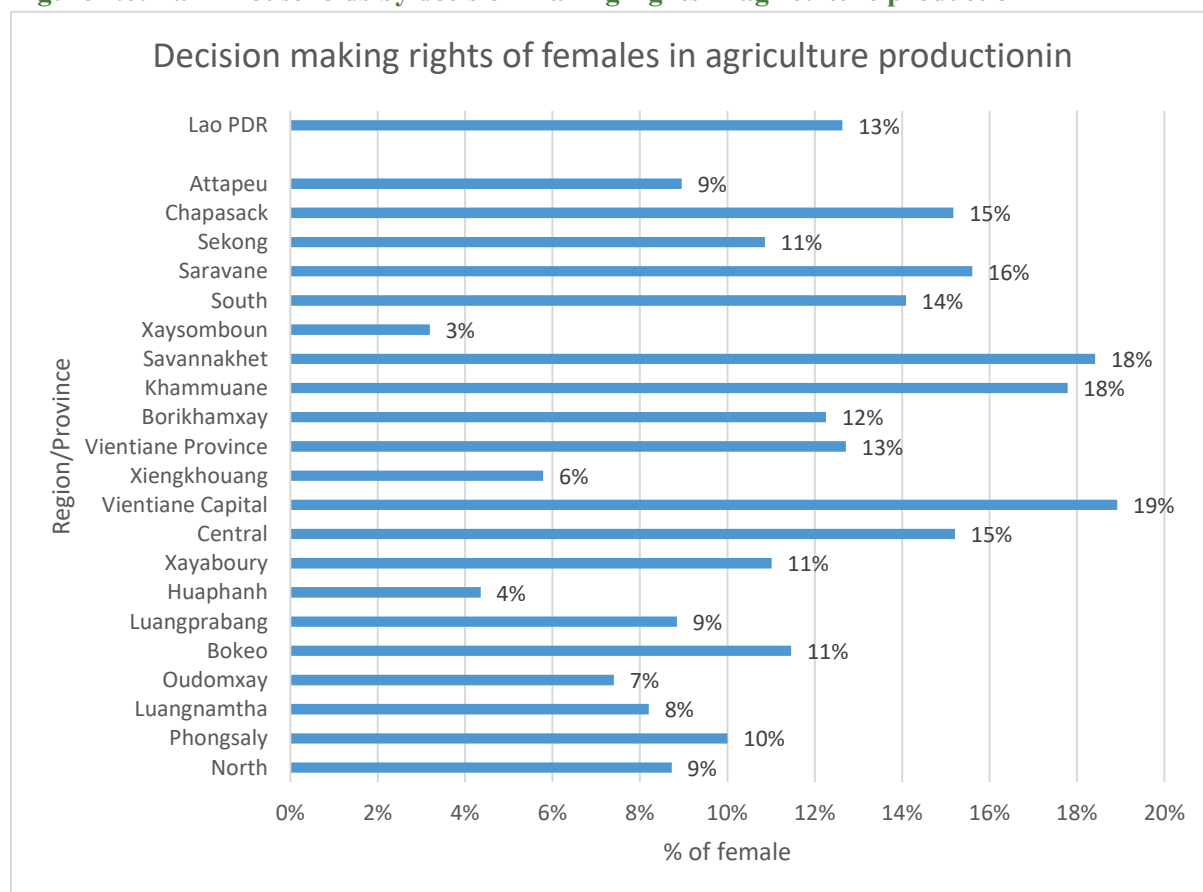


Figure 2.6: Farm households by decision making rights in agriculture production



Source: LAC 2019/20

Decision making rights like what to plant, when to plant and harvest, where to sell and at which prices are very much critical to the farm households. Gender disaggregation in decision making is considered as an indicator of capacity development of females in many areas. In Lao PDR, though the ownership of females in land is just 8%, as discussed earlier but the decision making on agriculture production is about 13% as presented in figure 2.5.

Among the regions of Lao PDR, the highest proportion of farm households on which females make decision on agriculture production is highest in central followed by south and lowest at the north. Among the provinces the highest proportion has been observed in Vientiane capital followed by Savannakhet and Khammuane. The lowest proportion has been observed in Xaysomboun followed by Huaphanh and Xiengkhouang.

2.5 Conclusion

Number of households engaged in the agricultural activities remained almost similar between 1998/99 and 2019/20, but the number was slightly increased in 2010/11.² In 1998/99 there were 668 farm households that increased to 783 in 2010/11. In 2020/21, the number of farm households reached to 851 based on the definition of farm households used in the second round of LAC, but according to the revised definition of farm households in the third round of LAC, the number of farm households was only 644. This is worth mentioning here that if the new threshold is applied for the farm households during 2010/11 census, the holding size goes down to 762.4 thousand instead of 783 thousand.

In 2020/21, the highest number of farm households were reported from Savannakhet followed by Chapasack while the least number of farm households were reported from Xaysomboun. Practice of carrying agricultural activities in the Lao PDR almost fully dominated by single household management as reported by the LAC 2019/20. Though farm population is equally distributed by gender with an overall sex ratio of 100.5, the entire agricultural activities are mostly dominated by males. Example includes only 10% farm households are headed by females, only 8% farm land was owned by female and only 13% households accept the decisions made by females. Distribution of land looks almost homogenous among the farm households but cross-sectional distribution of land is a bit heterogenous. One of the most important strengths of the Lao PDR is that most farm population are young and of productive age group with an overall dependency ratio of 54.2. On the other, educational attainment of farm population is quite low and unfortunately, vocational and other trainings on agricultural activities is underutilized. Therefore, strengthening the technical capacity by providing more trainings and upgrading educational attainment to the farm people especially females with equal participation would meet the aim of agricultural development in the Lao PDR.

The details are presented in the preceding tables.

² The number of farm households of the third round of LAC is not directly comparable with the first and second round of LAC because of changed definition of farm households.

Table 2.1.1: Agricultural and non-agricultural households ('000) by province, in 1998/9, 2010/11 and 2019/20

Province	Total number of households			Number of farm households			Non-farm household numbers		
	1998/99	2010/11	2019/20	1998/99	2010/11	2019/20	1998/99	2010/10	2019/20
North	256.6	323.0	370.9	238.4	288.9	236.7	18.2	34.0	134.2
Phongsaly	25.6	29.5	33.6	24.4	28.4	20.6	1.2	1.1	12.9
Luangnamtha	21.4	29.2	35.3	19.8	26.2	24.1	1.7	3.0	11.2
Oudomxay	35.8	48.3	60.7	33.4	44.6	39.1	2.5	3.7	21.5
Bokeo	20.8	28.5	32.9	18.8	24.8	19.0	2.0	3.7	13.9
Luangprabang	62.0	73.2	84.6	55.7	59.5	50.5	6.3	13.7	34.1
Huaphanh	38.5	45.7	48.8	36.9	42.3	30.8	1.6	3.4	18.0
Xayaboury	52.3	68.5	75.1	49.4	63.1	52.5	2.9	5.4	22.5
Central	371.7	499.7	615.0	285.9	336.4	274.4	85.8	163.3	340.6
Vientiane Capital	97.0	132.3	184.2	48.6	42.8	20.4	48.4	89.5	163.8
Xiengkhouang	30.9	40.4	43.5	28.1	36.2	24.3	2.8	4.2	19.2
Vientiane Province	50.2	81.2	77.3	43.7	62.7	41.5	6.5	18.5	35.8
Borikhamxay	29.6	43.3	54.0	26.5	35.0	30.0	3.0	8.3	24.1
Khammuane	52.4	65.1	71.3	43.6	51.1	38.9	8.8	14.0	32.4
Savannakhet	111.8	137.3	169.3	95.4	108.6	110.9	16.3	28.7	58.3
Xaysomboun			15.4			8.5			6.9
South	161.7	198.8	255.5	136.0	157.5	133.0	25.7	41.3	122.5
Saravane	45.4	55.4	71.4	41.3	50.1	44.5	4.1	5.3	27.0
Sekong	10.5	15.0	21.8	9.7	12.9	14.3	0.8	2.1	7.5
Chapasack	89.4	105.7	131.1	70.2	75.4	58.3	19.2	30.2	72.8
Attapeu	16.4	22.7	31.2	14.8	19.1	16.0	1.6	3.6	15.2
Lao PDR	798.0	1,021.4	1,241.4	668.0	782.8	644.1	130.0	238.6	597.3

Source: LAC 2019/20

Table 2.1.2: Households engaged in agriculture / non-agriculture ('000) by type of village and province, 2019/20

Province	Total number of households (HH)			Number of farm households by urban/rural		
	Total HH	Farm HH	Non farm HH	Urban HH	Rural HH with access to roads	Rural HH without access to roads
North	370.9	236.7	134.2	51.0	173.6	36.3
Phongsaly	33.6	20.6	12.9	3.9	14.0	2.8
Luangnamtha	35.3	24.1	11.2	5.0	17.7	1.4
Oudomxay	60.7	39.1	21.5	4.5	25.4	9.2
Bokeo	32.9	19.0	13.9	0.6	16.4	1.9
Luangprabang	84.6	50.5	34.1	11.8	31.9	6.8
Huaphanh	48.8	30.8	18.0	2.5	15.7	12.6
Xayaboury	75.1	52.5	22.5	19.2	32.8	0.5
Central	615.0	274.4	340.6	3.5	19.9	0.9
Vientiane Capital	184.2	20.4	163.8	35.4	203.2	11.5
Xiengkhouang	43.5	24.3	19.2	4.6	15.8	-
Vientiane Province	77.3	41.5	35.8	6.3	35.2	-
Borikhamxay	54.0	30.0	24.1	4.9	24.5	0.6
Khammuane	71.3	38.9	32.4	4.2	32.7	1.9
Savannakhet	169.3	110.9	58.3	13.6	88.7	8.6
Xaysomboun	15.4	8.5	6.9	1.9	6.3	0.3
South	255.5	133.0	122.5	16.7	102.1	14.2
Saravane	71.4	44.5	27.0	2.5	40.3	1.6
Sekong	21.8	14.3	7.5	2.7	10.4	1.2
Chapasack	131.1	58.3	72.8	6.9	41.4	9.9
Attapeu	31.2	16.0	15.2	4.6	9.9	1.5
Lao PDR	1,241.4	644.1	597.3	103.1	478.9	62.1

Source: LAC 2019/20

Table 2.1.3: Population of farm households by age group, 2019/20

Province	Total	Number of farm population							
		0 - 9 years	10 - 14 years	15 - 24 years	25 - 34 years	35 - 44 years	45 - 54 years	55 - 64 years	65 and older
North	1,230,298	233,172	137,185	240,089	198,185	156,000	117,789	83,366	64,511
Phongsaly	106,673	23,371	13,059	19,569	16,773	12,845	9,705	6,521	4,831
Luangnamtha	130,796	23,760	14,510	26,626	21,832	16,218	12,324	8,825	6,702
Oudomxay	206,372	41,793	23,990	44,252	33,192	24,377	18,527	11,542	8,698
Bokeo	105,323	23,266	12,298	20,367	18,093	10,713	8,973	6,900	4,712
Luangprabang	265,255	51,083	30,223	54,375	42,365	30,894	24,918	17,273	14,125
Huaphanh	170,426	34,377	21,887	35,263	24,856	20,575	15,358	9,504	8,607
Xayaboury	245,453	35,523	21,218	39,637	41,074	40,378	27,984	22,801	16,838
Central	1,518,118	280,105	162,085	299,444	251,147	186,136	157,338	101,576	80,287
Vientiane Capital	98,745	15,173	8,470	14,577	17,042	14,697	12,726	9,110	6,950
Xiengkhouang	133,954	27,798	15,288	25,826	21,748	14,688	12,116	8,735	7,756
Vientiane Province	217,495	37,035	23,295	39,046	34,475	28,451	24,734	16,770	13,690
Borikhamxay	154,825	29,359	16,642	30,142	25,217	18,574	16,825	10,095	7,971
Khammuane	198,920	33,845	21,239	43,246	32,369	24,692	21,414	12,483	9,631
Savannakhet	663,172	125,091	70,104	135,651	112,626	79,791	65,471	41,747	32,691
Xaysomboun	51,007	11,805	7,047	10,956	7,670	5,244	4,053	2,636	1,597

South	745,185	145,935	85,266	157,214	111,522	87,722	71,507	46,241	39,777
Saravane	256,095	51,032	28,468	53,177	40,304	30,221	23,730	15,148	14,015
Sekong	88,069	19,870	13,007	19,346	12,130	10,051	6,560	4,154	2,952
Chapasack	309,547	55,097	32,919	64,984	45,049	38,044	33,591	21,916	17,947
Attapeu	91,472	19,937	10,872	19,708	14,039	9,406	7,626	5,023	4,863
Lao PDR	3,493,601	659,213	384,537	696,747	560,854	429,858	346,635	231,183	184,576

Source: LAC 2019/20

Table 2.1.4: Male population of farm households by age group,2019/20

Province	Total	Number of male farm population							
		0 - 9 years	10 - 14 years	15 - 24 years	25 - 34 years	35 - 44 years	45 - 54 years	55 - 64 years	65 and older
North	621,130	119,000	68,313	121,300	98,789	79,902	58,082	43,095	32,649
Phongsaly	54,746	11,969	6,899	10,447	8,579	6,742	4,781	3,225	2,105
Luangnamtha	65,708	12,719	6,863	12,882	11,812	8,095	6,047	4,292	2,998
Oudomxay	103,345	21,112	11,938	21,897	16,126	12,421	9,228	6,104	4,519
Bokeo	52,183	11,482	6,061	10,004	8,998	5,686	4,338	3,359	2,256
Luangprabang	134,994	26,049	15,249	27,144	21,704	16,117	12,086	9,274	7,371
Huaphanh	86,720	17,182	11,043	18,382	12,593	10,525	7,856	4,944	4,196
Xayaboury	123,434	18,487	10,260	20,545	18,978	20,316	13,747	11,898	9,204
Central	758,108	142,508	82,454	149,751	125,519	92,037	77,013	51,634	37,192
Vientiane Capital	48,827	7,648	3,987	6,946	8,697	7,178	6,227	4,608	3,535
Xiengkhouang	68,345	14,266	7,342	13,302	11,536	7,545	6,068	4,272	4,014
Vientiane Province	110,162	18,379	12,691	20,334	16,637	14,255	11,862	9,078	6,924
Borikhamxay	78,213	15,140	8,574	15,342	12,452	8,738	8,876	5,365	3,727
Khammuane	98,650	17,178	10,833	21,285	16,341	11,726	10,835	6,005	4,448
Savannakhet	327,626	64,075	35,161	66,904	55,784	40,005	31,122	20,793	13,783
Xaysomboun	26,287	5,822	3,866	5,638	4,072	2,591	2,023	1,514	761

South	372,216	75,335	43,354	77,335	54,792	44,755	35,148	23,235	18,261
Saravane	127,069	26,392	14,097	25,846	19,745	15,256	11,622	7,509	6,602
Sekong	44,976	10,444	6,688	9,825	5,948	5,181	3,333	1,978	1,580
Chapasack	154,522	27,692	16,953	32,368	22,027	19,698	16,543	11,049	8,192
Attapeu	45,649	10,806	5,617	9,297	7,073	4,620	3,650	2,699	1,888
LAO PDR	1,751,455	336,843	194,121	348,386	279,101	216,694	170,243	117,965	88,101

Source: LAC 2019/20

Table 2.1.5: Female population of farm households by age group, 2019/20

Province	Total	Number of farm household population							
		0 - 9 years	10 - 14 years	15 - 24 years	25 - 34 years	35 - 44 years	45 - 54 years	55 - 64 years	65 and older
North	609,168	114,172	68,872	118,789	99,396	76,098	59,707	40,271	31,863
Phongsaly	51,927	11,402	6,160	9,121	8,194	6,103	4,924	3,296	2,726
Luangnamtha	65,088	11,041	7,646	13,744	10,019	8,122	6,277	4,534	3,704
Oudomxay	103,027	20,680	12,052	22,355	17,066	11,956	9,299	5,439	4,179
Bokeo	53,139	11,784	6,237	10,364	9,095	5,028	4,635	3,541	2,456
Luangprabang	130,262	25,034	14,974	27,231	20,661	14,777	12,832	7,998	6,754
Huaphanh	83,706	17,195	10,844	16,881	12,263	10,050	7,502	4,560	4,410
Xayaboury	122,019	17,036	10,959	19,092	22,096	20,062	14,238	10,903	7,634
Central	760,010	137,597	79,631	149,693	125,628	94,098	80,326	49,941	43,095
Vientiane Capital	49,919	7,525	4,483	7,631	8,345	7,518	6,499	4,501	3,415
Xiengkhouang	65,610	13,532	7,946	12,524	10,212	7,143	6,048	4,464	3,743
Vientiane Province	107,334	18,656	10,604	18,712	17,837	14,195	12,871	7,692	6,766
Borikhamxay	76,612	14,219	8,068	14,799	12,765	9,836	7,949	4,730	4,244
Khammuane	100,270	16,667	10,406	21,962	16,028	12,967	10,580	6,478	5,183
Savannakhet	335,546	61,016	34,943	68,748	56,843	39,786	34,349	20,954	18,908
Xaysomboun	24,720	5,982	3,181	5,317	3,598	2,653	2,030	1,123	836
South	372,969	70,600	41,912	79,878	56,729	42,967	36,359	23,006	21,517
Saravane	129,027	24,640	14,372	27,330	20,559	14,964	12,108	7,640	7,414
Sekong	43,093	9,425	6,319	9,521	6,182	4,870	3,227	2,176	1,372
Chapasack	155,025	27,405	15,966	32,616	23,022	18,346	17,048	10,867	9,755
Attapeu	45,824	9,130	5,255	10,411	6,967	4,786	3,976	2,323	2,976
Lao PDR	1,742,147	322,370	190,416	348,360	281,753	213,164	176,392	113,218	96,475

Source: LAC 2019/20

Table 2.1.6: Population of farm households by level of education by province, 2019/20

Province	Total	Number of farm population							
		Not attending	Primary	Lower secondary	Upper secondary	Intermediate / Higher	BA/higher	Training	Other
North	1,230,298	335,701	385,339	164,025	71,494	45,090	16,217	1,932	210,490
Phongsaly	106,673	41,730	26,449	10,427	4,660	4,204	1,439	75	17,689
Luangnamtha	130,796	47,793	34,635	14,982	8,182	5,133	2,247	8	17,816
Oudomxay	206,372	60,053	58,235	26,136	10,419	6,945	2,161	312	42,111
Bokeo	105,323	35,809	27,834	13,588	5,322	3,272	522	1,175	17,802
Luangprabang	265,255	70,213	85,677	34,958	16,591	8,470	3,988	350	44,998
Huaphanh	170,426	44,175	50,349	21,668	7,257	3,947	1,379	-	41,651
Xayaboury	245,453	35,929	102,161	42,265	19,063	13,119	4,481	12	28,423
Central	1,518,118	408,694	453,031	232,652	108,153	58,261	21,747	943	234,638
Vientiane Capital	98,745	12,913	29,163	17,225	14,180	6,451	3,540	480	14,793
Xiengkhouang	133,954	30,051	39,228	27,420	10,354	6,106	1,721	41	19,033
Vientiane Province	217,495	41,856	70,844	42,323	19,769	12,771	3,697	36	26,199
Borikhamxay	154,825	35,143	52,495	25,974	9,180	5,998	2,060	36	23,939
Khammuane	198,920	48,749	68,687	32,313	13,115	6,663	2,372	202	26,818
Savannakhet	663,172	228,994	180,621	79,012	37,925	17,983	6,726	103	111,809
Xaysomboun	51,007	10,988	11,994	8,384	3,630	2,290	1,630	45	12,046
South	745,185	226,193	237,701	85,318	36,556	24,541	5,073	342	129,460

Saravane	256,095	91,214	78,488	25,258	10,444	6,100	1,446	234	42,912
Sekong	88,069	30,407	23,915	9,407	4,111	3,649	583	-	15,998
Chapasack	309,547	72,543	107,889	40,932	17,574	11,926	1,713	75	56,894
Attapeu	91,472	32,030	27,409	9,721	4,426	2,866	1,331	33	13,657
Lao PDR	3,493,601	970,589	1,076,072	481,994	216,202	127,893	43,037	3,217	574,588

Source: LAC 2019/20

Table 2.1.7: Male population of farm households by level of education by province, Lao PDR

Province	Total	Number of farm household population							
		Not attending	Primary	Lower secondary	Upper secondary	Primary / Intermediate / Higher	Bachelor's degree or higher	Through training	Other
North	621,130	119,000	68,313	121,300	98,789	79,902	58,082	43,095	32,649
Phongsaly	54,746	11,969	6,899	10,447	8,579	6,742	4,781	3,225	2,105
Luangnamtha	65,708	12,719	6,863	12,882	11,812	8,095	6,047	4,292	2,998
Oudomxay	103,345	21,112	11,938	21,897	16,126	12,421	9,228	6,104	4,519
Bokeo	52,183	11,482	6,061	10,004	8,998	5,686	4,338	3,359	2,256
Luangprabang	134,994	26,049	15,249	27,144	21,704	16,117	12,086	9,274	7,371
Huaphanh	86,720	17,182	11,043	18,382	12,593	10,525	7,856	4,944	4,196
Xayaboury	123,434	18,487	10,260	20,545	18,978	20,316	13,747	11,898	9,204
Central	758,108	142,508	82,454	149,751	125,519	92,037	77,013	51,634	37,192
Vientiane Capital	48,827	7,648	3,987	6,946	8,697	7,178	6,227	4,608	3,535
Xiengkhouang	68,345	14,266	7,342	13,302	11,536	7,545	6,068	4,272	4,014
Vientiane Province	110,162	18,379	12,691	20,334	16,637	14,255	11,862	9,078	6,924
Borikhamxay	78,213	15,140	8,574	15,342	12,452	8,738	8,876	5,365	3,727
Khammuane	98,650	17,178	10,833	21,285	16,341	11,726	10,835	6,005	4,448
Savannakhet	327,626	64,075	35,161	66,904	55,784	40,005	31,122	20,793	13,783

Xaysomboun	26,287	5,822	3,866	5,638	4,072	2,591	2,023	1,514	761
South	372,216	75,335	43,354	77,335	54,792	44,755	35,148	23,235	18,261
Saravane	127,069	26,392	14,097	25,846	19,745	15,256	11,622	7,509	6,602
Sekong	44,976	10,444	6,688	9,825	5,948	5,181	3,333	1,978	1,580
Chapasack	154,522	27,692	16,953	32,368	22,027	19,698	16,543	11,049	8,192
Attapeu	45,649	10,806	5,617	9,297	7,073	4,620	3,650	2,699	1,888
Lao PDR	1,751,455	336,843	194,121	348,386	279,101	216,694	170,243	117,965	88,101

Source: LAC 2019/20

Table 2.1.8: Female population of farm households by level of education by province, Lao PDR

Province	Total	Number of farm household population							
		Not attending	Primary school	Lower secondary	Upper secondary	Primary / Intermediate / Higher	Bachelor's degree or higher	Through training	Other
North	609,168	193,698	187,060	70,663	27,705	16,804	6,259	1,115	105,865
Phongsaly	51,927	23,684	11,074	4,538	1,929	1,945	430	26	8,302
Luangnamtha	65,088	27,168	16,376	6,432	3,760	1,910	732	8	8,702
Oudomxay	103,027	35,743	27,244	11,091	4,063	2,474	847	235	21,330
Bokeo	53,139	20,832	12,953	6,521	1,857	1,264	128	625	8,960
Luangprabang	130,262	40,864	41,051	15,033	5,991	2,898	1,393	221	22,809
Huaphanh	83,706	25,545	23,631	8,434	2,525	1,590	426	-	21,555
Xayaboury	122,019	19,862	54,731	18,614	7,580	4,723	2,303	-	14,207
Central	760,010	232,789	224,577	108,412	44,891	23,379	8,696	459	116,805
Vientiane Capital	49,919	7,441	15,774	8,989	5,742	2,595	1,290	254	7,834
Xiengkhouang	65,610	17,171	20,205	11,569	3,615	2,702	523	27	9,799
Vientiane Province	107,334	25,091	35,261	19,036	7,837	4,964	1,479	13	13,653
Borikhamxay	76,612	19,852	26,882	11,310	4,073	2,107	669	-	11,720
Khammuane	100,270	28,980	33,925	15,111	5,353	2,754	1,102	97	12,948
Savannakhet	335,546	127,802	86,411	38,552	17,127	7,569	3,256	63	54,766

Xaysomboun	24,720	6,452	6,121	3,847	1,144	687	378	5	6,086
South	372,969	127,338	118,019	36,732	14,747	9,330	1,733	154	64,916
Saravane	129,027	50,685	38,467	10,706	4,523	2,358	535	101	21,652
Sekong	43,093	16,724	11,582	4,162	1,743	1,317	95	-	7,468
Chapasack	155,025	41,533	54,387	17,524	6,858	4,592	693	53	29,385
Attapeu	45,824	18,396	13,584	4,340	1,622	1,063	410	-	6,410
Lao PDR	1,742,147	553,825	529,656	215,807	87,343	49,514	16,687	1,729	287,586

Source: LAC 2019/20

Table 2.1.9: Farm households by gender and type of household, 2019/20

Province	Number of farm households	Male		Female	
		Single household	Multiple households	Single household	Multiple households
North	236,710	219,750	2,689	14,017	141
Phongsaly	20,647	19,176	126	1,322	23
Luangnamtha	24,066	22,277	268	1,494	26
Oudomxay	39,113	36,367	701	1,972	57
Bokeo	18,962	17,047	114	1,721	3
Luangprabang	50,539	47,179	586	2,749	20
Huaphanh	30,836	29,666	357	811	3
Xayaboury	52,545	48,039	538	3,948	9
Central	274,392	232,932	2,544	37,564	407
Vientiane Capital	20,361	17,033	73	3,185	-
Xiengkhouang	24,299	22,857	100	1,290	-
Vientiane Province	41,470	38,062	48	3,303	5
Borikhamxay	29,961	27,054	311	2,559	36
Khammuane	38,854	31,530	198	7,000	19
Savannakhet	110,925	88,890	1,777	19,900	346
Xaysomboun	8,523	7,506	36	327	-
South	132,996	116,989	1,002	14,536	143
Saravane	44,452	38,194	567	5,614	78
Sekong	14,266	13,086	103	1,063	-
Chapasack	58,306	50,817	198	6,928	59
Attapeu	15,972	14,892	134	931	6
Lao PDR	644,098	569,671	6,235	66,117	691

Source: LAC 2019/20

Table 2.1.10: Farm households by size and sex of owner, 2019/20

Province	No of farm households	Male				Female			
		Less than 1 hectare	1-2 hectares	2-3 hectare	More than 3 hectares	Less than 1 hectare	1-2 hectares	2-3 hectare	More than 3 hectares
North	236,710	68,659	53,442	35,626	64,060	4,132	3,832	2,167	4,015
Phongsaly	20,647	6,811	5,722	3,032	3,697	329	432	216	369
Luangnamtha	24,066	5,146	6,156	4,606	6,613	324	479	375	342
Oudomxay	39,113	9,132	8,742	6,458	12,718	798	438	202	591
Bokeo	18,962	5,457	5,550	2,417	3,640	410	740	289	285
Luangprabang	50,539	10,895	10,913	8,361	17,422	769	666	432	889
Huaphanh	30,836	18,177	7,669	2,223	1,651	545	181	49	39
Xayaboury	52,545	13,042	8,689	8,528	18,318	956	895	605	1,500
Central	274,392	76,912	60,871	34,985	62,037	11,855	10,944	6,002	9,040
Vientiane Capital	20,361	8,094	4,060	1,489	2,959	1,551	832	247	529
Xiengkhouang	24,299	6,027	6,800	3,608	6,494	144	378	295	473
Vientiane Province	41,470	11,920	7,737	5,043	13,335	1,065	816	418	975
Borikhamxay	29,961	6,529	6,635	5,535	8,667	757	791	353	694
Khammuane	38,854	13,830	9,220	4,353	4,270	2,754	2,195	1,004	1,065
Savannakhet	110,925	29,664	24,989	14,229	21,778	5,518	5,906	3,653	5,170
Xaysomboun	8,523	848	1,431	727	4,535	65	27	32	135

South	132,996	29,525	34,432	21,382	32,599	3,528	4,566	2,311	4,254
Saravane	44,452	8,535	11,106	7,017	12,081	1,295	1,833	826	1,719
Sekong	14,266	4,786	3,991	1,966	2,430	220	501	137	205
Chapasack	58,306	12,683	14,464	9,569	14,299	1,810	1,925	1,163	2,088
Attapeu	15,972	3,520	4,870	2,830	3,789	203	308	185	242
Lao PDR	644,098	175,096	148,744	91,993	158,696	19,515	19,341	10,480	17,310

Table 2.1.11 Farm households with land tenure and average area by sex and province, 2019/20

Province	Male			Female		
	All agricultural land	%	Average agricultural land area	All agricultural land	%	Average agricultural land area
North	621,373	96	2.79	24,295	4	1.82
Phongsaly	42,666	94	2.22	2,511	6	1.75
Luangnamtha	68,744	97	3.01	2,117	3	1.81
Oudomxay	105,932	97	2.87	3,459	3	1.59
Bokeo	40,190	94	2.35	2,778	6	1.59
Luangprabang	166,189	96	3.50	6,267	4	2.23
Huaphanh	35,170	98	1.18	712	2	0.82
Xayaboury	162,481	96	3.29	6,451	4	2.06
Central	682,619	89	2.90	82,966	11	2.18
Vientiane Capital	38,095	88	2.25	5,317	12	1.86
Xiengkhouang	71,553	97	3.10	2,048	3	1.80
Vientiane Province	124,116	94	3.31	7,399	6	1.97
Borikhamxay	90,233	94	3.32	6,186	6	2.21
Khammuane	65,413	84	2.05	12,514	16	1.85
Savannakhet	234,707	83	2.60	48,937	17	2.39
Xaysomboun	58,503	99	7.07	565	1	3.07
South	318,004	89	2.72	39,520	11	2.52
Saravane	109,313	87	2.88	16,775	13	2.61
Sekong	28,272	92	2.17	2,523	8	1.92
Chapasack	139,723	88	2.73	18,322	12	2.68
Attapeu	40,696	96	2.74	1,901	4	1.73
Lao PDR	1,621,996	92	2.82	146,781	8	2.19

Source: LAC 2019/20

Table 2.1.12: Farm households by decision-making rights in agricultural production (planting and raising livestock), 2019/20

Province	Male			Female		
	Grow crops	Livestock	%	Grow crops	Livestock	%
North	201,776	170,055	91	16,175	19,373	9
Phongsaly	17,134	15,500	90	1,437	2,192	10
Luangnamtha	18,928	17,852	92	1,092	2,195	8
Oudomxay	35,108	29,058	93	2,312	2,820	7
Bokeo	15,409	14,079	89	2,038	1,778	11
Luangprabang	42,293	36,805	91	3,775	3,903	9
Huaphanh	27,968	23,681	96	990	1,361	4
Xayaboury	44,936	33,080	89	4,533	5,124	11
Central	223,653	192,485	85	38,246	36,396	15
Vientiane Capital	15,137	10,200	81	2,962	2,951	19
Xiengkhouang	22,401	21,044	94	1,246	1,422	6
Vientiane Province	34,263	29,824	87	4,216	5,118	13
Borikhamxay	25,322	19,970	88	3,192	3,136	12
Khammuane	30,849	26,766	82	6,760	5,705	18
Savannakhet	88,621	77,348	82	19,698	17,762	18
Xaysomboun	7,060	7,333	97	171	303	3
South	111,069	83,058	86	16,767	15,066	14
Saravane	36,417	30,300	84	6,608	5,730	16
Sekong	12,106	9,494	89	1,260	1,371	11
Chapasack	48,928	31,229	85	7,614	6,726	15
Attapeu	13,619	12,035	91	1,285	1,239	9
Lao PDR	536,498	445,598	87	71,187	70,835	13

Source: LAC 2019/20

Chapter 3: Cropping Pattern Change

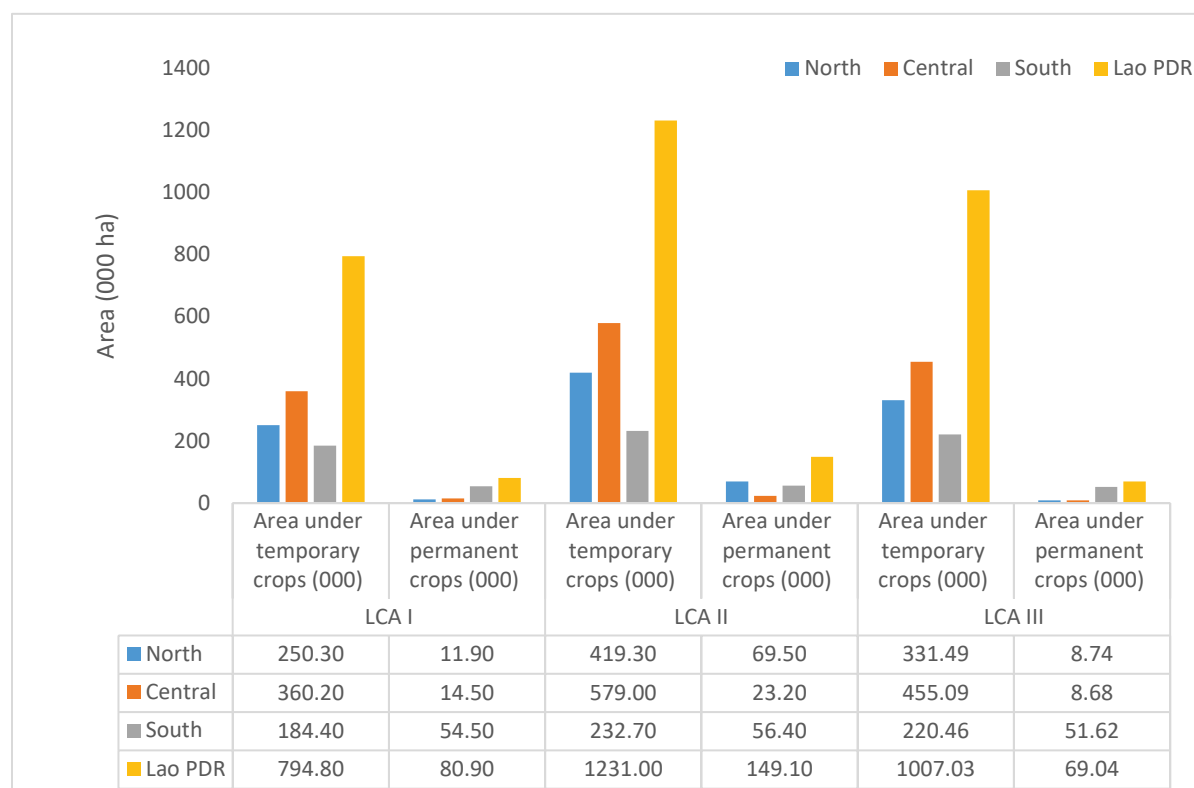
Lao PDR is a mountainous land-locked country having only 6 percent of arable land. In spite of limited arable land, Lao PDR has established agriculture sector as one of the important economic industries. In 2009, agricultural industry contributed national GDP by 35 percent. But, one year later in 2010, agriculture industry contributed the national GDP only by 28.8 percent and further decreased to 15.2 percent in 2019 (Lao Statistics Bureau, 2019). In 2020, the share of agricultural sector on GDP slightly increased to 16.51 percent. Under this scenario, government of Lao PDR had paid sufficient effort to uplift this industry by introducing agricultural policy initiatives aiming to modernize lowland farming. Basically, the policy initiatives focus on market-oriented production specially the cash crops for smallholders. Ministry of Planning and Investment (2011) in its 7th five-year National Socio-Economic Development Plans (NSEDP) mentions that the agricultural sector Lao PDR would be developed more intensively with potential and suitable means of modernization and commercialization. The plan document also highlights the agricultural sector to improve food security and promote the export. The plan aimed to apply the newer scientific and technological methods to increase the agricultural productivity. In addition, the 2011-2015 five-year plan aimed to improve the existing methods of production by improving irrigation system. Ministry of Planning and Investment, (2016) realized satisfactory levels of production in agriculture during the 7th five-year plan. Both domestic and private investment basically focused on energy, mining, service and agriculture sectors. In agriculture sector the investment mainly focused in the corn promotion, sugarcane, rubber tree, coffee and tea production project. During the 7th plan period Lao PDR has remarkably achieved its target mainly the improvement of agricultural production with commercialization of this sector. The next 8th five-year NSEDP for the period of 2015 to 2020 has also continued to emphasis the commercial production in agriculture sector. On top of this, it is very important to analyse the change in cropping pattern in the Lao PDR. Therefore, this chapter aims to review on the cropping patter change with the information provided by Lao Agriculture Censuses.

This chapter has three main subsections: crop production, factor of pattern changes and agricultural practices and extension service followed by many other subsections related to crop input and cropping patterns. Crop production includes production of both permanent and temporary crops as well as industry crop. Moreover, this subsection analyzes the cropping pattern change using the information provided by three Lao Census of Agriculture. The second subsection discuss on the factors responsible of pattern change including the reason of pattern change, cross analysis with holding characteristics and access and utilization of market. The third subsection explains the status of agricultural inputs such as irrigation, fertilizer etc. Similarly, agricultural tools and machinery, labor and financial instruments are discussed in the third subsection. Finally, this chapter concludes the pattern change in cropping practices with the factors responsible to the change and transition to market output and modernization of the Lao PDR.

3.1 Crop Production

A comparison of data from the LAC 1998/99, LAC 2010/11, and LAC 2019/20 reveals significant changes both in area under crops and crop production pattern. Figure 3.1 shows that the area under temporary crops and permanent crops for three LAC periods. There was remarkable increase in the area under both types of crops between 1998/99 and 2010/11. In contrast, there was a big fall of the area under both types of crops between 2010/11 and 2019/20. In the third round of LAC, the definition of farm household was changed as compared to the second round of LAC. For example, a household was considered as a farm household if it holds 0.1 ha or more agricultural land in 2019/20 but the threshold was only 0.02 ha in 2010/11. By virtue of this changed definition of farm household, some small households were excluded from the sample and hence their farm area under the temporary and permanent crops was also automatically omitted. On the other, in line with the government policy, agriculture system of Lao PDR might be changing to commercial production using comparatively small area of farmland.

Figure 3.1 Area under temporary and permanent crops by province in 1998/99, 2010/11 and 2019/20



Province-wise area under temporary and permanent crops is presented in the Appendix 3.1. Area under temporary crop varies from 8740 hectares in Xaysomboun province to 197200 hectares in Savannakhet province. Similarly, area under permanent crop varies from 50 hectares in Khammuane to 39900 hectares in Chapasack. As well as the second LAC, the third LAC also

reported that larger farm holders prefer permanent crops than the smaller holders. Total area under permanent crop with land tenure less than one hectare was only 980 hectares while the area with land tenure three hectare and above was 55260 hectares in 2019/20. Similar pattern was reported for temporary crops as well. Total area under temporary crop with land tenure less than one hectare was 50780 hectares while the area under temporary crop with land tenure three hectare and above was 597010 hectares in 2019/20.

In Lao PDR, temporary crops are grown mainly in two seasons: rainy and dry. However, rainy season cultivation dominated the overall temporary crop cultivation because of high dependency on rain-fed irrigation system in most part of the country. Evidence from the LAC 2019/20 shows that about 89% farm households grew temporary crops in the rainy season while only about 17% households grew the temporary crops in the dry season. The practice of growing crops depends on the size of land tenure. As presented in the Table 3.1, the larger farm households dominated both rainy season and dry season cultivation of the temporary crops.³ There were 37% farm households with three or more land tenure growing temporary crops in the rainy season and 34% of similar type of households growing temporary crops in the dry season. The second majority of farm households growing temporary crops in both seasons were from the class having agricultural land of size one to two hectares. The lowest number of households growing temporary crops in both seasons were reported from the class having the smallest land tenure size (less than 1 ha) of agricultural land. The geographic distribution of farm households growing temporary crops shows that the Central region reported the highest number of farm households growing temporary crops both in rainy and dry season while the Southern region reported the lowest number (Table 3.1). Appendix 3.1a presents the provincial distribution of number of farm households growing the temporary crops by seasons and land tenure. According to the Appendix 3.1a, Savannakhet reported the highest number of farm households growing temporary crops in both seasons while Xaysomboun reported the lowest number of farm households in both seasons. Savannakhet and Xaysomboun both provinces are from the Central region and they reported the highest and the lowest number of total farm households respectively in 2019/20.

³ The LAC 2019/20 reported that 27.3% farm households owned three hectares and more, 15.9% owned two to three hectares, 26.1% owned one to two hectares and 30.2% owned less than one hectare of agricultural land in Lao PDR.

Table 3.1: Temporary crop growers by season and size of land, 2019/20

Province	Number of households growing temporary crops in the rainy season (000)	Number of households growing temporary crops in the rainy season by land tenure (000)				Number of households growing temporary crops in the dry season (000)	Number of households growing temporary crops in the dry season by land tenure (000)			
		Less than 1 ha	1 - 2 ha	2 - 3 ha	3 ha and up		Less than 1 ha	1 - 2 ha	2 - 3 ha	3 ha and up
North	208	38	51	40	79	29	6	8	6	10
Central	253	42	71	48	91	58	11	17	12	18
South	109	11	32	26	41	19	2	5	4	8
Lao PDR	571	91	154	114	211	107	20	29	22	36

Source: LAC 2019/20

Number of permanent crop growers sharply increased from 1998/99 to 2010/11 while the number sharply decreased from 2010/11 to 2019/20 (Figure 3.2). Central region reported the highest rise in number of permanent crops growers between the first LAC and second LAC period and also reported the highest fall in the number between the second LAC and third LAC period. Overall, 246,400 permanent crops growers were added between 1999 to 2011 but the number of permanent crops growers went sharply down again by 289,330 between 2011 to 2020.

Figure 3.2 Permanent crop growers in 1998/99, 2010/11, and 2019/20 by region

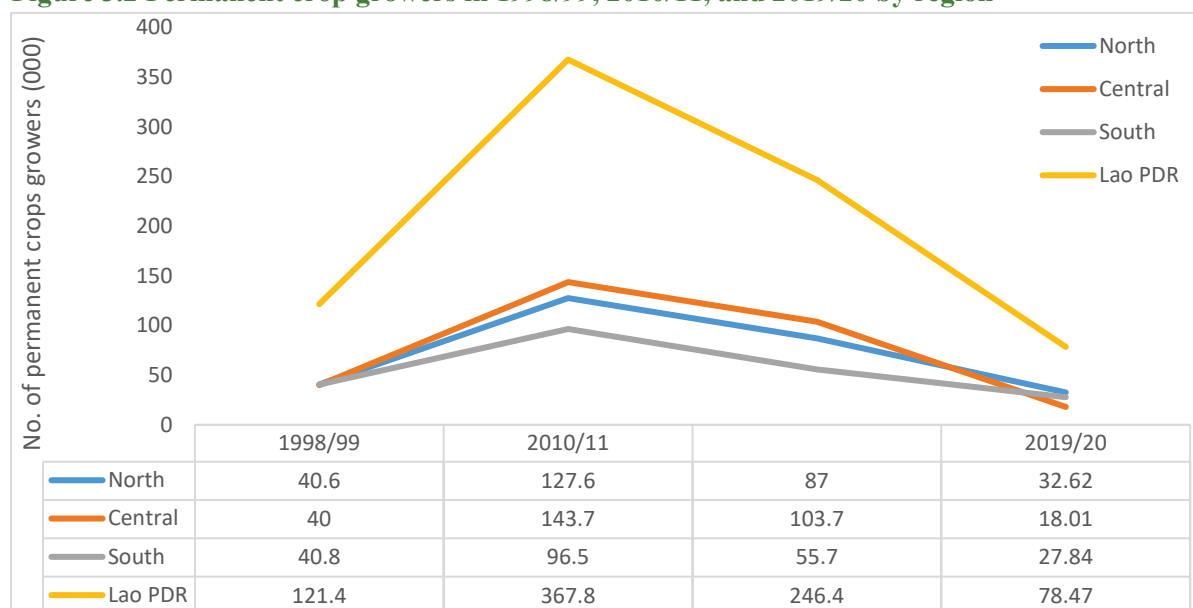
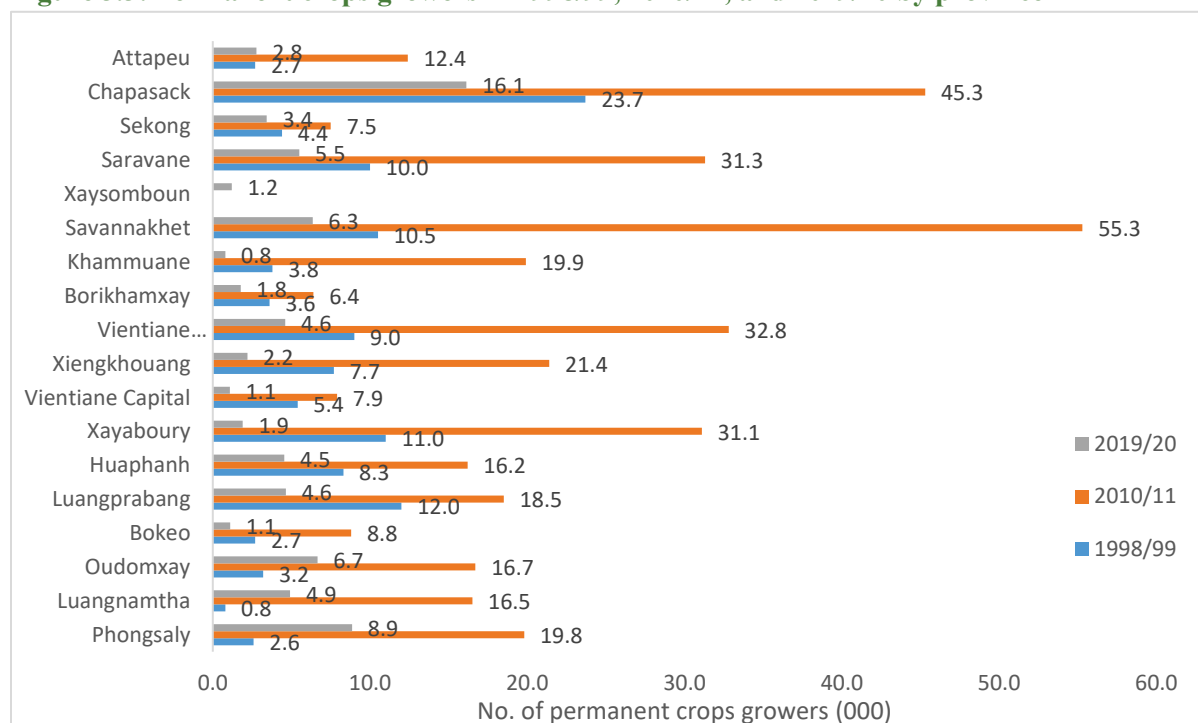


Figure 3.3: Permanent crops growers in 1998/99, 2010/11, and 2019/20 by province



Source: LAC 2019/20

As can be seen in the Figure 3.3, there were sharp rise in the number of permanent crops growers in Chapasack, Saravane, Savannakhet, Vientiane province and Xayaboury between 1998/99 and 2010/11. Remaining other provinces also showed high rise in the number of permanent crops growers in that period. In contrast, between 2010/11 and 2019/20, the number of permanent crops growers sharply decreased in all provinces. However, the fall was comparatively low in Sekong, Borikhamxay, Vientiane Capital, and Bokoko provinces.

Number of provincial crops growers by type of crops and size of land in 2019/2020 is presented in Appendix. There was a big variation among the number of farm household growing both temporary and permanent crops during the third LAC. In 2019/20, average number of permanent crops growers by province was 3,715 with standard deviation of 4,400. Number of provincial crops growers ranged from 800 in Khammuane to 16100 in Chapasack province during the third LAC. Similarly, average number of temporary crops growers by province was 37,600 ranged from 7,500 in Xaysomboun to 126,200 in Savannakhet province with standard deviation of 26,100. Regarding temporary crops, both smaller and larger farmers were equally engaged in growing these crops though number of farmers with smaller farm holdings size is slightly lower than that of larger farmers. Nevertheless, in case of permanent crops, larger farmers were more attractive because 38,430 farm households with farm holding size three hectare and more were involved in cultivating permanents crops while only 8,400 farm households with farm holding size below one hectare cultivated the permanent crops in 2019/20. Similar behavior of farm households

was also noticed during the second Lao agriculture census period. Therefore, it can be argued that farm holding size matters in choosing the type of crops for cultivation. Obviously, smaller farmers seem to be more likely to use their available agricultural land optimally for subsistence of food requirements rather than establishing permanent crops farming that relatively give output in a bit far long time period.

Geographic structure of Lao PDR to grow crops can be divided into lowland and upland system. Both rain-fed and irrigated system cultivation are practiced in the country. Lowland agriculture is dominated by rice crops while upland agriculture is shifting crop system cultivation. Commercial crops are planted mainly in the irrigated lowland system. Majority of farmers in Lao PDR followed mixed farming depending upon the topography of the land. Farmers in Lao PDR grew and produced a wide variety of temporary crops and permanent crops during the third LAC period as did during the first and second LAC periods. The LAC 2010/11 reported that the country had grown more than 100 temporary crops, broadly the categories of: food crops; starchy roots and tubers; legumes; leafy, stem and fruit-bearing or other vegetables; sugar crops; oil seed crops; fibre crops; and fodder crops (Ministry of Agriculture and Forestry, Government of the Lao People's, 2014). The third round of LAC 2019/20 also reported more than 100 temporary crops grown by farm population in the Lao PDR that seems to be increased/decreased than that of second LAC. Table 3.1a and 3.1b presents the number of growers and area under the major temporary crops with average annual change and average area per grower. As can be seen in the Table 3.1a, rice was one of the most cultivated temporary crops in Lao PDR during all three round LAC periods. A total of 603 farm households grew rice in 2019/20 which was decreased by 1.5% as compared to the second round LAC 2010/11 period (Table 3.1b). In Lao PDR rice cultivation system was upland and lowland system. Rice was cultivated in both wet and dry season however, area under dry season rice was only 41,875 hectares while that of wet season was 669,199 hectares showing almost 16 times larger area covered by rice in the wet season. Dry season rice cultivation basically depended on irrigation while most of the wet season rice cultivation was rain-fed. There were mainly three types of rice grown in Lao PDR during the third round of LAC: Stick rice, rice and upland rice. Among these three types of rice, sticky rice was more common since majority of grower cultivated this rice using larger area in 2019/20 (Appendix 3.1.3). However, both growers and area under rice were decreased between 2010/11 and 2019/20 in contrast to the remarkable rising trend observed between 1998/99 and 2010/11 (Table 3.1b). The average area per grower in 2010/11 was 1.4 hectare while in 1998/99 and 2019/20 was 1.2 hectare. This shows in the third round LAC period, one rice growing farmer used 1.2 hectare to cultivate rice in an average which was slightly decreased as compared to the second LAC period.

The second popular crop in Lao PDR was maize followed by chili and Chinese cabbage. Cassava was also one of the major temporary crops during first and second LAC periods but the popularity of the cassava sharply fell in 2019/20 since growers and area under cassava crop decreased respectively by 21 percent and 26.5 percent between 2010/11 and 2019/20. Not only cassava there was a huge fall between 2010/11 and 2019/20 in the number of growers and area

under the various temporary crops such as Chinese cabbage (growers by -52.1% and area by -38.9%), sesame (growers by -40.7% and area by -45.7%), tobacco (growers by -29.1% and area by -22.2%) and so on. Out of 15 major temporary crops 12 crops had decreased number of growers and 11 crops had decreased area under cultivation between the 2010/11 and 2019/20 periods. However, both number of growers and area under mung bean and cotton were increased between 2010/11 and 2019/20. Similarly, irrespective of the decreased number of growers between 2010/11 and 2019/20, area under yam bean was increased during that period (Table 3.2 and 3.3).

Table 3.2: Crop growers and area under major temporary crops in Lao PDR, 1998/99, 2010/11, and 2019/20

SN	Temporary crops	Number of growers (000)			Area * (000ha)		
		1998/99	2010/11	2019/20	1998/99	2010/11	2019/20
1	Rice	614.0	723.5	604.20	735.1	986.6	711.1
2	Maize	149.9	187.3	51.4	25.5	134.5	64.0
3	Sweet potato	19.6	10.2	7.2	0.2	0.7	0.7
4	Cassava	71.0	47.9	2.8	7.4	18.9	0.5
5	Yam bean	8.9	3.8	3.3	0.2	0.3	1.4
6	Mung bean	3.1	2.6	13.0	0.7	0.6	18.3
7	Sugar cane	22.4	13.0	7.8	3.1	6.4	1.5
8	Groundnut	21.4	28.5		4.9	8.3	
9	Soybean	4.8	6.9	0.3	0.8	1.9	0.1
10	Sesame	19.0	25.7	0.0	0.6	9.9	0.0
11	Cotton	9.3	1.1	1.8	2.5	0.1	0.9
12	Tobacco	18.4	14.8	0.2	2.7	3.4	0.2
13	Chinese cabbage	88.2	105.9	0.0	2.1	1.7	0.0
14	Watermelon	11.0	7.5	0.6	1.8	2.0	0.7
15	Chili	127.5	126.2	5.2	2.1	2.6	0.9

Source: LAC 2019/20

Note: *Area excludes crops planted in plots of less than 100 square meters,

Table 3.3: Annual change in the number of growers and area under major temporary crops with average area per grower in Lao PDR, 1998/99, 2010/11, and 2019/20

S N	Temporary crops	% Annual change **		% Annual change **		Average area/grower (ha)		
		Growers		Area		1998/ 99	2010/ 11	2019/ 20
		1998/99 to 2010/11	2010/11 to 2019/20	1998/99 to 2010/11	2010/11 to 2019/20			
1	Rice	1.4	-1.5	2.5	-2.7	1.2	1.4	1.2
2	Maize	1.9	-10.2	14.9	-6.0	0.2	0.7	1.2
3	Sweet potato	-5.3	-2.8	11.0	-0.4	0.0	0.1	0.1
4	Cassava	-3.2	-21.0	8.1	-26.5	0.1	0.4	0.2
5	Yam	-6.8	-1.1	3.4	13.7	0.0	0.1	0.4
6	Mung bean	-1.5	14.3	-1.3	32.9	0.2	0.2	1.4
7	Sugar cane	-4.4	-4.2	6.2	-11.3	0.1	0.5	0.2
8	Groundnut	2.4		4.5		0.2	0.3	
9	Soybean	3.1	-24.1	7.5	-23.2	0.2	0.3	0.3
10	Sesame	2.5	-40.7	26.3	-45.7	0.0	0.4	0.1
11	Cotton	-16.3	4.2	-23.5	20.1	0.3	0.1	0.5
12	Tobacco	-1.8	-29.1	1.9	-22.2	0.2	0.2	0.7
13	Chinese cabbage	1.5	-52.1	-1.7	-38.9	0.0	0.0	0.3
14	Watermelon	-3.1	-19.3	0.9	-8.3	0.2	0.3	1.2
15	Chili	-0.1	-23.4	1.8	-8.4	0.0	0.0	0.2

Source: LAC 2019/20

Note: ** Indicates annual compound growth rates

Number of growers, area, and average area per grower for major temporary crops cultivated in the Lao PDR by season during 2019/20 is presented in Appendix 3.1.3. Majority of farm households cultivated sticky rice, rice, upland rice, hard corn in wet season. Similarly in dry season majority of farm households cultivated sticky rice though the number of households were very low as compared to the wet season growers. The average area per grower ranged from 0.001 hectare (sugar cane) to 2.27 hectares (grasses) in wet season while 0.0002 hectare (other oilseeds) to 1.44 hectare in 2019/2020. The crop intensity in Lao PDR was one for most of the temporary crops in 2019/20. But, few crops including cinnamon were cultivated two times in the wet season during 2019/20.

Table 3.4 and 3.5 represents the permanent crops cultivation pattern during the three LAC periods. Majority of farmers cultivated rubber, coffee, banana in 2019/20 as compared to the other permanent crops and also used large land area. On the other, both the growers and area sharply decreased for coconut, tamarind, papaya between 2010/11 and 2019/20. For mango, number of

growers sharply fell down between 2010/11 and 2019/20 while area under mango went little up in that period. The number of growers of mango increased but area decreased between 1998/99 and 2010/11 while in contrast, number of growers decreased but area increased between 2010/11 and 2019/20. This shows that in Lao PDR rubber, coffee, cardamon were popular among farmers while mango, papaya, tamarind, coconut were less popular in 2019/20. Average area per grower for permanent crops was almost similar to that of temporary crops (Table 3.2 and 3.3). Average area per grower was notice in increasing trend during the three LAC periods for most of the permanent crops (Table 3.2b). Farm household growing rubber and coffee held relatively higher area under these crops while farm household growing papaya and banana held relatively smaller area under these crops in 2019/20. In summary, average area per grower increased but number of growers and area under permanent crops decreased during the last 30 years period.

Table 3.4: Crop growers and area under major permanent crops, 1998/99, 2010/11, and 2019/20

Types of permanent crops	Number of growers (000)			Area (000 ha)**		
	1998/99	2010/11	2019/2020	1998/99	2010/11	2019/2020
Bananas	109.00	70.40	12.83	13.40	9.30	3.59
Mango	152.00	187.60	8.07	3.80	3.30	4.39
Papaya	23.00	14.00	0.33	0.50	0.20	0.05
Pineapple	25.90	12.20	2.30	2.30	2.10	0.84
Tamarind	68.00	76.50	0.99	1.50	1.00	0.24
Coffee	23.70	25.20	30.82	41.20	45.90	47.34
Tea	1.70	6.30	4.62	0.50	2.50	2.36
Coconut	109.10	110.70	0.58	0.90	0.90	0.11
Cardamom	6.10	13.30	16.38	5.20	6.40	2.93
Rubber	0.10	49.00	57.12		66.50	91.85

Source: LAC 2019/20

Note: ** The area does not include the scattered planting area

Table 3.5: Annual change of growers and area and average area per grower for the permanent crops, 1998/99, 2010/11, and 2019/20

Types of permanent crops	*(%) Annual change 1998/99 to 2010/11		*(%) Annual change 2010/11 to 2019/20		Average area/grower (ha)		
	Growers	Area	Growers	Area	1998/99	2010/11	2019/20
Bananas	-3.58	-3.00	-13.23	-7.63	0.12	0.13	0.28
Mango	1.77	-1.17	-23.07	2.41	0.03	0.02	0.54
Papaya	-4.05	-7.35	-26.89	-11.43	0.02	0.01	0.14
Pineapple	-6.08	-0.76	-12.99	-7.35	0.09	0.17	0.37
Tamarind	0.99	-3.32	-30.42	-11.31	0.02	0.01	0.24
Coffee	0.51	0.90	1.69	0.26	1.74	1.82	1.54
Tea	11.53	14.35	-2.55	-0.46	0.29	0.40	0.51
Coconut	0.12	0.00	-35.43	-15.91	0.01	0.01	0.19
Cardamom	6.71	1.75	1.75	-6.31	0.85	0.48	0.18
Rubber	67.56		1.29	2.73		1.36	1.61

Source: LAC 2019/20

Note: * Indicates annual compound growth rates

Table 3.6 presents the regional variation of number of growers and area under some major permanent crops in 2019/20. A total of 78,470 farm households cultivated permanent crops under 69,037 hectares farm land. North region had the highest number of permanent crops growers followed by the South. Similarly, South region reported the largest area (51,619 ha) under the permanent crops while North and Central regions reported relatively smaller area (about 9 ha) under these crops. The third round of LAC reported that tea, banana and mango were grown by more than two thousand farm households in North region and remaining permanent crops were grown by relatively lower farm households. Majority of farm households cultivated banana in Central region and coffee in the South. In contrast, South region did not grow tea, orange and Logan fruit in 2019/20. Similarly, North did not grow durian and very few farm households grew this crop in Central region too. Very few farm households grew orange, durian, coconut, avocado and papaya in total in Lao PDR during the third LAC period.

Table 3.6: Crop growers and area under major permanent crops by region, 2019/20

	North		Central		South		Lao PDR	
	Grower (000)	Area (000ha)	Grower (000)	Area (000ha)	Grower (000)	Area (000ha)	Grower (000)	Area (000ha)
All permanent crops	32.616	8.740	18.015	8.679	27.839	51.619	78.470	69.037
Coffee	0.83	0.45	0.23	0.20	14.19	46.69	15.25	47.34
Tea	2.86	1.31	1.75	1.05	0.00	0.00	4.61	2.36
orange	0.32	0.12	0.45	0.30	0.00	0.00	0.77	0.43
Banana	2.81	0.38	8.11	2.80	1.87	0.41	12.79	3.59
Durian	0.00	0.00	0.08	0.04	0.45	0.19	0.53	0.23
Lemon	0.30	0.03	1.19	0.42	0.28	0.11	1.77	0.56
Pineapple	0.90	0.12	1.10	0.62	0.26	0.11	2.26	0.84
Coconut	0.26	0.06	0.19	0.02	0.13	0.02	0.58	0.11
Mango	2.78	0.24	1.96	0.50	0.32	0.08	5.07	0.82
Jackfruit	0.25	0.01	0.28	0.02	0.22	0.05	0.74	0.08
Longan fruit	1.09	0.10	0.20	0.06	0.00	0.00	1.29	0.16
Papaya	0.08	0.00	0.20	0.05	0.05	0.00	0.33	0.05

Source: LAC 2019/20

The LAC 2019/20 reported that farm households practiced both planting by technique and scattered planting for the permanent crops depending on the types of crops. For example, majority of coffee trees were planted by following the technique while tamarind was planted randomly (Table 3.3b). Another most important information received from the Table 3.3b is that the number of trees planted was led sharply by coffee followed by tamarind. Permanent plants such as coffee, pineapple, tea, cashew, orange, lemon, avocado, jackfruit, durian, longan, dragon, coconut, pear, mangosteen were mostly planted by following the technique while banana, mango, papaya, were planted almost equally by following technique and scattered planting. Rest of the plants were mostly followed the scattered planting (Table 3.6). Basically, planting using technique represents to some extent of modernization in permanent crop cultivation while scattered planting represents the traditional way of planting. Plantation by following the technique would increase the productivity in one hand and on the other such plantation make easy to care and grow the plants. Therefore, plantation by following the technique is one of the sign of modernization and commercialization of planting permanent crops.

Table 3.7: Technique used in the plantation of major permanent crops, 2019/20

SN	Name of permanent plants	Total planted trees	Planted according to technique		Scattered planting	
			Number of planted trees	%	Number of planted trees	%
1	Coffee	187,905,363	140,812,185	75	47,093,179	25
2	Cardamom	47,774,366	12,517,031	26	35,257,336	74
3	Other permanent crops	10,960,838	2,846,927	26	8,113,911	74
4	Pineapple	8,792,460	5,897,879	67	2,894,582	33
5	Banana	5,489,303	2,860,555	52	2,628,747	48
6	Tea	2,936,376	2,104,677	72	831,699	28
7	Cashew nut	1,818,856	1,503,908	83	314,948	17
8	Mango	397,928	203,533	51	194,395	49
9	Orange	380,710	330,151	87	50,559	13
10	Lemon	364,821	307,310	84	57,511	16
11	Permanent crops provide oil	271,926	98,021	36	173,905	64
12	Avocado	258,094	230,744	89	27,350	11
13	Custard apple	130,732	68,726	53	62,006	47
14	Rambutan	129,103	40,566	31	88,537	69
15	Lychee	125,696	48,890	39	76,806	61
16	Tamarind	121,339	121,339	100	-	-
17	Peach	117,021	33,486	29	83,535	71
18	Bamboo	106,069	7,253	7	98,816	93
19	Plum	80,232	41,973	52	38,259	48
20	Jackfruit	71,676	45,773	64	25,903	36
21	Durian	48,992	31,071	63	17,921	37
22	longan	45,878	35,861	78	10,017	22
23	Dragon	44,584	34,551	77	10,033	23
24	Coconut	43,675	32,118	74	11,557	26
25	Jujube	28,287	16,083	57	12,204	43
26	Pear	16,552	13,383	81	3,170	19
27	Papaya	16,236	3,479	21	12,758	79
28	Mangos teen	15,939	15,939	100	-	-

Source: LAC 2019/20

3.2 Rice Production in the Lao PDR

Rice is the prime crop in the Lao PDR since majority of farm households have been growing this crop since long ago and also continued during the year 2019/20. The 8th NSEDP shows that in an average Lao PDR produces 3 million tons of rice per year. This plan also claims that a total of 1.04 million tons of more rice was produced in the interval of 4 years between 2010/11 and 2014/15, increased from 3.06 million tons to 4.1 million tons. Rice production system in the Lao PDR can be divided into three systems: rain-fed rice farming, dry season rice, and the upland rice. Among them, rain-fed rice farming system dominated the rice cultivation in the Lao PDR since it covered relatively more farming land and produced more rice a year. For instance, in 2015, total rain-fed rice farming area was 757,640 hectares yielding 3.3 million tons of rice, dry season rice farming area was 101,525 hectares yielding 520,000 tons of rice and the upland rice farming area was 91,060 hectares yielding 224,360 tons of rice (Ministry of Planning and Investment, 2016). The LAC 2019/20 reported that 639,182 hectares land was used for rainy season rice cultivation while only 40,699 hectares land was used for dry season rice cultivation. Total rice harvested areas reported respectively in rainy season and dry season were 620,411 hectares and 39,897 hectares in 2019/20. In Lao PDR, farm households planted mainly two types of rice: sticky rice and non-sticky rice. Sticky rice shared a high proportion of the total rice production both in rainy and dry season. In the rainy season of 2019/20, a total of 1,185 million tons of sticky rice was produced contributing 84% of the total production and in the dry season of the year, a total of 120 million tons of sticky rice was produced contributing 96% of total production of the respective seasons. The upland rice production contributed 9% of total production of the rainy season and 3% of total production of the dry season. The LAC 2019/20 reported that a total of 1,536 million tons of rice of all kind and all seasons was produced in the year 2019/20. Farm households produced crops basically for three purposes: consumption, consumption and sale, and sale. In 2019/20, farmers in the Lao PDR sold a total of 221.6 thousand tons (16% of total production of the season) of rice in rainy and dry seasons. Remaining proportion of rice were massively produced for consumption, however, farmers reported that the purpose of growing sticky rice was equally for consumption and for both consumption and sale.

Majority of farm households produced sticky rice in 2019/20. More than ten-fold farm households as compared to the rice growers and almost six-fold farm households as compared to the upland rice growers grew sticky rice in the year. In all types of rice, Indigenous varieties were popular though some households used the improved varieties as well.

Almost five-fold more farm households used the indigenous varieties of rice. Very negligible number of households used improved varieties of upland rice while relatively high proportion of households used the improved varieties of rice. Province Savannakhet seems to be relatively more attractive towards the improved varieties of rice Savannakhet remained completely reluctant towards it. Provinces such as Bokeo, Huaphanh, Xiengkhouang, Oudomxay, Phongsaly,

Xiengkhouang had shown relative very low interest in the improved variety of the rice. Moreover, fifty percent provinces did not used the improved variety of upland rice.

As can be seen in the Table 3.8 majority of households used the variety of rice from the production of last year. Farm households in the Lao PDR basically used indigenous variety and the variety came mainly from their own production of previous year. Farm households from the Central region relatively used more seed purchased from the center or DAFOs for stick rice.

Table 3.8: Number of households by source of rice variety, 2019/20

Sticky rice	North	Central	South	Lao PDR
Production from last year	142,511	189,108	83,308	414,927
Purchased from center or DAFOs	880	16,309	1,587	18,776
Production group	3,409	17,655	2,094	23,158
Other	3,409	17,655	2,094	23,158
Upland rice				
Production from last year	52,101	14,079	6,013	72,193
Purchased from center or DAFOs	41	-	9	49
Production group	21	5	8	34
Other	344	540	10	894
Ordinary rice				
Production from last year	8,442	19,073	7,624	35,139
Purchased from center or DAFOs	601	5,066	723	6,389
Production group	21	158	77	256
Other	156	1,960	354	2,470

From the aforesaid information, it can be said that rice is cultivated everywhere in the Lao PDR. However, many of leading rice producing provinces are located along the Mekong River. Based on the total area used for rice cultivation both in wet and dry season, Vientiane Province, Khammuane, Savannakhet, Saravane, Chapasack are the main leading rice producing provinces of the Lao PDR. Rice is a key staple for the country and majority of arable land is used for its cultivation.⁴ Lowland area of the Lao PDR is fertile for rice cultivation and only about 11 % rice production takes place in the highland areas. Cropping pattern of rice is gradually changing to commercial production in the recent time as some families have shifted from slash-and-burn rice cultivation to commercial production. Rice production in the Lao PDR not only supply the food grains to people of Lao PDR but also secure their improved livelihood. Moreover, Lao exports rice specially to China that helps to earn foreign currency and hence support the national income. Xinhua (2020) states that Lao PDR has been gradually increasing the export amount of rice to China. According to the news, Lao PDR exported rice of worth 5.6 million U.S. dollars in 2017 that increased to 7.25 million U.S. dollars in 2018 and further increased to 14.54 million U.S. dollars in 2019. Rice export of the Lao PDR are mainly destined for Vietnam, China and Thailand.

⁴ Lao PDR is a mountainous country and only about 4 percent of its total area is arable.

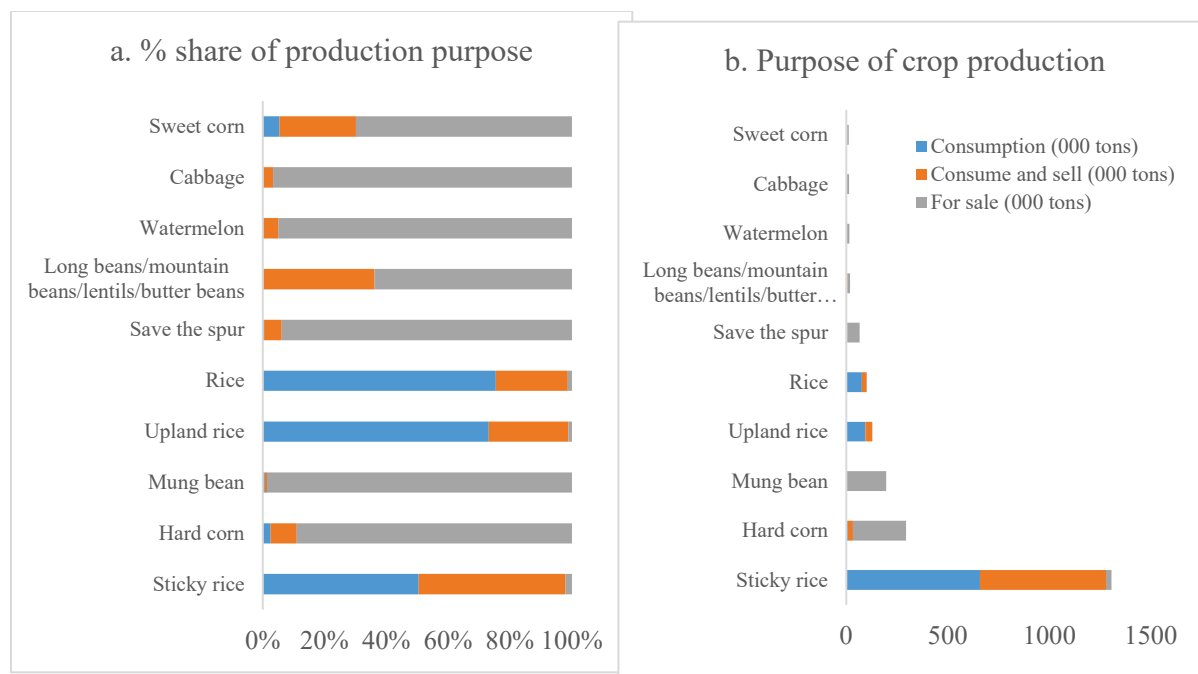
This shows that rice is potential domestic product of the Lao PDR to raise its national income. Nevertheless internal regulations, higher costs and quality issue jointly limit the rice export of the Lao PDR (Welcher & Prasertsri, 2019).

3.3 Purpose of Producing Crops

Agricultural production of Lao PDR was for both consumption and selling purpose depending on the types of crops. Nevertheless, most crops were mainly produced for the selling purpose 2019/20 (Appendix 3.1.4). For instance, the purpose of production of ten major crops based on the total yield in 2019/20 is presented in the Figure 3.4. Out of ten major crops, rice production in Lao PDR was dominated by consumption purpose while maize for sale. Majority crops (seven out of ten) were produced mainly for sale while remaining three types of rice were produced mainly for consumption (Figure 3.)4. Major consuming food in Lao PDR were rice, maize, cassava, sweet potato, onions, rattan, dragon etc. (Appendix 3.1.4). Majority of crops were produced for both consumption and purpose of sale. Tobacco, mushroom and chinese cabbage were produced only for sale. Crops such as hard corn, mung bean, jobs tear, watermelon, cabbage, pineapple, other weeds, lettuce, red beans, cotton, ginger, black beans, rattan, and sesame were mainly produced for sale. In summary, agriculture production of Lao PDR was dominated by purpose of sale since majority of crops fell under this category in 2019/20.

Additional information that can be drawn from the Figure 3.4 is that the amount of rice production in Lao PDR was enormously large as compared to other crops in 2019/20. Among the different variety of rice, sticky rice was mostly produced followed by hard corn, mung bean, and non-sticky rice. Interestingly, production of rice of all varieties was five times more than that of maize of all varieties, the second mostly produced crop in Lao PDR in 2019/20.

Figure 3.4: Major ten temporary crops and purpose of production, 2019/20



Most of the permanent crops were grown for the purpose of sale in the Lao PDR as reported by the LAC 2019/20. Production of coffee dominated the permanent crops and it was grown almost for sale. Out of ten major permanent crops, relatively highest proportion of consumption was reported for the mango while all other crops either for sale or with the purpose of consume and sale (Table 3.9). Coffee, banana, lemon, watermelon were grown mainly for sale while mango was grown mainly for consumption and sale. In sum, the results of the LAC 2019/20 suggested that farm households in the Lao PDR grow permanent crops mainly for sale and consumption and sale. Very nominal amount of permanent crops was grown for consumption only.

Table 3.9: Major ten permanent crops and purpose of production, 2019/20

Plants	Total yield	Consumption		Consume and sale		For sale	
		(000 tons)	%	(000 tons)	%	(000 tons)	%
Coffee	252192	8	0%	180	0%	252005	100%
Banana	18882	293	2%	9382	50%	9207	49%
Other perennial plants	7312	688	9%	3322	45%	3303	45%
Pineapple	6981	83	1%	3318	48%	3581	51%
Tea	6146	189	3%	2959	48%	2998	49%
Cashew	3343	3	0%	189	6%	3151	94%
Lemon	3156	1	0%	686	22%	2469	78%
Jackfruit	3026	33	1%	700	23%	2292	76%
Mango	2071	447	22%	1436	69%	189	9%
Watermelon	773	1	0%	216	28%	556	72%

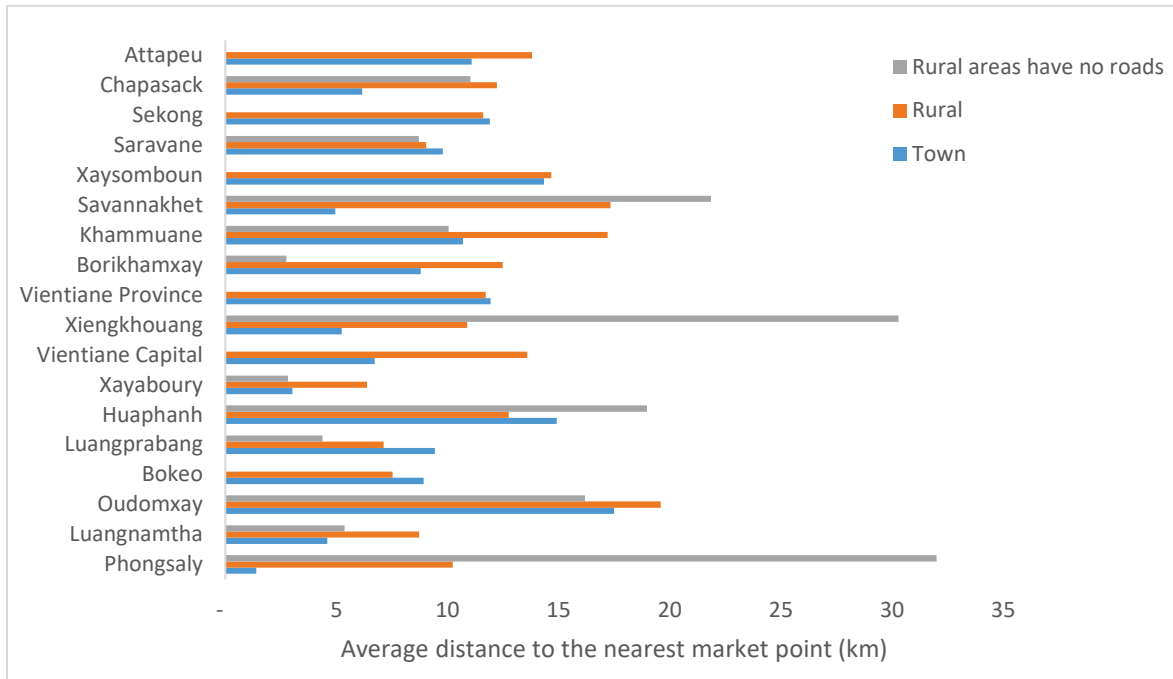
Source: LAC 2019/20

3.4 Market Access and Utilization

Well managed market access help to increase the commercial production of agricultural industry. Market access is one of the key determinants of production decision. Studies shows that a good market access not only increase the productivity and income but also the food security (see for example: International Fund for Agricultural Development). Basically, the rural producers often face various problems and one of them is assessing the markets. As the market distance goes longer, farm households compel to bear high transportation cost, limited knowledge and lack of business skill as well. With this note, this subsection documents and analyze the findings of the LAC 2019/20 on market access and utilization.

The LAC 2019/20 reported that the average distance between farm households and the nearest distribution point varied according to the geographic location of the households. Generally, households at town areas reported relatively lower distance than that of the rural areas. In town, a household need to move 8 kilometers in an average to reach the nearest market point while rural with road access need 12 kilometers and rural with no road need 13 kilometers. This shows that the market access in the Lao PDR differed according to the geographic location of the households. The market distance also varied among provinces. As presented in the Figure 3.5, Phongsaly is the province where the average market distance from the farm households at town was relatively the lowest while at rural with no road was relatively the highest. Xiengkhouang and Savannakhet also reported relatively higher average distance of market point to the rural with no road. Xayaboury and Borikhamxay reported only 3 km distance to the market point from the farm households in an average at rural with no road. In fact, Xayaboury had well facilitated the market as the average distance for all location was relatively low. On the other, Oudomxay reported relatively high distance for all location as compared to the other provinces (Figure 3.5).

Figure 3.5: Average distance from farm households to the nearest distribution point (km)



Majority of households (about 72% of total farm households) engaged in selling agricultural produce either inside their own village or outside of it. From all three geographical location, majority of farm households sold their agricultural produce inside the village while a small number of households sold the produce outside of their village. Proportionally, about 85% households sold inside the village and next 15% sold outside the village. Province wise data on the number of households selling agricultural product is presented in the following Table 3.10. All provinces reported that farm households sold their agricultural produce either inside the village or outside in the town and rural with roads. Nevertheless, Vientiane Capital, Xaysomboun and Attapeu reported that no households from rural without road sold the agricultural products. Some provinces reported that the farm households from rural with road sold but no road did not sell. However, in the rural with no road had very little access of market in another village.

Table 3.10: Number of households selling agriculture products by province 2019/20

Province	Town		Rural have road		Rural areas have no roads	
	Inside the village	Another village	Inside the village	Another village	Inside the village	Another village
North	34,609	4,481	116,024	13,772	9,171	906
Phongsaly	3,400	210	11,986	1,204	1,100	6
Luangnamtha	4,282	1,425	11,228	5,036	239	10
Oudomxay	2,709	819	20,303	1,465	3,331	436
Bokeo	1,485	204	7,753	776	413	-
Luangprabang	7,295	566	28,237	1,508	1,555	92
Huaphanh	1,570	513	11,398	2,547	2,031	309
Xayaboury	13,869	743	25,119	1,236	502	53
Central	22,521	5,307	136,447	15,486	4,239	182
Vientiane Capital	3,283	699	8,095	1,226	-	-
Xiengkhouang	2,683	1,306	14,509	1,453	997	48
Vientiane Province	4,168	333	23,660	1,674	72	-
Borikhamxay	3,271	1,432	14,809	1,163	1,748	42
Khammuane	2,077	57	17,764	1,801	539	70
Savannakhet	4,813	1,021	54,532	7,878	882	22
Xaysomboun	2,225	460	3,077	290	-	-
South	12,597	5,003	56,771	23,773	4,219	1,374
Saravane	1,297	1,210	18,024	11,632	580	358
Sekong	3,201	1,975	3,699	2,211	11	-
Chapasack	5,850	1,012	29,122	8,709	3,628	1,015
Attapeu	2,250	806	5,926	1,221	-	-
Lao PDR	69,728	14,791	309,241	53,032	17,630	2,461

Source: LAC 2019/20

3.5 Agricultural Practices and Extension service

This sub-section presents and analyze the various resources used in agricultural industry and farm management practices in Lao PDR. Basically, use of fertilizer, use of irrigation, use of tools and machinery, agricultural labor, and access to loan and credit are explained in this sub-section. After having the agricultural policy emphasizing on commercialized system of agricultural production in Lao PDR, this sub-section aims to explain the cropping pattern change in a bit detail.

3.6 Use of Fertilizer

Farm households in Lao PDR mostly used manure fertilizer and minimally used organic fertilizer and chemical fertilizer since long ago. But, with the increased commercial farming practices, the use of organic and chemical fertilizer has been gradually increased in recent decades. Ministry of Agriculture and Forestry, Government of the Lao People's (2014) reported that

adoption of modern agricultural practices has been increasing including use of chemical fertilizer, pesticides. The LAC 2010/11 reported that use of chemical fertilizer had increased by 13 percentage point between 1998/99 and 2010/11. However, the Government of Lao PDR has been promoting the use of organic fertilizer and established organic fertilizer factories in various parts of the country.

3.7 Use of Irrigation

Experiments and experiences show that well irrigation system improves the agricultural productivity elsewhere in the world. Therefore, irrigation plays a great role and thus supposed to be a vital input for the agriculture system of any country. To discuss on the use of irrigation system of a country, first it is better to know its basic environment and existing scenario of the agriculture system and irrigation practices as well as the policy expectation. Agricultural system of Lao PDR can be broadly divided into two seasonal cultivations for the temporary crops namely wet season and dry season crops. Mostly, in wet season cultivation, farm household depends on rain-fed system while in dry season additional irrigation is needed. Lao PDR is rich in freshwater resources and potential for the development of irrigation system. The Mekong and its tributaries are the major water sources for irrigation in most parts of the country. Mekong river and its tributaries serve the plains of mainly Vientiane, Savannakhet and Khammuane provinces for the irrigation system. Ministry of Planning and Investment (2016) shows that there was an increment in the total irrigated land area between 2010/11 and 2014/15 from 409,276 hectare to 419,267 hectare. The 8th five-year national socio-economic development plan (NSED) of Lao PDR has set a target of 800,000 hectare to be irrigated by 2020. Therefore, the 8th NSED had set irrigation as one of the prioritized activities and projects. Nevertheless, recent past trend shows that water supply for irrigation declined specially in the dry season because of natural disasters that damaged the irrigation plants in the Lao PDR. On top of this, the report of three rounds of LAC highlighted the actual progress towards irrigation system and present the use of irrigation in the country. In the LAC 2019/20, household level questionnaire had a separate section to collect the information on irrigation. There were eight questions that collect information on number of households using irrigation, source of irrigation, mode of irrigation, irrigated land area, sufficiency of irrigation, irrigated area by type of crops, cost for irrigation service. With the simple analysis of the collected data the following paragraphs explain the findings of the third round LAC.

Table 3.11: Area under irrigation

Region	Total agricultural land (000 ha)		Irrigated area (%)	
	2010/11	2019/20	2010/11	2019/20
North	587.08	621.37	21.3	29
Central	716.42	682.61	26.1	32
South	319.61	318.00	12.2	13
Lao PDR	1623.12	1621.99	21.6	27

Source: LAC 2019/20

Province wise data on the number of households using irrigation service is presented in Appendix 3.1.6. The proportion of households using irrigation ranged from 6 percent (Chapasack) to 57 percent (Xiengkhouang). In terms of absolute number, the highest number of households using irrigation was reported from Savannakhet (37,346) followed by Huaphanh (14,813). On the other, the lowest number of households using irrigation was reported from Attapeu (1,515) followed by Xaysomboun (2,599).

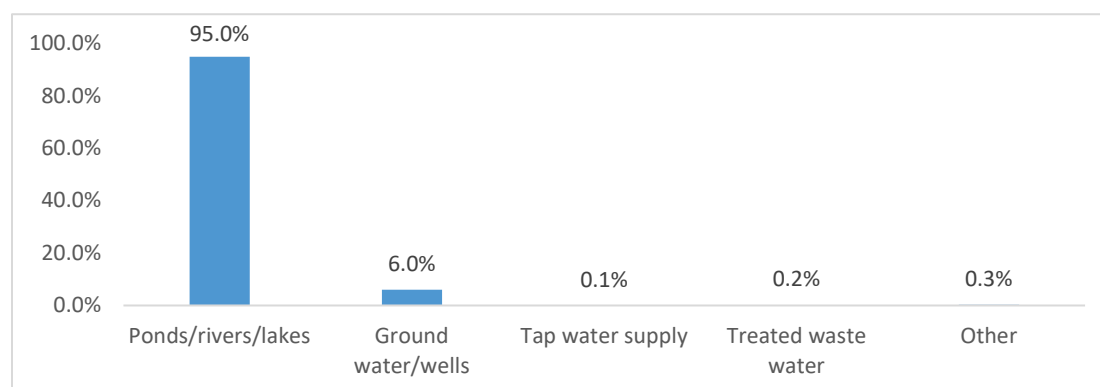
Table 3.12: Irrigation use by size of landholdings, 2019/20

Region	Number of households using irrigation	Percentage of irrigation use by size of agricultural land tenure			
		less than 1 hectare	1-2 hectares	2-3 hectares	3 and more hectares
North	69007	30.2	26.8	17.0	26.1
Central	87830	24.6	26.9	17.3	31.1
South	17549	19.6	27.3	20.8	32.4
Lao PDR	174,386	26.3	26.9	17.5	29.2

Source: LAC 2019/20

The LAC 2019/20 revealed that farmers in the various landholding size class reported almost similar proportion of land area under irrigation. However, the proportion of land area under irrigation minimally varies according to landholding size ranged from 17.5 percent with 2 to 3 hectare land size to 29.2 percent with 3 and more hectare land size. Regionally, the highest variation on the proportion of land area under irrigation according to landholding size was reported from central region ranged from 17.3 percent to 31.1 percent. Interestingly, in the north region, the farm households in the smallest landholding size class reported a higher proportion of land area under irrigation. On the other, in the central and southern regions, the farm households in the largest landholding size class reported a higher proportion of land area under irrigation.

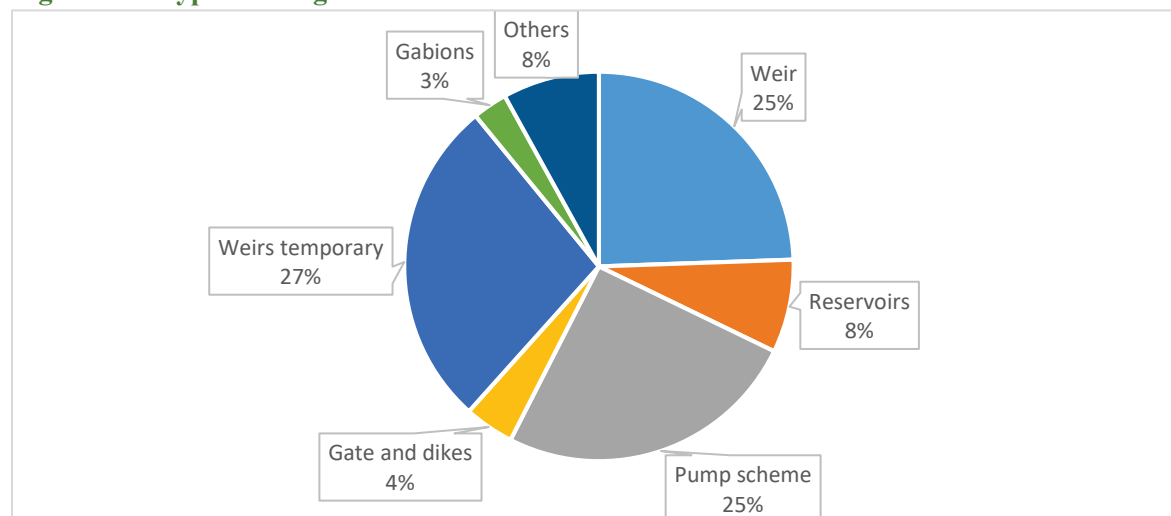
Figure 3.6: Sources of irrigation, 2019/20



Source: LAC 2019/20

Almost all irrigation source of Lao PDR was ponds/rivers/lakes in 2019/20. Ponds/rivers/lakes supplied 95 percent of irrigation in the country followed by ground water/wells that contributed 6 percent. Remaining sources like tap water supply, treated wastewater, and other contributed only 0.6 percent irrigation in 2019/20.

Figure 3.7: Types of irrigation



Source: LAC 2019/20

As can be seen in the Figure 3.7, temporary weirs constituted the highest 27 percent of available irrigation facilities followed by weir that contributed 25 percent of available irrigation facilities. Gabions constituted the lowest 3 percent followed by gate and dikes constituted 4 percent of available irrigation facilities.

3.8 Use of Tools and Machinery

Farm households in Lao PDR have been increasingly used modern tools and machinery in farm operations. For example, farmers have been using four-wheeled or two-wheeled tractors, use machine to lift water, machine for harvesting various crops and other tools in the cultivation process. This sub-section presents the practice of using tools and machines in agriculture industry as reported by the third LAC. The LAC 2019/20 showed that majority of households used machinery and equipment in their farm operation. Proportion of households using machinery and equipment respectively in north, central and southern region of Lao PDR were found to be 71.5%, 87.6%, and 88.6%. In total, 81.9 percent households used machinery and equipment. Province wise proportion of households using machinery and equipment ranged from 55% (Luangprabang) to 94.6% (Xiengkhouang).

Table 3.13: Households using machinery and equipment in farm operations, 2019/20

Province	No of farm households	No of households using machinery and equipment	Proportion of households using machinery and equipment (%)
North	236,710	169,206	71.5
Phongsaly	20,647	12,746	61.7
Luangnamtha	24,066	15,961	66.3
Oudomxay	39,113	27,687	70.8
Bokeo	18,962	12,606	66.5
Luangprabang	50,539	27,773	55.0
Huaphanh	30,836	25,565	82.9
Xayaboury	52,545	46,867	89.2
Central	274,392	240,503	87.6
Vientiane Capital	20,361	16,144	79.3
Xiengkhouang	24,299	22,976	94.6
Vientiane Province	41,470	36,739	88.6
Borikhamxay	29,961	23,520	78.5
Khammuane	38,854	35,647	91.7
Savannakhet	110,925	99,549	89.7
Xaysomboun	8,523	5,928	69.6
South	132,996	117,850	88.6
Saravane	44,452	41,532	93.4
Sekong	14,266	9,898	69.4
Chapasack	58,306	54,030	92.7
Attapeu	15,972	12,389	77.6
Lao PDR	644,098	527,559	81.9

Source: LAC 2019/20

Table 3.14: Farm households using machinery and equipment by type of village, FY 2019/20

List of machinery used in agriculture	Number of households using machinery	Percentage of households using machinery (% of total farm households)	Proportion of households by village type (%)		
			Urban village	Rural villages have access roads	Rural villages do not have access roads
Trucks	54,932	8.529	10,836	41,898	2,199
4-wheel tractor	72,111	11.196	12,006	58,195	1,910
2 wheel tractor	390,938	60.695	70,572	305,859	14,508
Generator	983	0.153	304	654	25
Pumps / water pumps	52,155	8.097	6,648	44,864	643
Planting or dropping seeds	3,310	0.514	241	2,749	320
Spreaders	500	0.078	76	406	19
Rice dryer	584	0.091	43	501	40
Timber deposit box	23	0.004	-	23	-
Egg incubator	197	0.031	134	42	22
Egg Sorting Machine	14	0.002	-	14	-
Milking machine	46	0.007	4	15	27
Injection molding machine	31,455	4.884	4,670	25,742	1,043
Weed mowers	13,104	2.034	2,057	10,234	813
Harvesting machine	24,248	3.765	4,372	18,824	1,052
Rice threshing machine	158,456	24.601	28,869	123,359	6,228
Rice miller / plant	119,429	18.542	12,762	97,924	8,743
Mill / wood grinder	3,101	0.482	523	2,420	159
Tillage machines	4,656	0.723	339	3,982	335
Straw compressor	809	0.126	642	167	-
Lawn mower	192,962	29.959	43,035	145,130	4,797
Sync car	37,047	5.752	7,407	28,393	1,247

Source: LAC 2019/20

Table 3.14 shows that various agricultural machinery and their owner from three types of villages: urban, rural having road access, and rural having no road access in 2019/20. Majority of households (60.69%) used 2-wheel tractor. About one quarter farm households used rice threshing machine and one fifth farm households used rice miller. Only 14 farm households used Egg Sorting Machine, 23 farm households used Timber deposit box and 46 households used Milking machine in 2019/20.

The distribution of farm households according to village type showed that majority of them belong to rural village having road access and same did by the machinery owner as well. Therefore,

most of the machinery were mostly used by the farm households from rural villages having road access. Timber deposit box, Egg Sorting Machine were only used by rural villages having road access and Straw compressor was not used by rural village with no road access.

3.9 Labor

The third round of LAC 2019/20 had collected information on the labor force and labor income only for the persons of age 14 to 64 years old. The questionnaire covered both supply and demand of labor force in the agricultural industry in Lao PDR. In addition, it covered the expenditure on hiring labor as well as income received by the labor service provided to the next unit in agriculture industry. Agricultural activities were divided into two activities: main activities and secondary activities categorized by crops, livestock, fisheries, and forestry. FY 2019/20 was the reference period for the labor related information. Based on this information collected in the LAC 2019/20, this sub-section explains the status of labor market in the agricultural industry in Lao PDR.

A total of 642,991 (98.83%) farm households had labor out of 644,098 total farm households in the Lao PDR during the reference period. These farm households comprised a total of 2,412,023 workers in 2019/20. Almost 50 percent workers were female in 2019/20 showing that male and female in Lao PDR equally involved in agricultural activities.

Figure 3.8: Province wise distribution of workers by sex, 2019/20

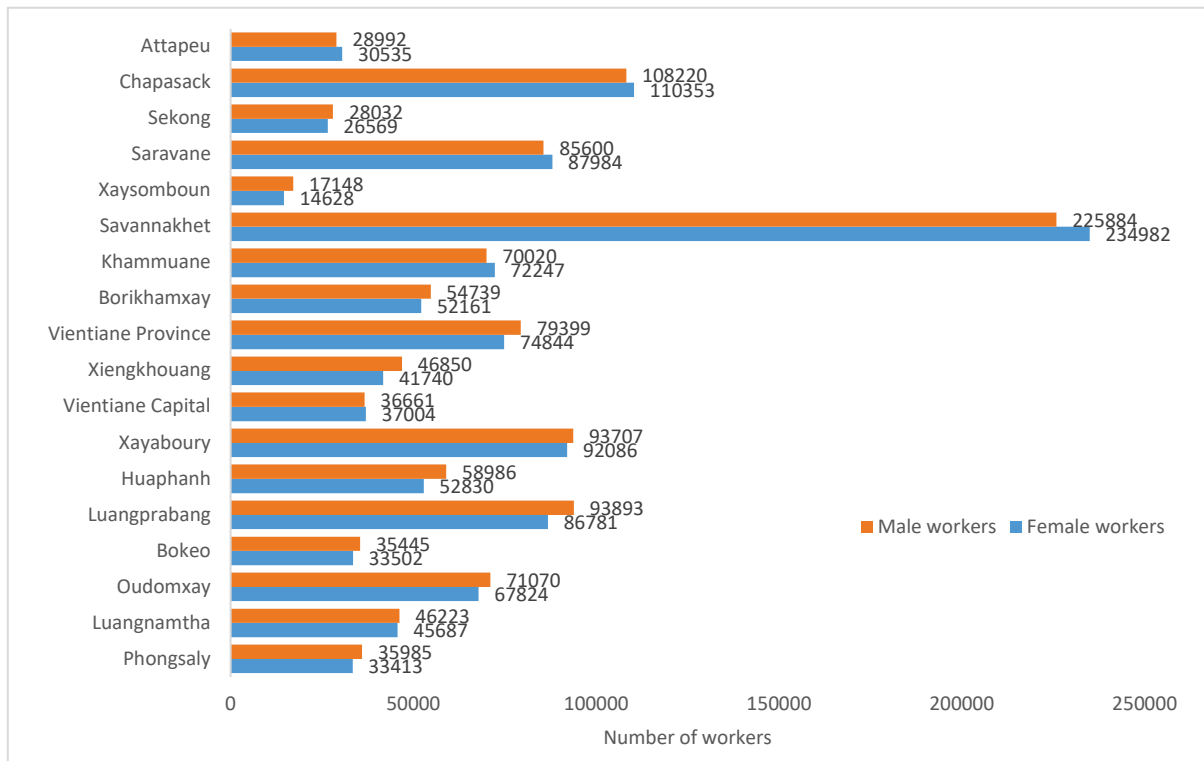
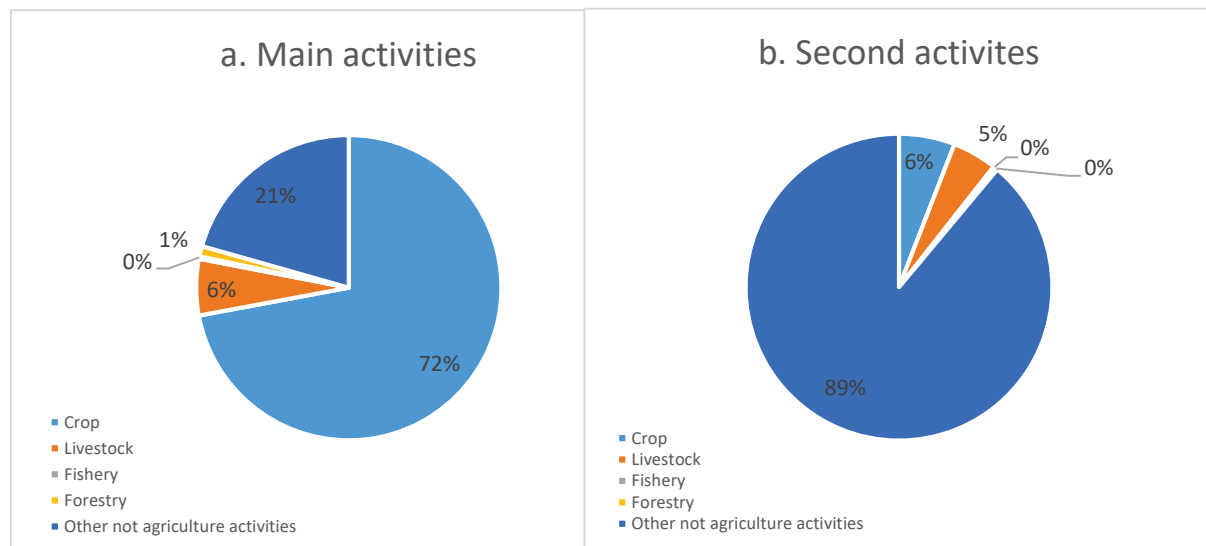


Figure 3.8 depicts the sex distribution of workers by province in 2019/20. Savannakhet province reported the highest number of workers in 2019/20 while Xaysomboun province reported the lowest number of workers. Comparatively, number of female workers were more than male workers in six provinces, namely Vientiane Capital, Khammuane, Savannakhet, Saravane, Chapasack, and Attapeu and rest of the provinces reported highest number of male workers. In fact, there is no big difference between number of male and female workers in Lao PDR, however, relatively highest difference was reported from Savannakhet province and the lowest difference from Vientiane Capital.

Figure 3.9: Labor concentration by type of activities, 2019/20



Source: LAC 2019/20

Majority of workers in Lao PDR engaged in crop cultivation as their main activity in agriculture followed by other activities not the agriculture activities (Figure 3.9 panel a) during the third LAC period. Six percent worker accepted keeping livestock as main activity while relatively very few people involved in fishery and forestry as their main activity. On the other, majority of workers chose non-agricultural activity as second activity in Lao PDR during the third LAC period. As second activity six percent reported cultivation of crops and five percent reported keeping livestock. As in main activities, nominal worker only accepted forestry and fishery as their secondary activity in 2019/20 (Figure 3.9 panel b).

3.10 Access to Loan and Credit

As commercialization of farming goes on increasing trend, the demand of purchased inputs and agricultural infrastructure also goes up. To substitute the limited resources of farm households, agricultural loan plays a vital role to boost up the commercial farming. On the other, to provide with informed policy process, information on agricultural loan is one of the important inputs. It is very crucial to know the information on access and utilization of agricultural loan to ensure the

appropriate use and better management for the needy farm households. Therefore, the LAC 2019/20 collected information on agricultural loan, its purpose, and source. Based on the information collected in the LAC 2019/20, this subsection documents and analyzes the access and utilization of agricultural loan.

In 2019/20, a total of 168,484 farm households (26% of total farm households) took agricultural loan from some kind of loan sources. In ten years, the proportion of farm households obtaining loan became double since there were only 13% farm households who obtained loan in 2010/11 (Ministry of Agriculture and Forestry, Government of the Lao People's, 2014). Proportion of farm households taking loan ranged from 66 % (Oudomxay) to 9% (Savannakhet). Relatively larger number of the farm households from rural with road access reported that they loaned for some agricultural purpose while relatively smaller number of rural with no road access took loan (Table 3.15).

Table 3.15: Distribution of farm households with loan, 2019/20

Province	Total number of farm households	Total	Percentage of farm households with loan			
			Total	Town	Rural	Rural areas with no roads
North	236710	86891	37	27	51	23
Phongsaly	20647	6343	31	40	44	16
Luangnamtha	24066	10299	43	29	49	22
Oudomxay	39113	25888	66	25	48	27
Bokeo	18962	6259	33	25	57	18
Luangprabang	50539	16783	33	26	52	22
Huaphanh	30836	12876	42	24	54	23
Xayaboury	52545	8443	16	27	52	21
Central	274392	49513	18	27	52	21
Vientiane Capital	20361	4928	24	29	49	22
Xiengkhouang	24299	8816	36	27	51	22
Vientiane Province	41470	6711	16	26	53	21
Borikhamxay	29961	7858	26	26	54	20
Khammuane	38854	8172	21	25	51	24
Savannakhet	110925	10333	9	26	53	22
Xaysomboun	8523	2697	32	41	42	17
South	132996	32080	24	27	54	19
Saravane	44452	9093	20	21	58	20
Sekong	14266	5068	36	45	38	17
Chapasack	58306	12938	22	23	56	22
Attapeu	15972	4981	31	30	57	13
Lao PDR	644098	168484	26	27	51	22

Source: LAC 2019/20

Farm households obtain loan mainly from public bank, village development fund, agricultural extension bank, other banks, microfinance. Besides these sources some households also received loan from other sources. Figure 3.10 shows the number and percentage of farm households who obtained loan from various sources. Public bank in the Lao PDR dominated all other sources to disburse agricultural loan in 2019/20 since it shared 25% loaned households. However, public bank's contribution to disburse agricultural loan slightly changed from 55% to 54% between LAC 2010/11 and LAC 2019/20. The second popular source for the loan was village development fund followed by agricultural extension bank.

Purpose of loans is another important indicator to policy makers accessing which subsector/s demand more loan. Basically, farm households seek loan to purchase agricultural inputs, farm equipment, livestock, land and to construct farm building and other infrastructure. Majority of farm households borrowed money to buy livestock followed by buying crop inputs. Relatively very few farm households (1461) loaned to buy land (Figure 3.11).

Figure 3.10: Farm households obtaining credit from different sources, 2019/20

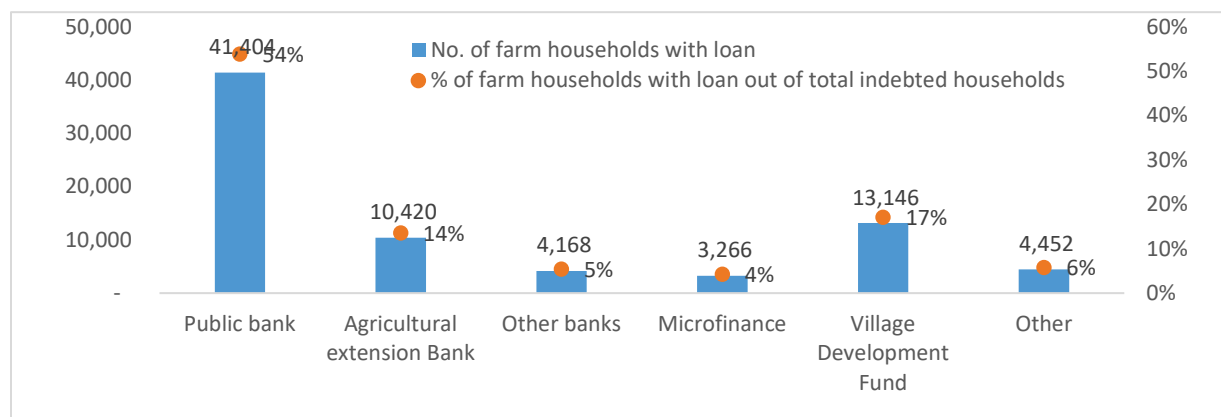
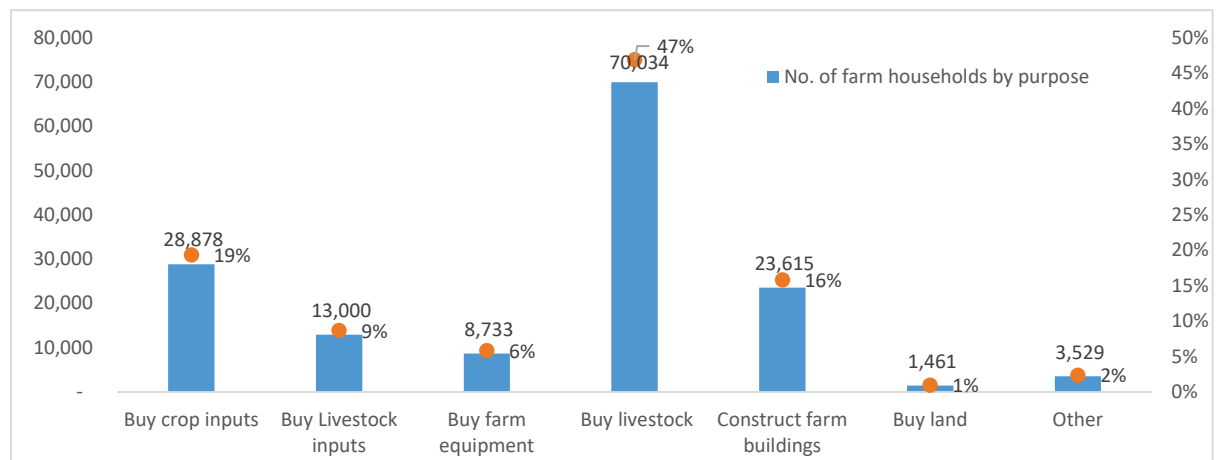
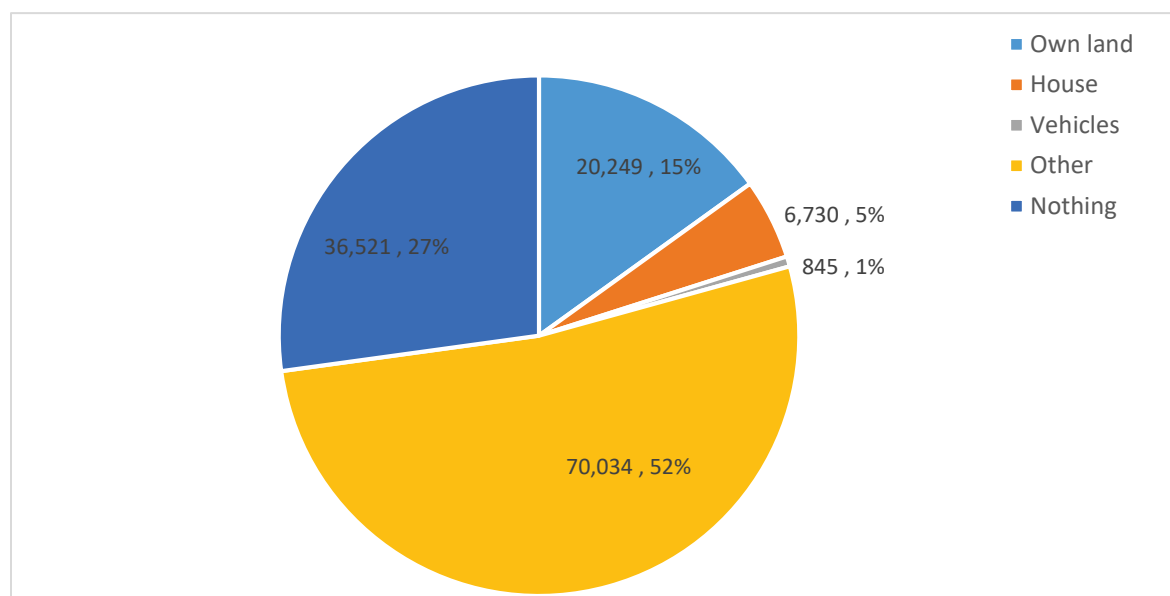


Figure 3.11: Purpose of loan, 2019/20



Source: LAC 2019/20

Figure 3.12: Collateral for getting loan, 2019/20



Source: LAC 2019/20

The LAC 2019/20 had also reported the type of collateral used to obtain loan. Main collateral used were categorized as own land, house and vehicles. Besides these collateral farm households used other collateral and some households borrowed without collateral. As can be seen in the Figure 3.12, majority of households received loan either by using collateral other than land, house and vehicles or using nothing as collateral. More than half farm households reported that they used other property as collateral while more than one fourth farm households used nothing as collateral. Among the collateral of land, house and vehicles; own land was used by relatively larger number of farm households followed by house. Very few (only 1%) farm households used vehicles as collateral to burrow the agricultural loan. In order to provide with specific collateral, next round survey would expand the types of property as most farm households reported other than the stated collateral in the questionnaire.

3.11 Conclusion

Agricultural system of Lao PDR can be broadly divided into lowland and upland system. Lowland agriculture is dominated by rice while upland is shifting crop. With the prioritized Government projects on agriculture to improve the productivity by strengthening the agricultural infrastructure, Lao PDR gradually transformed its traditional cultivation practices to commercial production practice. Mechanized farm operation with developed agricultural facilities not only improve the productivity of this sector but also optimize the limited resources. Therefore, the third round of LAC reported that area under crops (temporary and permanent) and number of growers both decreased as compared to the report of second round of LAC. Most farm households aim to

sale their agricultural produce that helps to enhance the livelihood of farmers as well as rise the national income.

Rice is the main crop that farmers grow in Lao PDR for the primary purpose of consumption while other many crops were grown for sale, for example coffee and tea. Majority of workers accepted crop cultivation as their principal activity followed by livestock in the agriculture sector. However, farmers were not significantly attracted in fishery and forestry as reported by the third round of LAC. Male and female equally involved in agricultural activities. Significant regional variation can be seen in most of the agricultural indicators such as number of growers, area under various crops, irrigation practices etc. Nevertheless, use of modern machinery and equipment has been rapidly growing during the last decades. Increasing access and utilization of agricultural loan in 2019/20 shows that farm households gradually shift towards commercial farming. Moreover, larger number of households obtained loan to buy livestock also indicates that farm households are attracted towards professional agricultural activities.

Table 3.1.1: Area under temporary and permanent crops by province in 2019/20

Province	Area under temporary crops (000)	Area under temporary crops by size of land tenure (000)				Area under permanent crops (000)	Area under permanent crops by size of land tenure (000)			
		Below 1 ha	1 - 2 ha	2 - 3 ha	3 ha and up		Below 1 ha	1 - 2 ha	2 - 3 ha	3 ha and up
North	331.49	19.13	52.22	60.59	199.54	8.74	0.39	1.42	1.46	5.47
Phongsaly	17.27	1.96	4.45	3.80	7.07	1.54	0.22	0.40	0.45	0.47
Luangnamtha	26.04	0.76	4.21	5.74	15.33	1.60	0.01	0.15	0.25	1.19
Oudomxay	60.06	2.40	9.48	10.96	37.21	2.16	0.06	0.29	0.29	1.52
Bokeo	22.26	1.44	4.81	5.89	10.12	0.62	0.01	0.04	0.13	0.44
Luangprabang	78.29	1.69	9.74	11.66	55.20	1.66	0.01	0.33	0.20	1.13
Huaphanh	26.64	7.02	9.71	4.99	4.93	0.55	0.04	0.17	0.12	0.21
Xayaboury	100.92	3.87	9.83	17.55	69.68	0.61	0.04	0.04	0.03	0.51
Central	455.09	24.77	83.83	86.19	260.12	8.68	0.27	0.49	1.35	6.57
Vientiane Capital	25.84	4.86	6.74	4.38	9.86	0.72	0.06	0.04	0.02	0.60
Xiengkhouang	46.18	1.95	7.85	8.20	28.19	0.66	0.00	0.05	0.16	0.44
Vientiane Province	60.84	4.03	8.07	7.33	41.40	4.06	0.13	0.27	0.33	3.33
Borikhamxay	53.23	1.55	7.32	9.97	34.21	1.08	0.04	0.07	0.14	0.83
Khammuane	63.06	5.08	16.55	14.74	26.69	0.05	0.01	-	0.02	0.03
Savannakhet	197.20	7.15	36.24	40.55	113.26	1.59	0.01	0.05	0.66	0.88
Xaysomboun	8.74	0.15	1.07	1.02	6.50	0.52	0.01	0.01	0.03	0.47
South	220.46	6.88	38.03	48.19	127.35	51.62	0.32	2.84	5.24	43.22
Saravane	93.04	2.38	13.61	19.44	57.61	7.96	0.01	0.40	0.94	6.61
Sekong	17.72	0.95	4.39	5.31	7.06	1.38	0.00	0.29	0.17	0.91
Chapasack	85.92	2.85	15.70	18.68	48.68	39.90	0.30	2.02	3.93	33.64
Attapeu	23.77	0.70	4.32	4.75	14.00	2.38	0.00	0.13	0.19	2.06
Lao PDR	1,007.03	50.78	174.08	194.98	587.01	69.04	0.98	4.75	8.05	55.26

Source: LAC 2019/20

Table 3.1.2: Households growing temporary crops by season and land tenure (000)

Province	No of HH growing temporary crops in the rainy season (000)	No of households growing temporary crops in the rainy season by land tenure (000)				No of HH growing temporary crops in the dry season (000)	No of households growing temporary crops in the dry season by land tenure (000)			
		Less than 1 ha	1 - 2 ha	2 - 3 ha	3 ha and up		Less than 1 ha	1 - 2 ha	2 - 3 ha	3 ha and up
North	208.15	37.80	51.05	40.07	79.24	29.41	6.35	7.52	5.55	9.99
Phongsaly	16.54	4.22	5.25	3.04	4.03	2.32	0.47	0.94	0.49	0.42
Luangnamtha	18.58	1.73	5.06	4.46	7.33	4.91	0.43	1.03	1.29	2.16
Oudomxay	36.31	4.97	9.10	6.90	15.34	7.07	0.80	1.68	1.45	3.14
Bokeo	17.18	2.78	4.70	4.04	5.65	1.63	0.20	0.35	0.34	0.75
Luangprabang	44.24	3.14	8.69	8.54	23.88	4.43	0.60	1.35	0.72	1.77
Huaphanh	28.02	13.60	8.96	2.97	2.49	5.25	2.88	1.54	0.48	0.35
Xayaboury	47.29	7.36	9.29	10.12	20.52	3.79	0.96	0.63	0.79	1.40
Central	253.28	41.97	71.33	48.47	91.46	58.28	11.21	16.99	11.65	18.43
Vientiane Capital	17.28	6.33	4.87	2.17	3.91	7.50	3.19	2.21	0.84	1.25
Xiengkhouang	23.26	3.83	6.81	4.54	8.08	8.16	1.74	2.74	1.85	1.84
Vientiane Province	36.69	7.36	7.77	5.40	16.17	5.61	1.33	1.31	0.81	2.15
Borikhamxay	26.74	2.86	6.24	5.43	12.16	6.48	0.57	1.62	1.35	2.94
Khammuane	36.27	8.09	12.61	7.25	8.31	9.88	2.02	3.29	2.16	2.41
Savannakhet	105.98	13.13	32.02	22.87	37.96	20.23	2.27	5.80	4.59	7.57

Xaysomboun	7.07	0.37	1.01	0.81	4.87	0.42	0.08	0.02	0.05	0.27
South	109.26	11.48	31.68	25.51	40.59	19.07	2.10	4.78	4.35	7.83
Saravane	39.34	3.59	10.55	9.20	16.00	8.45	0.96	1.84	1.87	3.78
Sekong	12.50	1.68	4.29	3.40	3.12	1.63	0.19	0.46	0.51	0.48
Chapasack	43.64	4.94	13.04	9.88	15.78	5.67	0.68	1.91	1.17	1.91
Attapeu	13.78	1.27	3.80	3.03	5.69	3.32	0.27	0.57	0.82	1.67
Lao PDR	570.69	91.25	154.06	114.05	211.30	106.76	19.66	29.29	21.56	36.25

Source: LAC 2019/20

Table 3.1.3: Households growing crops by crop type, according to agricultural land tenure, by season and by province, 2019/20

Province	No of temporary crops growers (000)	No of households growing temporary crops by size of land tenure (000)				No of permanent crops growers (000)	No of households growing permanent crops by land tenure (000)			
		below 1 ha	1 - 2 ha	2 - 3 ha	3 ha and up		below 1 ha	1 - 2 ha	2 - 3 ha	3 ha and up
North	237.56	44.14	58.57	45.62	89.23	32.62	4.94	7.80	5.93	13.94
Phongsaly	18.86	4.69	6.19	3.53	4.45	8.85	2.13	2.79	1.33	2.60
Luangnamtha	23.49	2.16	6.09	5.74	9.50	4.92	0.31	1.04	1.23	2.35
Oudomxay	43.38	5.77	10.78	8.35	18.48	6.65	0.25	1.07	1.39	3.95
Bokeo	18.81	2.98	5.04	4.38	6.40	1.10	0.04	0.20	0.20	0.65
Luangprabang	48.68	3.74	10.04	9.25	25.65	4.64	0.29	0.87	0.82	2.66
Huaphanh	33.27	16.48	10.50	3.45	2.84	4.55	1.72	1.62	0.55	0.67
Xayaboury	51.08	8.32	9.92	10.91	21.92	1.91	0.21	0.22	0.41	1.06
Central	311.56	53.18	88.32	60.12	109.89	18.01	1.95	2.93	3.69	9.45
Vientiane Capital	24.78	9.52	7.08	3.01	5.17	1.08	0.30	0.11	0.11	0.56
Xiengkhouang	31.42	5.57	9.55	6.39	9.91	2.20	0.14	0.57	0.61	0.88
Vientiane Province	42.29	8.69	9.08	6.21	18.31	4.61	0.69	0.71	0.61	2.61
Borikhamxay	33.22	3.44	7.86	6.78	15.11	1.77	0.22	0.30	0.27	0.98
Khammuane	46.15	10.11	15.90	9.41	10.72	0.79	0.25	0.12	0.09	0.32
Savannakhet	126.21	15.40	37.82	27.46	45.54	6.35	0.27	1.05	1.89	3.13
Xaysomboun	7.48	0.45	1.04	0.86	5.14	1.21	0.07	0.05	0.11	0.97

South	128.33	13.58	36.46	29.87	48.42	27.84	1.51	5.70	5.59	15.04
Saravane	47.79	4.55	12.39	11.06	19.78	5.50	0.28	1.45	0.92	2.84
Sekong	14.13	1.87	4.76	3.91	3.60	3.43	0.22	1.03	0.90	1.28
Chapasack	49.31	5.62	14.95	11.05	17.69	16.13	0.93	2.66	3.30	9.24
Attapeu	17.10	1.54	4.36	3.85	7.35	2.77	0.08	0.55	0.47	1.67
Lao PDR	677.45	110.91	183.35	135.61	247.54	78.47	8.40	16.42	15.21	38.43

Source: LAC 2019/20

Table 3.1.4: Crop growers, area, and average area per grower for major temporary crops cultivated by season during 2019/20

SN	Plants	Rainy season temporary plants			Dry season temporary plants		
		Number of growers (000)	Area (000ha)	Average area per grower (ha)	Number of growers (000)	Area (000ha)	Average area per grower (ha)
1	Sticky rice	437.05	551.73	1.26	45.36	39.55	0.87
2	Rice	42.76	41.72	0.98	1.04	0.70	0.67
3	Upland rice	74.77	75.75	1.01	2.01	1.63	0.81
4	Hard corn	38.31	59.69	1.56	1.74	1.43	0.82
5	Sweet corn	3.70	1.63	0.44	3.48	1.04	0.30
6	Soybeans	0.11	0.03	0.26	0.09	0.03	0.30
7	Green beans	0.88	0.14	0.16	1.96	0.33	0.17
8	Peanuts	1.68	0.74	0.44	1.67	0.66	0.40
9	Black beans	0.04	0.02	0.58	0.11	0.04	0.38
10	Red beans	0.92	0.50	0.54	0.42	0.26	0.61
11	Job's tear	24.08	31.55	1.31	0.15	0.22	1.44
12	Sesame	1.79	0.90	0.50	0.01	0.00	0.09
13	Pineapple	0.82	0.38	0.47	1.79	0.73	0.41
14	Dragon	0.04	0.00	0.13	0.06	0.01	0.24
15	Watermelon	0.02	0.02	0.80	0.07	0.02	0.37
16	Sugarcane	0.55	0.69	1.25	0.02	0.02	1.09
17	Cigarettes	0.08	0.02	0.32	0.16	0.14	0.88
18	Cotton	0.02	0.00	0.30	0.00		
19	Long beans/mountain beans/lentils/butter beans	1.54	0.78	0.51	1.66	0.47	0.28
20	Chayote	2.97	0.86	0.29	4.16	0.43	0.10
21	Mark ton	0.29	0.01	0.05	0.20	0.01	0.05
22	Eggplant	0.29	0.02	0.06	0.04	0.01	0.14
23	Chili	3.01	0.22	0.07	4.21	0.14	0.03
24	Tomato	2.43	0.46	0.19	2.42	0.54	0.22
25	Pumpkin	1.52	0.26	0.17	1.88	0.36	0.19
26	Cucumber	0.60	0.03	0.06	0.76	0.10	0.13
27	Cabbage	0.84	0.59	0.71	0.66	0.10	0.15
28	Spinach	3.59	1.80	0.50	2.63	0.29	0.11

29	Lettuce	0.54	0.27	0.51	0.17	0.00	0.03
30	Morning water	0.00	0.02		0.25	0.04	0.17
31	Phak hom	0.49	0.21	0.43	0.23	0.02	0.08
32	Phak Tang O.	0.00	0.00	1.00	0.00		
33	Coriander	0.48	0.34	0.71	0.00		
34	Vegetable	0.39	0.42	1.06	0.00		
35	Garlic	0.20	0.03	0.15	2.89	0.57	0.20
36	Onions	0.04	0.01	0.28	0.36	0.04	0.11
37	Lettuce	0.15	0.01	0.09	0.06	0.01	0.13
38	PhakhomePorm	0.53	0.11	0.20	0.55	0.06	0.11
39	Taro	0.03	0.00	0.15	0.02	0.00	0.12
40	Sweet potato	4.96	0.01	0.00	2.83	0.00	0.00
41	Cassava	9.64	14.71	1.53	2.66	3.54	1.33
42	Potatoes	0.00			0.00		
43	Yam	0.06	0.04	0.61	0.19	0.04	0.22
44	Carrot	0.91	0.18	0.20	0.85	0.33	0.39
45	Kha	0.22	0.08	0.34	0.05	0.02	0.44
46	Ginger	0.05	0.02	0.29	0.00		
47	Grass lemone	0.08	0.00	0.02	0.16	0.00	0.02
48	Rattan	0.05	0.02	0.36	0.00		
49	kind of rattan(waiy)	0.16	0.11	0.65	0.00		
50	Asparagus	0.00			0.00		
51	Mushrooms	0.06	0.03	0.45	0.00		
52	Other oilseeds	3.28		0.00	1.32	0.00	0.00
53	Other temporary crop	0.11	0.19	1.81	0.01	0.00	0.02
54	Grass	0.58	1.31	2.27	0.01	0.01	1.00
55	Other grasses	0.08	0.04	0.46	0.05	0.03	0.52

Source: LAC 2019/20

Table 3.1.5: Agricultural produce by purpose of production, 2019/20

SN	Plants	Total yield (000 tons)	Consumption (000 tons)	Consumption (%)	Consume and sell (000 tons)	Consume and sell (%)	For sale (000 tons)	For sale (%)
1	Sticky rice	1305.42	658.59	50.45	620.63	47.54	26.19	2.01
2	Hard corn	294.97	7.42	2.52	25.07	8.50	262.47	88.98
3	Mung bean	196.47	1.26	0.64	1.44	0.73	193.77	98.63
4	Upland rice	129.21	94.42	73.08	33.30	25.78	1.48	1.15
5	Rice	101.49	76.52	75.39	23.59	23.25	1.38	1.36
6	Save the spur	65.35	0.29	0.45	3.70	5.66	61.36	93.89
7	Long beans/mountain beans/lentils/butter beans	18.07	0.02	0.13	6.51	36.00	11.54	63.86
8	Watermelon	14.78	0.00	-	0.73	4.95	14.04	95.05
9	Cabbage	13.85	0.02	0.12	0.44	3.17	13.39	96.71
10	Sweet corn	11.89	0.64	5.40	2.94	24.74	8.30	69.87
11	Garlic	6.36	0.02	0.30	1.83	28.81	4.51	70.90
12	Car head	5.74	0.05	0.92	1.08	18.82	4.60	80.26
13	Cabbage	5.30	0.09	1.67	1.22	23.04	3.99	75.29
14	Deposit / Slave	3.32	0.14	4.22	2.14	64.39	1.04	31.39
15	Peanuts	3.01	0.02	0.59	1.31	43.41	1.69	56.00
16	Pineapple	2.95	0.02	0.68	0.53	17.94	2.40	81.38
17	Cassava	2.51	0.17	6.66	0.50	20.11	1.84	73.24
18	Kha	2.00	0.00	-	1.99	99.81	0.00	0.19
19	Tomato deposit	1.96	0.01	0.42	0.47	23.81	1.48	75.77
20	Deposit shit	1.60	0.01	0.44	0.56	34.95	1.03	64.61
21	Lettuce	1.44	0.03	2.34	0.65	45.32	0.75	52.34
22	Spicy deposit	1.10	0.04	3.77	0.71	64.52	0.35	31.71
23	Soybean	0.93	0.00	-	0.44	47.61	0.49	52.39
24	Aromatic vegetables	0.92	0.00	0.26	0.35	38.19	0.57	61.55
25	Other weeds	0.83	0.02	1.87	0.00	0.04	0.82	98.09
26	Phak Bong	0.80	0.00	0.09	0.00	0.06	0.80	99.85
27	Cucumber deposit	0.64	0.00	0.36	0.42	66.05	0.21	33.58
28	Lettuce	0.59	0.00	-	0.05	8.27	0.54	91.73
29	Red beans	0.54	0.00	0.33	0.03	6.40	0.50	93.27

30	Cotton	0.53	0.00	0.86	0.08	15.29	0.44	83.85
31	Rattan	0.52	0.00	-	0.52	99.25	0.00	0.75
32	Asparagus	0.44	0.00	-	0.19	43.28	0.25	56.72
33	Ginger	0.35	0.00	-	0.01	3.05	0.34	96.95
34	Tobacco	0.33	0.00	-	0.00	-	0.33	100.00
35	Spinach	0.31	0.00	0.67	0.10	32.84	0.21	66.49
36	Vegetable	0.26	0.00	-	0.15	58.62	0.11	41.38
37	Other weeds	0.25	0.24	95.81	0.00	1.16	0.01	3.03
38	Grasses are grown	0.18	0.04	24.00	0.00	-	0.14	76.00
39	Ton deposit	0.10	0.00	1.67	0.02	22.99	0.07	75.34
40	Cinnamon head	0.09	0.00	-	0.04	47.21	0.05	52.79
41	Sweet potato	0.09	0.02	26.24	0.03	37.17	0.03	36.58
42	Save the eggplant	0.08	0.00	3.27	0.05	67.74	0.02	28.99
43	Coriander	0.07	0.00	1.51	0.07	98.49	0.00	0.00
44	Onions	0.07	0.00	6.04	0.04	60.12	0.02	33.84
45	Black beans	0.07	0.00	0.36	0.01	8.22	0.06	91.42
46	Sugar cane	0.02	0.00	1.56	0.02	96.52	0.00	1.92
47	Mushrooms	0.02	0.00	-	0.00	-	0.02	100.00
48	Chinese cabbage	0.01	0.00	-	0.00	-	0.01	100.00
49	Rattan	0.01	0.00	7.34	0.00	-	0.01	92.66
50	Dragon deposit	0.01	0.00	10.99	0.01	89.01	0.00	0.00
51	Sesame	0.00	0.00	1.97	0.00	-	0.00	98.03

Source: LAC 2019/20

Table 3.1.6: Farm households and proportion of households using irrigation service by province, 2019/20

Province	Number of farm households	Number of households using irrigation	Percentage of households with irrigation use
North	236,710	69,007	29
Phongsaly	20,647	7,508	36
Luangnamtha	24,066	7,939	33
Oudomxay	39,113	12,640	32
Bokeo	18,962	8,015	42
Luangprabang	50,539	7,284	14
Huaphanh	30,836	14,813	48
Xayaboury	52,545	10,807	21
Central	274,392	87,830	32
Vientiane Capital	20,361	5,241	26
Xiengkhouang	24,299	13,919	57
Vientiane Province	41,470	13,841	33
Borikhamxay	29,961	6,173	21
Khammuane	38,854	8,712	22
Savannakhet	110,925	37,346	34
Xaysomboun	8,523	2,599	30
South	132,996	17,549	13
Saravane	44,452	8,338	19
Sekong	14,266	3,973	28
Chapasack	58,306	3,724	6
Attapeu	15,972	1,515	9
Lao PDR	644,098	174,386	27

Source: LAC 2019/20

Table 3.1.7: Households growing rice by type, variety and province, 2019/20

Province	Sticky Rice		Non-sticky Rice	
	Indigenous varieties	Improved varieties	Indigenous varieties	Improved varieties
North	139,900	10,164	8,556	1,142
Phongsaly	8,361	133	191	8
Luangnamtha	12,101	397	392	401
Oudomxay	23,543	224	510	8
Bokeo	15,169	59	776	40
Luangprabang	25,357	933	1,549	345
Huaphanh	22,821	13	3,750	147
Xayaboury	32,547	8,405	1,388	193
Central	169,413	64,666	17,081	10,167
Vientiane Capital	12,383	3,198	2,870	1,274
Xiengkhouang	17,862	356	488	50
Vientiane Province	27,654	5,613	1,405	1,039
Borikhamxay	21,117	2,603	1,172	724
Khammuane	33,560	1,717	5,612	1,481
Savannakhet	50,845	51,180	5,375	5,599
Xaysomboun	5,993	-	159	-
South	73,116	17,309	5,929	3,452
Saravane	24,909	8,607	3,586	1,909
Sekong	8,626	390	714	219
Chapasack	28,563	7,483	1,219	1,147
Attapeu	11,019	830	410	177
Lao PDR	382,429	92,139	31,566	14,760

Source: LAC 2019/20

Chapter 4: Livestock and Poultry Production

Livestock and poultry are the most important subsectors of agricultural industries all over the world since the demand of meat, milk, eggs keep growing with the growing population. According to the estimate of Food and Agriculture Organization (FAO) of the United Nations, the demand of livestock products will grow by 50% by 2050 (FAO, 2020). Livestock and poultry farming are the central activity of most farm households in many communities and enhance the employment and entrepreneurship. The product of livestock and poultry not only substitute the dietary requirement of people but also the economic wellbeing of the society. Livestock accounts for 20 to 24% agricultural value added worldwide (Poudel, Dahal, Upadhyaya, Chaudhari, & Dhakal, 2020). Moreover, FAO (2020) also estimates that 34% of global food protein supply comes from the livestock and about 600 million poor small farmers depend on livestock for their livelihoods. Livestock and poultry farming activities are also the best opportunity to make people's contribution to achieving the Sustainable Development Goals (SDGs). FAO also reports that Africa and Southern Asia are leading for both production and consumption of the livestock products.

4.1 Livestock and Poultry Production in the Lao PDR

Livestock farming become an important and popular economic activity in the Lao PDR in recent years. FAO (2019) reports that the production index of livestock increased from 73 in 1997 to 104 in 2007 and further increased to 126 in 2017. Though internal supply of the meat and meat preparation is not sufficient as its trade deficit was reported 119 million USD in 2017 and that of dairy products was reported 36 million USD in 2017 (FAO, 2019). However, the output at current price of the livestock and livestock products keep increasing since the Lao Statistics Bureau, (2021) reports that the value added of livestock and livestock products increased from 3,188 billion Kip in 2019 to 3,747 billion Kip in 2020. In the similar fashion, the value added of livestock and livestock products at constant price also increased from 2,637 billion Kip in 2019 to 2,772 billion Kip in 2020 an increase of 5.15% a year. The share of livestock and livestock products to the national GDP at current price has also increased from 1.96% in 2019 to 2.17% in 2020 (Lao Statistics Bureau, 2021). Another important indicator to show the increasing popularity of livestock farming in the Lao PDR is that majority farm households sought loan to by livestock as reported by the LAC 2019/20.

Livestock is the second largest agricultural activities in Lao PDR. Nevertheless, only six percent workers accepted this sector as their main activity while 72 percent workers accepted crop sector as their main activity in 2019/20. Moreover, only five percent workers accepted livestock as their second activity in the Lao PDR during the third round of LAC. In spite of being prioritized program of the Government of Lao PDR and being the second largest agricultural activities, livestock sector is still underdeveloped. However, the 8th five-year NSEDP of Lao Government states that livestock and fishery sectors have been expanded by supporting to provide

materials and inputs for their production process such as providing technical training, providing vaccination service etc. In the review plan period, FY 2010/11 to 2014/15 most of the livestock's herd size had grown and by virtue of this growth, there was a increasing trend of meat, fish, egg production. Commercial livestock farming practice has also been increasing in the Lao PDR due to using improved species of livestock and poultry farmed throughout the country. The produce of livestock and poultry seems to be consumed by the country itself and also export to the neighbouring countries. However, the supply of this sector is still insufficient (NSED, 2016). Then the 8th NSED had set a target of producing 258,000 tons of meat and per year and 229,500 tons of fish and aquatic animals per year. This plan also aimed to increase livestock by 6 percent per year and fishery and aquatic animal breeding by 8 to 10 percent per year. Policy directed to transforming natural livestock farming towards the commercial farming to yield a meat weight of at least 10,000 to 15000 tons in 2020. To monitor the achievement against the policy expectation, one of the major official data sources on livestock and poultry in Lao PDR is the agriculture censuses. This chapter documents, analyzes and explains the information from the LAC 2019/20 and makes comparison with the first and second round of LAC in some contexts.

Table 4.1: Farm households raising livestock and poultry by province, 2019/20

Province	Total number of farm households (000)	Number of farm households raising livestock/poultry (000)	Percentage
North	236.71	189.44	80
Phongsaly	20.65	17.68	86
Luangnamtha	24.07	20.06	83
Oudomxay	39.11	31.88	82
Bokeo	18.96	15.87	84
Luangprabang	50.54	40.71	81
Huaphanh	30.84	25.04	81
Xayaboury	52.55	38.19	73
Central	274.39	228.95	83
Vientiane Capital	20.36	13.15	65
Xiengkhouang	24.30	22.48	93
Vientiane Province	41.47	34.94	84
Borikhamxay	29.96	23.09	77
Khammuane	38.85	32.48	84
Savannakhet	110.93	95.18	86
Xaysomboun	8.52	7.63	90
South	133.00	98.17	74
Saravane	44.45	36.05	81
Sekong	14.27	10.80	76
Chapasack	58.31	37.96	65
Attapeu	15.97	13.36	84
Lao PDR	644.10	516.55	80.2

Most farm households in the Lao PDR engaged in some kind of livestock and poultry farming. A total of 515,554 farm households reported that they have some kind of livestock or poultry during the reference period of the third round of LAC. The LAC 2019/20 reported that more than 80% farm households has some kind of livestock or poultry. This shows 127,544 households engaged in agricultural activities without livestock or poultry in 2019/20. There was slight regional and provincial variation in the number and proportion of farm households with livestock or poultry. The Central region had the highest proportion of households with livestock or poultry while the Southern region has the lowest (Table 4.1). Proportion of households with livestock or poultry ranged from 65% to 93%. In terms of absolute number, Savannakhet reported the highest number while Xaysomboun reported the lowest number of both farm households and households with livestock or poultry in 2019/20.

Table 4.2: Distribution of households by type of village and land with corresponding livestock and poultry and their number, 2019/20

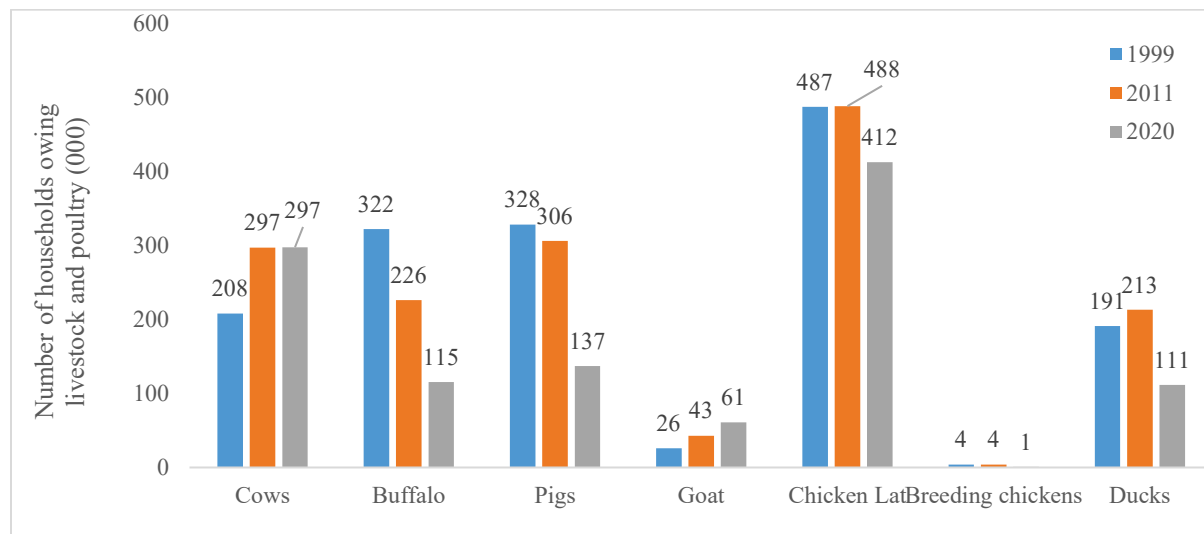
Type of village/Village land type	% of farm households with livestock					% of farm households raising poultry		
	Cows	Buffalo	Pig	Sheep	Goat	Chicken Lat	Breeding chickens	Ducks
Town	36	12	13	0.005	6	63	0.10	18
Rural with roads	48	18	22	0.001	10	64	0.05	18
Rural without roads	46	30	39	0.000	13	64	0.00	11
Plains	53	19	16	0.003	11	66	0.06	22
Mountain	40	19	34	0.000	11	66	0.06	11
Plateau	40	14	19	0.000	5	59	0.05	16
Mixed soil	44	15	20	0.000	6	63	0.06	18
Lao PDR	46	18	21	0.002	9	64	0.06	17
	Number of livestock					Number of poultry		
	Cows	Buffalo	Pig	Sheep	Goat	Chicken Lat	Breeding chickens	Ducks
Town	361	74	84	0.011	56	2957	142	417
Rural with roads	1730	434	388	0.009	328	8467	275	1198
Rural without roads	74	33	38	0.000	22	477	0	39
Plains	1086	258	178	0.020	240	5279	218	971
Mountain	436	138	202	0.000	105	2883	2	244
Plateau	565	127	113	0.000	51	3286	197	382
Mixed soil	78	18	17	0.000	9	453	0.2	57
Lao PDR	2165	541	509	0.020	406	11900	417	1654

Source: LAC 2019/20

As can be seen in the Table 4.2, majority of farm households with cows belonged to rural areas having road access and in the plain areas. For buffaloes, most farm households were found in rural areas without road and equally the plain and mountain villages. Similarly, pig and goat farming seems to be popular in the rural areas without road and mountain villages. More interestingly, number of farm households with chicken farming was almost equally distributed across the country. Moreover, relatively lesser farm households were reported from rural areas without road access and mountain villages while sheep and breeding chickens were farmed by very few farm households all over the country (Table 4.2). In the similar fashion, highest number of livestock and poultry were enumerated from rural with road access and plain villages. Nevertheless, highest number of pigs were reported from mountain villages. In sum, it can be said that rural areas with road access are the key hub of livestock and poultry farming in the Lao PDR as suggested by the result of the LAC 2019/20. In addition, it also can be argued that the rural areas without road access be promoted for livestock and poultry farming by strengthening the access of roads along with other development measures.

4.2 Livestock and Poultry Production (Holding and Production) Trend Analysis

Figure 4.1: Farm households with livestock/poultry in Lao PDR, 1998/99, 2010/11, 2019/20



Number of farm households owing major livestock and poultry went erratic during the 30 years periods between first, second and third Lao agricultural censuses. The number of cow owner, goat owner, chicken lat owner and duck owner increased between first and second LAC while the number of buffalo owner, pig owner went down during that period. Coincidentally, the number of breeding chicken owners remained unaltered between 1998/99 and 2010/11 (Figure 4.1). On the other, only the owner of goat farming increased between 2010/11 and 2019/20 while buffalo owner, pig owner, poultry owner decreased during the period. Interestingly, number of cow owner remained unaltered during 2010/11 to 2019/20. The LAC 2019/20 shows that majority of households farmed chicken lat followed by cows. Very few farmers kept breeding chickens in Lao PDR during the third LAC period. This decrease in number of farm households keeping

livestock and poultry might be due to commercialization of livestock and poultry farming in the country. The third LAC reported that among all other livestock and poultry, people are attracted toward goat farming, since the number of goat farming households is in increasing trend though the number is comparatively smaller than that of other cattles or poultry.

Figure 4.2: Animals/poultry in Lao PDR, 1998/99, 2010/11, 2019/20

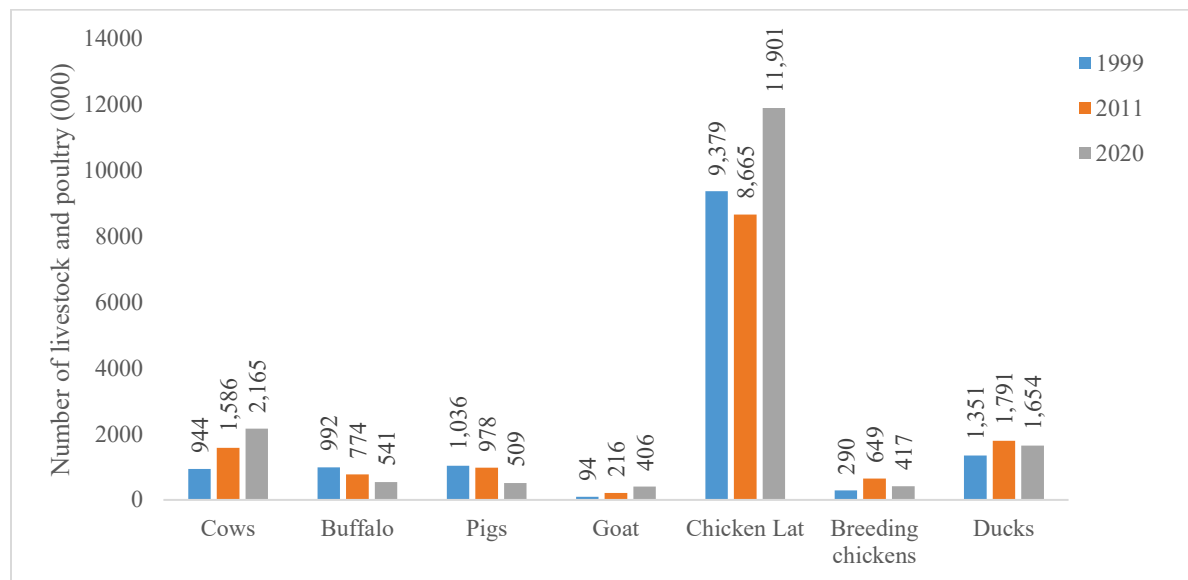


Figure 4.2 shows that the total number of livestock and poultry raised in 2019/20. The number of chicken lat, cows, buffalo and goat increased between 2010/11 and 2019/20 while that of buffalo, pig, breeding chicken and duck decreased. Between the 1998/99 and 2010/11 number of cows, goat, breeding chicken and duck increased and buffffalo, pig, chicken lat decreased. The LAC 2019/20 reported that both farm households and number of goats increased between second and third round of LAC period while number of farm households and number of buffaloes, pigs, breeding chickens and ducks decreased. Non-increasing number of farm households but increasing number of cows and decreasing number of farm household but increasing number of chickens lat indicates that raising cows and chicken transferred gradually to commercial production in the Lao PDR.

As can be seen in the Table 4.3 the average number of livestock per farm household increased between 2010/11 and 2019/20. Average number of livestock/farm households sharply increased for breeding chicken and other poultry while the increment is relatively low for cattles, pig and goat. Moreover, the average number of livestock per farm household seems to be relative very high for breeding chickens followed by other poultry.

Province-wise data on the number of households owing livestock/poultry and the exact number of livestock/poultry and average amount of livestock/poultry per farm households in 2019/20 are presented respectively in the Appendix 4.1.1, 4.1.2, and 4.1.3. According to the LAC 2021, number of households owing cows ranged from 2.40 thousand (Phongsaly) to 73.34

thousand (Savannakhet). Savannakhet also reported the highest number of farm households owing buffalo, pig, goat, chicken lat. and duck. Vientiane Province reported the highest number of farm households owing breeding chicken and however, there were not much variation among the provinces on this number. Remarkably, Xaysomboun reported none of the households keeping chicken lat in 2019/20. Relatively, Vientiane Capital reported the smaller number of households raising livestock and poultry. In the similar fashion, number of livestock/poultry varies by province (see Appendix 4.1.2). Savannakhet reported the highest number of cows, buffalo, goat, and chicken lat; Luangprabang reported the highest number of pigs and breeding chicken; Vientiane Province reported the highest number of duck. Average number of cows per farm households ranged from 4.7 (Oudomxay) to 10.9 (Xayaboury), that of buffaloes ranged from 3 (Oudomxay) to 8.4 (Vientiane Capital), that of pigs ranged from 2.3 (Saravane and Attapeu) to 46.5 (Vientiane Capital), that of goats ranged from 4.1 (Sekong) to 10.2 (Vientiane Capital), that of chicken lat ranged from 35.9 (Saravane) to 171.5 (Attapeu), that of breeding chickens ranged from 8.6 (Phongsaly) to 11221.1 (Luangprabang), and that of ducks ranged from 10.6 (Saravane) to 20 (Vientiane Province and Vientiane Capital). Farm households owing livestock/poultry from Vientiane Capital seems to be relatively larger since they own higher number of the livestock. On the other, Saravane seems to be relatively smaller since farm households owned relatively smaller number of livestock/poultry from this province. By convention, it can be said that commercial farming owns more livestock or poultry and therefore, commercialization of livestock farming is relatively well developed in the capital areas.

Table 4.3: Average livestock per farm households, 1998/99, 2010/11 and 2019/20

Livestock/poultry	Average number of livestock/farm households		
	1998/99	2010/11	2019/20
Cows	4.54	5.34	7.28
Buffalo	3.08	3.42	4.698
Pigs	3.16	3.2	3.716
Goat	3.62	5.02	6.66
Chicken Lat	19.3	17.8	28.87
Breeding chickens	72.5	162	574.5
Ducks	7.07	8.41	14.86

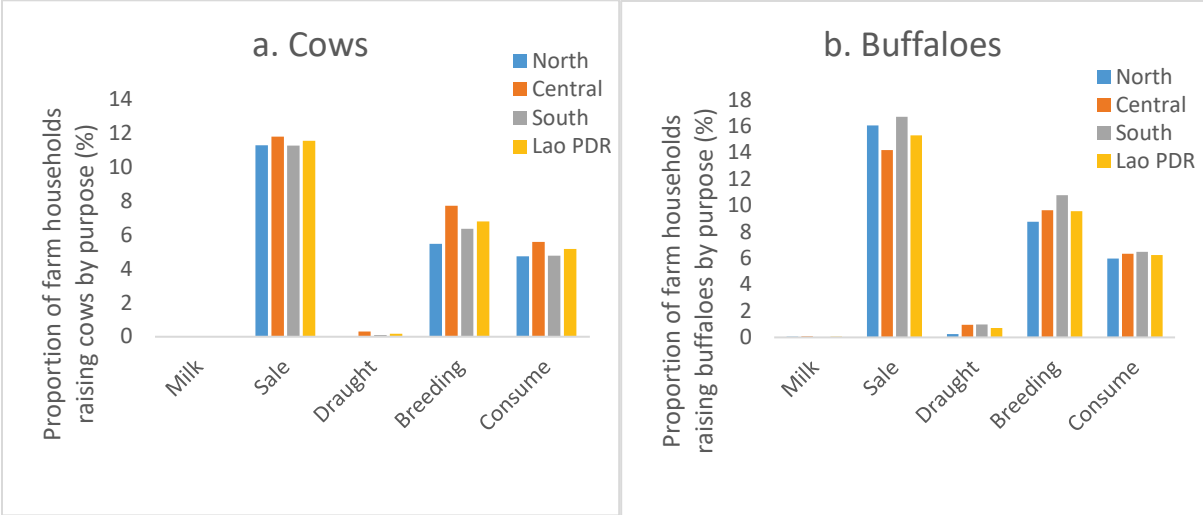
Source: Lao Statistics Bureau

4.3 Purpose of Raising Cattles: Cows and Buffaloes

The LAC 2019/20 reported the main purpose of livestock farming and poultry for major five livestock: cow, buffalo, pig, goat, and poultry. The purposes of raising livestock are categorized into five main objectives: milk, sale, draught, breeding, and consume. However, pig, goat, and poultry are not supposed for milk and draught in Lao PDR. Majority of farm households kept cows and buffaloes mainly for sale (Figure 4.2). Very nominal farm households kept these domestic animals for milk. An interesting fact observed in the purpose of raising cows and buffaloes is that both cows and buffaloes played almost similar role in all regions of Lao PDR. The height

of candles in the Figure 4.2 panel "a" and "b" looks similar for both cows and buffales indicates that the main objective of raising cows are buffaloes is indifferent. Overall, the main objective of raising both cows and buffaloes is for sale followed by breeding and then by consumption. Very few farm households kept these animals with the objective of producing milk and draught (Figure 4.2). With this note, livestock raising activities are directed towards commercial production which is inline with the Government policy of Lao PDR.

Figure 4.3: Purpose of raising cows and buffaloes

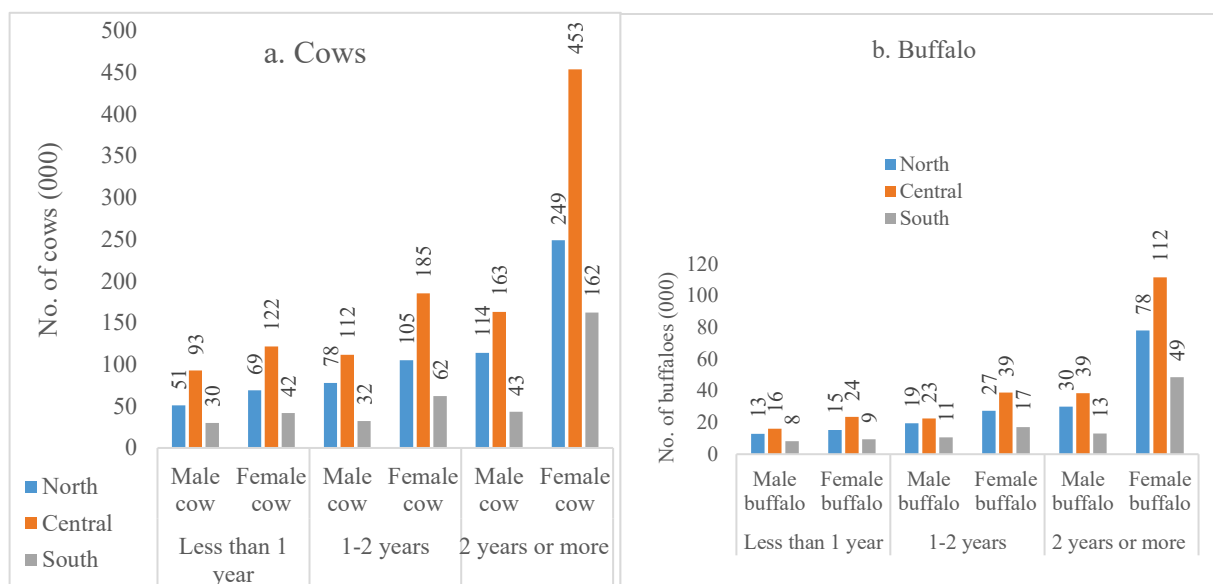


4.4 Number of Livestock and Poultry: Trend and Age Structure

4.5 Cows and Buffaloes

The LAC 2019/20 reported that the number of cows were dominated by the aged female cows of age 2 or more years. Central region reported the highest number of cattle in all age groups and sex of cow. Southern region reported comparative the lowest number of of cows in all age groups and sex of cow (Figure 4.4). Similarly, LAC 2019/20 reported the highest number of female buffalo of age 2 or more years while number of male buffaloes of age less than one year is the smallest in Lao PDR. Choice of keeping cows and buffalo was indifferent in all regions since central region reported the highest number while southern region reported the lowest number of buffalo of all sex and all age (Figure 4.4).

Figure 4.4: Number of cows and buffaloes by age, sex, and region, 2019/20



Number of cows to the farm households according to their farm size shows that there was unequal distribution of cattles. The number of cattle increases as the size of agricultural land increases in general. By contrast, the average number of cattles per farm households goes on decreasing with the increasing size of farmland. As presented in the Table 4.4, larger number of farm households owned land of size 3 hectare or more as well as larger number of cattles while very small number of households engaged in the agricultural activities having no agricultural land. However, farm households having no farmland owned 5 cattles in an average which is greater than that of farm households holding agricultural land size less than 1 hectare. Except the holding with no farmland, other farm households depicted an interesting fact that as the size of owned land increases, the average number of cattles also increases (Table 4.4). Similarly, largest number of cows were reported from the herd size of 20 or more followed by the size of herd 5 to 9. Interestingly, total number of cows from the class of 10 to 19 herd size was less than that of all class of herd size. As can be seen in the Appendix 4.1.4, majority of households owned cows of herd size of 5 to 9 followed by that of 1 to 2. The number of farm households raising cattle ranged from 2,399 (Phongsaly) to 73,345 (Savannakhet). Similarly, average number of cows per farm households ranged from 4.73 (Oudomxay) to 10.88 (Xayaboury).

Table 4.4: Cows by size of herds and agricultural land size, 2019/20

Size of agricultural land (ha)	Number of farm households (000)	Number of farm households raising cattle (000)	Total (000)	Number of cows by herd size (000)					Average no. of cows per farm households raising cows
				1-2	3-4	5-9	10-19	20 or more	
No agricultural land	4.5	1.2	2.8	0.3	0.3	0.4	0.1	1.6	5.0
0.01-0.49	48.0	13.0	28.3	4.1	3.7	4.0	1.2	15.4	4.8
0.50-0.99	83.3	30.0	50.6	9.3	8.8	8.9	2.5	21.0	4.9
1.00-1.49	118.5	48.1	75.7	12.9	13.2	15.2	5.8	28.6	5.5
1.50-1.99	68.5	30.5	42.9	7.6	7.2	10.5	4.2	13.4	5.9
2.00-2.99	117.3	58.7	79.6	12.1	13.9	20.3	10.2	23.2	6.6
3.00 ha or more	204.1	115.8	145.0	15.7	20.1	38.8	27.9	42.6	9.7
Lao PDR	644.1	297.4	425.0	62.0	67.2	98.0	51.9	145.9	7.3

Table 4.5: Buffaloes by size of herds and agricultural land size, 2019/20

Size of agricultural land (ha)	Number of farm households (000)	Number of farm households raising buffaloes (000)	Total (000)	Number of buffaloes by class of herds (000)					Average no. of buffaloes per farm households raising buffalo
				1-2	3-4	5-9	10-19	20 or more	
No. agricultural land	4.5	97.04	447.90	1.13	1.19	1.02	0.39	0.02	4.62
0.01-0.49	48.0	3.74	16.98	1.07	1.22	1.04	0.34	0.05	4.53
0.50-0.99	83.3	3.72	17.94	1.81	1.37	1.83	0.38	0.17	4.82
1.00-1.49	118.5	5.55	28.10	0.66	0.69	0.77	0.33	0.11	5.06
1.50-1.99	68.5	2.57	15.19	0.25	0.38	0.50	0.21	0.04	5.92
2.00-2.99	117.3	1.37	8.14	0.28	0.34	0.48	0.16	0.00	5.95
3.00 ha or more	204.1	1.25	7.13	5.19	5.18	5.64	1.81	0.38	5.70
Lao PDR	644.1	115.24	541.37	1.13	1.19	1.02	0.39	0.02	4.70

Source: LAC 2019/20

Majority of the farm households with no agricultural land owned buffaloes in the Lao PDR (Table 4.5). Moreover, majority of buffaloes were owned by the farm households with no farm

land. A total of 541,370 buffaloes were enumerated in the third round of LAC raised by 115,244 farm households yielding 4.7 buffaloes per farm households in an average. Average number of buffaloes per farm households ranged from 4.53 to 5.95 according to the land size of the buffalo owner. Farm households with land size 1.5 to 1.99 hectare owned relatively larger number of buffalo while the farm households with land size of 0.01 to 0.49 hectare owned relatively smaller number of buffalo in an average (Table 4.2b). Provincial distribution of number of buffaloes by herd size is presented in Appendix 4.1.5. Savannakhet dominated both number of farm households with buffalo and number of buffalo owned. In an average Vientiane Capital reported the highest number of buffaloes per farm households while Oudomxay reported the lowest number of buffaloes per farm household in an average. The average number of buffaloes per farm households remarkably ranged from 3.02 to 8.44 buffaloes per farm household among the provinces. On the other, highest number of buffaloes were reported from the class of herd size 5 to 9 while the lowest number of buffaloes were reported from the class of herd size 20 and more. This shows that farm households with buffaloes of Lao PDR prefer to keep medium size herd not exceeding 20 buffaloes.

4.6 Pigs and Goats

The LAC 2019/20 reported that the average number of pigs and goats per farm households goes on increasing with the increasing size of farmland. For instance, farm households with no farmland owned 2.37 pigs and 4.56 goats in an average while the number increases to 4.62 pigs and 8.02 goats for the group of farm households having land size 3 hectare or more. Total number of pigs surpassed goats by 103,343 while pig owners surpassed goat owner only by 76,113 in 2019/20. Overall, 21% of total farm households owned pigs and only 9% of total farm households owned goat as presented in the Table 4.3. Another important fact can be seen in the Table 4.3 is that larger the size of farm, larger the number of pig and goat owner.

The third round of LAC reported that Savannakhet had the highest number of farm households owing pigs and goats while Xaysomboun had the lowest number of farm households owing pigs and goats in 2019/20. Luangprabang reported the highest number of pigs though the number of farm households owing pigs was less than that of Savannakhet. Nevertheless, Xaysomboun reported the lowest number of both farm households owing pigs and number of pigs in 2019/20. The highest number of goats were reported from the Savannakhet province. In sum, a total of 509,479 pigs were reported from 137,092 farm households and a total of 406,137 goats were reported from 60,979 farm households.

Table 4.6: Farm households with pigs/goats and number of pigs/goats, 2019/20

Size of possession (ha)	Number of farm households (000)	Number of farm households having (000)				Number of (000)		Average number of pigs/goats per possession	
		Pigs	%	Goats	%	Pigs	Goats	Pigs	Goats
No farm land	4.46	0.18	4	0.21	5	0.4	0.95	2.37	4.56
0.01-0.49	47.98	5.65	12	2.46	5	16.2	14.05	2.86	5.70
0.50-0.99	83.26	16.19	19	6.88	8	47.4	39.08	2.93	5.68
1.00-1.49	118.50	22.65	19	10.39	9	70.2	56.76	3.10	5.46
1.50-1.99	68.53	15.73	23	6.70	10	49.5	36.50	3.15	5.45
2.00-2.99	117.27	25.45	22	11.67	10	88.8	76.99	3.49	6.60
3.00 Ha or more	204.10	51.25	25	22.67	11	236.9	181.82	4.62	8.02
Lao PDR	644.10	137.09	21	60.98	9	509.5	406.14	3.72	6.66

Source: LAC 2019/20

4.7 Poultry Farming

Poultry includes chickens, ducks, turkey, guinea fowl, goose etc. that are raised for meat and eggs. In Lao PDR, chicken farming is categorized as local chicken farming that includes small breed and big breed chickens and commercial chicken farming that includes broiler chicken and layer hen. Similarly, there are three types of ducks: local, broiler and layer. Altogether, a total of 430,825 (67% of total farm households) farm households farmed a total of 14,003,722 poultry in 2019/20. Out of total 644,098 farm households 64% of them farmed chickens while only 17% farmed ducks and only nominal farm households farmed other birds. Poultry farming in the Lao PDR was dominated by chicken followed by ducks in 2019/20. A total of 11,901,278 chickens; 1,654,032 ducks and 2,496 other birds were reported during the third round of LAC.

The LAC 2019/20 reported that average number of chickens per chicken households was greater than that of duck. Reportedly, the average number of chickens per chicken households was 29 while that of duck was 15 in 2019/20 (Appendix 4.1.6). Majority of farm households with poultry were from Savannakhet province while relatively lowest number of chicken households were reported from Xaysomboun and that of duck reported from Sekong province. Savannakhet also reported the highest number of both chickens and ducks in 2019/20. Xayaboury reported the

highest average number of chickens per chicken households and Vientiane Capital reported the highest average number of ducks per duck households. On the other, Saravane reported the lowest average number of both chicken and ducks per respective farm households. Average number of chickens per chicken households ranged from 20 to 44 and that of ducks ranged from 11 to 20 (Appendix 4.1.6). Moreover, only 7 provinces reported the farming practice of other birds such as turkey, guinea fowl, and goose in 2019/20.

Poultry farming was also dependent on the size of land that the respective possession hold. The LAC 2019/20 reported that as size of land increases, the number of farm households raising chicken also increases. For example, there were only 2,520 farm households with no land raising lat-chickens while there were 139,221 farm households with land of size 3 hectare or more raising lat-chickens in 2019/20. The third round of LAC also showed that the distance of the poultry house from the households matters the poultry farming in the Lao PDR. Majority of the farm households kept poultry house close to their residential areas. However, there were a large number of farm households (49%) engaged in poultry without poultry house in the Lao PDR.

4.8 Vaccination and Feeding Livestock and Poultry

One of the major challenges of livestock and poultry farming is to control various diseases that attack and destroy the lives of livestock and poultry. Disease control mechanism has mainly two dimensions: preventive and curative measures. In addition, food for livestock and poultry is another important input of this industry. Sufficient food for livestock and poultry with dietary balance only can assist to achieve the expected output from the livestock and poultry farming activities. Therefore, this subsection basically discusses on the preventive measure of controlling diseases using vaccination and food type. Based on the results of the LAC 2019/20, the practice of utilization of vaccination service in the Lao PDR is analyzed and documented.

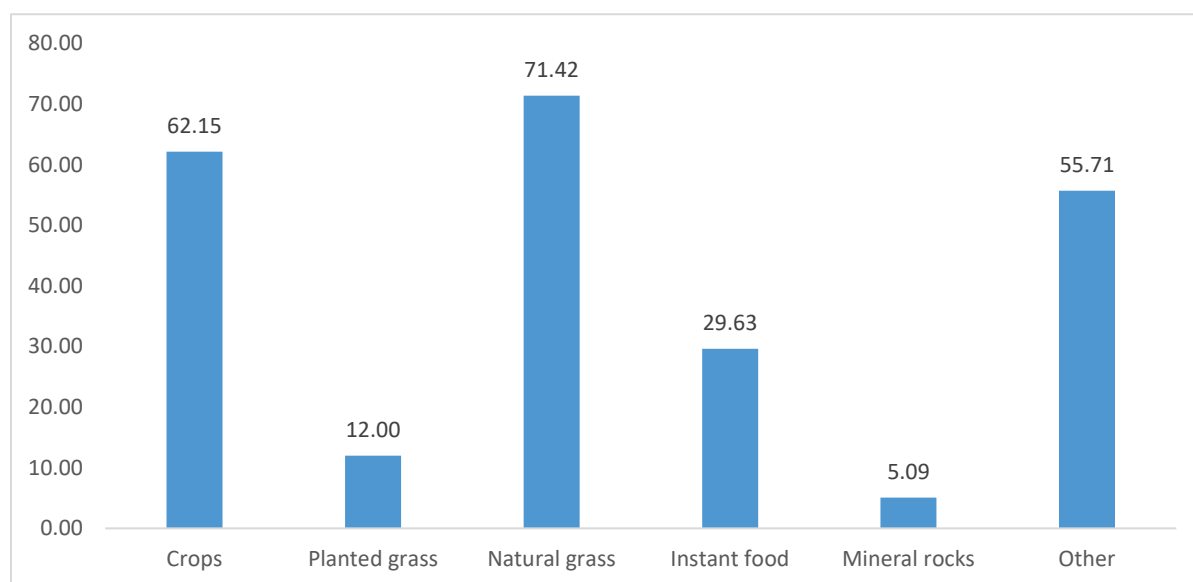
Table 4.7: Livestock and poultry vaccinated in 2019/20 by province

Province	% Vaccinated				
	Cows	Buffalo	Pig	Goat	Poultry
North	48.84	44.00	13.89	16.60	10.38
Phongsaly	27.18	40.31	5.34	17.07	2.30
Luangnamtha	32.73	22.01	2.88	39.51	6.17
Oudomxay	59.07	49.56	7.17	11.22	5.80
Bokeo	46.42	47.57	6.19	14.88	0.01
Luangprabang	47.23	43.49	31.73	10.20	22.32
Huaphanh	30.59	29.67	4.42	12.10	11.02
Xayaboury	59.33	55.63	7.74	38.13	5.73
Central	35.90	29.81	26.90	4.65	2.28
Vientiane Capital	36.79	35.39	15.67	15.70	3.92
Xiengkhouang	48.77	38.90	1.77	4.57	2.48
Vientiane Province	33.88	24.96	115.31	2.46	1.68
Borikhamxay	25.74	28.32	1.62	9.67	2.07
Khammuane	32.23	33.19	2.73	2.75	3.03
Savannakhet	37.69	28.17	9.68	3.95	1.09
Xaysomboun	17.49	22.09	3.02	-	12.32
South	21.76	21.25	9.06	5.16	0.75
Saravane	19.67	16.47	1.94	1.52	0.25
Sekong	25.44	21.43	4.62	11.62	0.10
Chapasack	20.80	30.64	28.75	9.39	1.26
Attapeu	32.68	13.32	1.62	6.41	0.26
Lao PDR	37.45	32.92	8.02	8.02	5.32

Source: LAC 2019/20

As can be seen in the Table 4.7, relatively high proportion of cows were vaccinated as compared to the other livestock and poultry in 2019/20. Nevertheless, utilization of vaccination service was quite low since only 37.45% of cows, 32.92% of buffaloes, 8.02% of pigs and goat, and 5.32% of poultry were vaccinated in 2019/20. Obviously, lower the coverage of vaccine, higher the risk of incidence of various diseases means that livestock and poultry farming activities in the Lao PDR had high risk of various diseases. However, Xayaboury and Oudomxay reported more than half of cows and buffaloes were vaccinated but Xaysomboun, Saravane, and Attapeu reported relatively lower proportion of cattle vaccinated in 2019/20. Xaysomboun reported none of the goat vaccinated and entire the Southern region reported very low proportion of poultry vaccinated in 2019/20 (Table 4.7).

Figure 4.5: Farm households by type of feed to the livestock and poultry, 2019/20



Most farm households depended on the natural grass to feed livestock and poultry followed by crops. Only 12% households planted grass to feed livestock and poultry and 29.63% households used instant food as well. High dependency on natural grass indicates lesser cost of inputs but might be the possibility of insufficiency of balance diet to the livestock and poultry.

4.8 Conclusion

Livestock and poultry farming is the second largest agricultural activities in the Lao PDR. Even though, there was a big gap between the workers accepting livestock and crops means that livestock and poultry is far behind the agricultural sector. As a result, there was a big supply gap of meat and related product as of 2017, which is supplemented by trade deficit. However, livestock and poultry subsector seem to be gradually growing in the country. One of the evidences to claim the growing trend of livestock and poultry farming is increased demand of loan to buy livestock as reported by the LAC 2019/20. In contrast, some indicators such as percentage of vaccinated livestock and poultry, use of instant food of livestock and poultry, use of farmhouse shows that the

livestock and poultry farming in the Lao PDR is in the developing stage and need to strengthen with a strong technical and financial support.

Table 4.1.1: Households owing livestock/poultry by province, 2019/20

Province	Number of households owning livestock						Ducks
	Cows	Buffalo	Pigs	Goat	Chicken Lat	Breeding chickens	
North	88.15	37.84	67.72	18.46	56.13	0.16	26.71
Phongsaly	2.40	2.97	6.48	0.65	5.52	0.03	2.15
Luangnamtha	6.23	3.31	5.51	1.84	5.02	0.03	3.99
Oudomxay	12.08	4.22	11.70	5.52	8.69	0.03	7.13
Bokeo	9.96	3.47	6.15	2.39	4.06	0.03	1.19
Luangprabang	20.51	8.97	15.66	4.63	10.86	0.03	6.56
Huaphanh	15.66	6.99	11.50	1.85	10.68	0.02	2.19
Xayaboury	21.31	7.89	10.71	1.58	11.30	0.02	3.49
Central	157.95	51.84	45.91	34.49	107.09	0.13	57.50
Vientiane Capital	6.40	1.69	0.64	1.14	9.24	0.05	3.38
Xiengkhouang	18.05	5.04	8.19	1.16	16.51	0.02	6.11
Vientiane Province	18.32	5.11	5.63	1.38	15.06	0.07	15.84
Borikhamxay	13.85	5.34	4.54	1.79	7.07	0.01	3.71
Khammuane	21.38	8.69	5.10	6.45	12.67	0.01	4.40
Savannakhet	73.34	24.51	19.89	22.27	46.54	0.01	22.34
Xaysomboun	6.61	1.46	1.92	0.29	-	0.01	1.72
South	51.35	25.57	23.46	8.03	40.81	0.08	27.09
Saravane	23.95	8.69	12.15	4.57	16.13	0.02	13.64
Sekong	4.19	2.70	3.10	0.59	2.02	0.01	1.01
Chapasack	19.85	9.13	4.56	1.97	21.23	0.05	8.18
Attapeu	3.36	5.04	3.65	0.90	1.43	0.01	4.26
Lao PDR	297.44	115.24	137.09	60.98	412.11	0.36	111.30

Table 4.1.2: Livestock/poultry by province, 2019/20

Province	Cows	Buffalo	Pigs	Goat	Chicken Lat	Breeding chickens	Ducks
North	665.6	183.2	259.9	112.0	4,971.8	336.4	393.7
Phongsaly	13.7	12.5	20.0	3.6	367.9	0.2	27.2
Luangnamtha	30.8	11.6	16.8	11.2	464.6	28.8	58.2
Oudomxay	57.1	12.8	34.8	29.3	674.8	1.3	79.3
Bokeo	70.0	14.6	22.4	13.0	377.8	1.0	15.0
Luangprabang	164.3	46.6	80.5	36.3	1,150.1	304.7	117.4
Huaphanh	97.9	30.2	44.4	9.4	679.4	0.4	29.8
Xayaboury	231.8	54.8	41.0	9.1	1,257.2	-	66.7
Central	1,127.9	251.3	187.5	238.5	4,888.6	79.3	916.0
Vientiane Capital	62.7	14.3	29.9	11.7	357.8	77.2	67.9
Xiangkhouang	153.0	25.6	25.9	6.7	682.2	-	106.1
Vientiane Province	166.7	33.8	33.8	8.9	997.1	1.6	316.5
Borikhamxay	102.0	31.3	18.0	16.2	526.1	-	52.1
Khammuane	115.4	38.0	19.7	37.1	445.5	0.1	72.5
Savannakhet	470.2	99.8	54.2	156.0	1,710.6	0.2	280.9
Xaysomboun	58.0	8.6	5.9	2.0	169.2	-	20.2
South	371.8	106.9	62.1	55.6	2,040.8	1.2	344.3
Saravane	137.0	28.3	28.4	27.7	579.2	0.2	145.0
Sekong	20.9	9.4	9.8	2.4	151.8	-	12.8
Chapasack	179.0	39.4	15.6	17.8	1,065.0	0.6	127.6
Attapeu	34.8	29.8	8.3	7.7	244.9	0.4	58.8
Lao PDR	2,165.2	541.4	509.5	406.1	11,901.3	416.9	1,654.0

Table 4.1.3: Average number of livestock/poultry per farm households

Province	Cows	Buffaloes	Pig	Goat	Chicken Lat	Breeding Chicken	Ducks
North	7.6	4.8	3.8	6.1	88.6	2,095.3	14.7
Phongsaly	5.7	4.2	3.1	5.6	66.6	8.6	12.7
Luangnamtha	4.9	3.5	3.1	6.1	92.7	879.9	14.6
Oudomxay	4.7	3.0	3.0	5.3	77.7	49.1	11.1
Bokeo	7.0	4.2	3.6	5.4	93.1	32.7	12.6
Luangprabang	8.0	5.2	5.1	7.8	105.9	11,221.1	17.9
Huaphanh	6.3	4.3	3.9	5.1	63.6	25.0	13.6
Xayaboury	10.9	6.9	3.8	5.8	111.2	-	19.1
Central	7.1	4.8	4.1	6.9	45.6	626.2	15.9
Vientiane Capital	9.8	8.4	46.5	10.2	38.7	1,671.9	20.0
Xiengkhouang	8.5	5.1	3.2	5.8	41.3	-	17.4
Vientiane Province	9.1	6.6	6.0	6.5	66.2	25.1	20.0
Borikhamxay	7.4	5.9	4.0	9.0	74.4	-	14.0
Khammuane	5.4	4.4	3.9	5.8	35.2	10.0	16.5
Savannakhet	6.4	4.1	2.7	7.0	36.8	16.3	12.6
Xaysomboun	8.8	5.8	3.1	6.7	-	-	11.8
South	7.2	4.2	2.6	6.9	50.0	16.1	12.7
Saravane	5.7	3.3	2.3	6.1	35.9	10.5	10.6
Sekong	5.0	3.5	3.1	4.1	75.1	-	12.7
Chapasack	9.0	4.3	3.4	9.1	50.2	12.0	15.6
Attapeu	10.4	5.9	2.3	8.6	171.5	23.5	13.8
Lao PDR	7.3	4.7	3.7	6.7	28.9	1,147.9	14.9

Table 4.1.4: Farm households according to herd size of cattle by province, 2019/20

Province	Number of farm households	Number of farm households raising cattle	Number of cows	The size of the cattle herd					Average number of cows per farm households
				1-2	3-4	5-9	10-19	20 and up	
North	236,710	88,145	665,561	21,054	9,977	26,424	14,996	6,726	7.55
Phongsaly	20,647	2,399	13,737	891	342	529	327	91	5.73
Luangnamtha	24,066	6,233	30,772	2,330	1,050	1,560	570	143	4.94
Oudomxay	39,113	12,076	57,089	4,633	1,649	3,028	1,173	197	4.73
Bokeo	18,962	9,955	70,019	2,291	1,015	3,156	1,707	609	7.03
Luangprabang	50,539	20,514	164,307	3,990	1,992	6,856	3,912	1,672	8.01
Huaphanh	30,836	15,659	97,871	3,968	2,016	4,998	2,212	667	6.25
Xayaboury	52,545	21,309	231,766	2,952	1,913	6,298	5,096	3,347	10.88
Central	274,392	157,946	1,127,914	29,683	19,078	55,170	28,811	8,457	7.14
Vientiane Capital	20,361	6,396	62,682	794	429	2,165	1,432	887	9.80
Xiengkhouang	24,299	18,048	152,989	2,458	1,786	6,477	4,487	1,374	8.48
Vientiane Province	41,470	18,319	166,708	2,404	1,779	6,126	4,741	1,640	9.10
Borikhamxay	29,961	13,849	102,013	2,172	1,456	5,231	2,862	789	7.37
Khammuane	38,854	21,382	115,359	6,184	3,215	6,227	2,460	476	5.40

Savannakhet	110,925	73,345	470,176	14,706	9,636	26,745	11,588	2,674	6.41
Xaysomboun	8,523	6,608	57,986	965	778	2,199	1,240	617	8.78
South	132,996	51,346	371,774	11,225	6,591	16,397	8,106	3,142	7.24
Saravane	44,452	23,947	137,024	6,441	3,389	7,302	3,105	594	5.72
Sekong	14,266	4,189	20,918	1,249	718	1,130	414	53	4.99
Chapasack	58,306	19,850	178,996	2,813	2,143	7,141	3,924	1,952	9.02
Attapeu	15,972	3,360	34,836	721	341	823	663	542	10.37
Lao PDR	644,098	297,437	2,165,249	61,962	35,647	97,991	51,913	18,324	7.28

Table 4.1.5: Buffaloes by herd size and province, 2019/20

Province	Number of farm households ('000)	Number of farm households raising buffaloes ('000)	Number of buffaloes by size of the herd(000)						Average number of buffaloes per possession
			Total	1-2	3-4	5-9	10-19	20 and up	
North	236.71	37.84	183.2	19.9	34.2	65.3	47.2	16.6	4.84
Phongsaly	20.65	2.97	12.5	2.4	2.4	3.3	1.4	3.1	4.21
Luangnamtha	24.07	3.31	11.6	2.3	3.2	2.9	3.0	0.2	3.52
Oudomxay	39.11	4.22	12.8	3.1	4.0	4.9	0.8	0.0	3.02
Bokeo	18.96	3.47	14.6	1.9	3.9	5.1	2.5	1.1	4.21
Luangprabang	50.54	8.97	46.6	4.0	8.9	15.9	13.9	3.9	5.19
Huaphanh	30.84	6.99	30.2	3.6	6.9	13.3	5.3	1.0	4.32
Xayaboury	52.55	7.89	54.8	2.4	5.0	19.9	20.2	7.3	6.94
Central	274.39	51.84	251.3	27.6	48.0	89.9	61.6	24.2	4.85
Vientiane Capital	20.36	1.69	14.3	0.5	1.1	4.2	5.2	3.2	8.44
Xiengkhouang	24.30	5.04	25.6	2.6	3.6	11.2	6.0	2.1	5.07
Vientiane Province	41.47	5.11	33.8	1.8	3.9	12.0	9.2	6.9	6.61
Borikhamxay	29.96	5.34	31.3	2.0	3.9	12.5	10.2	2.7	5.87
Khammuane	38.85	8.69	38.0	4.8	9.2	13.6	8.1	2.3	4.37
Savannakhet	110.93	24.51	99.8	15.3	25.0	33.5	19.9	6.1	4.07

Xaysomboun	8.52	1.46	8.6	0.6	1.2	2.9	3.1	0.8	5.84
South	133.00	25.56	106.9	14.3	28.3	36.0	22.1	6.2	4.18
Saravane	44.45	8.69	28.3	6.2	9.7	9.6	2.7	0.0	3.25
Sekong	14.27	2.70	9.4	1.8	2.9	3.3	1.4	0.0	3.48
Chapasack	58.31	9.13	39.4	4.2	11.7	14.1	6.7	2.8	4.32
Attapeu	15.97	5.04	29.8	2.1	4.1	9.0	11.2	3.5	5.92
Lao PDR	644.10	115.24	541.4	61.8	110.5	191.2	130.8	47.0	4.70

Table 4.1.6: Distribution of poultry by type and province, 2019/20

Province	Chickens			Ducks			Other birds
	Chicken households ('000)	Number of chickens (000)	Average number of chickens per chicken household	Duck households ('000)	Number of ducks (000)	Average number of ducks per duck household	Number ('000)
North	155.61	4972	32	26.71	394	15	0.77
Phongsaly	16.42	368	22	2.15	27	13	-
Luangnamtha	18.24	465	25	3.99	58	15	-
Oudomxay	26.39	675	26	7.13	79	11	0.71
Bokeo	12.75	378	30	1.19	15	13	-
Luangprabang	32.25	1150	36	6.56	117	18	0.06
Huaphanh	20.95	679	32	2.19	30	14	-
Xayaboury	28.61	1257	44	3.49	67	19	-
Central	178.44	4889	27	57.50	916	16	1.33
Vientiane Capital	9.63	358	37	3.38	68	20	0.46
Xiengkhouang	19.13	682	36	6.11	106	17	-
Vientiane Province	30.09	997	33	15.84	316	20	0.16
Borikhamxay	16.56	526	32	3.71	52	14	-
Khammuane	22.31	446	20	4.40	72	16	-
Savannakhet	74.04	1711	23	22.34	281	13	0.71
Xaysomboun	6.66	169	25	1.72	20	12	-
South	78.06	2041	26	27.09	344	13	0.40
Saravane	29.67	579	20	13.64	145	11	0.22
Sekong	7.73	152	20	1.01	13	13	-
Chapasack	28.86	1065	37	8.18	128	16	-

Attapeu	11.80	245	21	4.26	59	14	0.18
Lao PDR	412.11	11901	29	111.30	1654	15	2,496

Chapter 5: Fisheries

Fisheries and aquaculture are the most important natural resource-related subsectors of agricultural industry of the Lao PDR economy. These subsectors nearly contribute 4 percent of National GDP. Though Lao is landlocked country, it has extensive freshwater resources since the entire country is a part of the Lower Mekong River Basin. Area covered by freshwater resources is estimated to be 333.6 square kilometers. Traditionally, people of Lao PDR mostly relied on fish as an important element of animal protein supply and therefore, aquatic resources were supposed to be a good resource of food security as well as livelihoods in the country. At present, fisheries and aquaculture have also been playing a vital role to contribute the Lao PDR economy since the country has ample water resources such as Mekong River and its tributaries, water reservoirs, ponds, cages, rain-fed and irrigated rice fields, lakes, water bodies and so on. Fishing in the country has been observed both subsistence and commercial purpose.

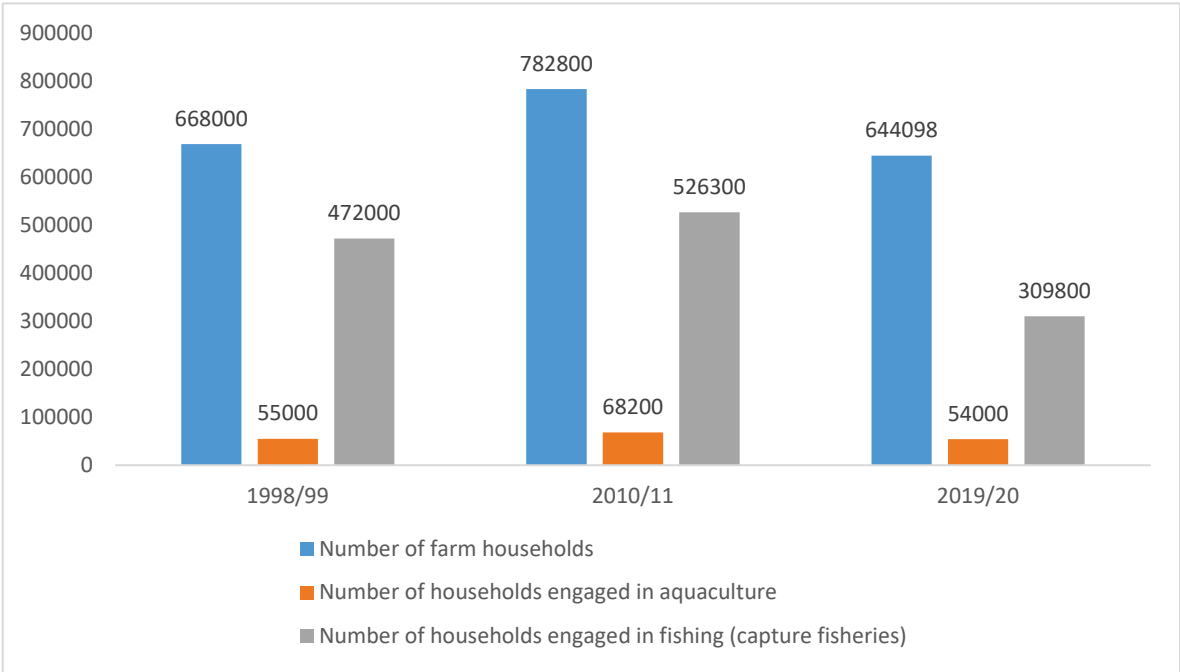
This chapter highlights the analytical report of fisheries and aquaculture activities in the country. Mainly, this report presents the analytical findings of the information gathered in the LAC 2019/2020. However, in some cases the results from LAC 2019/2020 is compared to the results of previous two agricultural censuses: LAC 1998/99 and LAC 2010/11. In this way, development on fisheries and aquaculture industries during the inter-censuses period is assessed which also help to examine the dependence of agricultural households on the aforesaid economic subsectors. Moreover, the available information on fisheries and aquaculture are used to discuss the cross-sectional variability on the various indicators related to these subsectors across the country. Basically, this chapter discusses on the various characteristics of the variables related to fisheries and aquaculture such as the farm households growing fisheries and aquaculture; income generated by farm households from this subsector; fish farming area covered; fishing sites including natural lake, river and other places; equipment used for aquaculture. Overall, the analysis helps to discuss the major issues and challenges affecting these subsectors and that would be the great inputs for policy makers and other stakeholders.

More than 481 species of fish have been found in Lao PDR, reported by agriculture holdings. Food and Agriculture Organization (2021) shows that Lao PDR produced about 175,000 tonnes fish produce in 2017. Out of the total fish production, aquaculture contribute 59 percent with an average annual growth of 5 percent from 2005. Fisheries also create a significant labor market in the country as an estimated 55,200 people were involved in aquaculture and 15,300 people in inland fisheries (Food and Agriculture Organization, 2021). According to the Lao Agriculture Censuses, capturing fisheries in public water resources is one of the important secondary occupations of the farm households in Lao PDR. A total of 472,000 farm households (70.6%) engaged in fishing in the year 1998/99 and the number of farm households engaged in fishing increased to 526,300 (67%) in 2010/11, and slightly decreased to 309,800 (48%) in the year 2019/2020 (Figure 5.1). Similarly, Figure 5.1 shows that number of households engaged in

aquaculture activities increased in 2010/11 as compared to 1998/99 and again slightly decreased in 2019/2020.

This chapter is presented in three subsections: holding characteristics, source of fishing, and sale and market access. The first subsections describe the characteristics of farm households engaging in fisheries and aquaculture in the Lao PDR. The second subsection explains various sources of fishing such as natural fishing sites and cultivated fishing sites. The third subsection provides an overview of the sale and market access for this subsector of the agriculture industry in the Lao PDR. Finally, this chapter summarizes the key findings of the analysis and highlights the major problems affecting these subsectors.

Figure 5.1: Farm households engaged in fishing activities



5.1 Holding Characteristics

Fisheries and aquaculture activities are very popular in Lao PDR. Past two agriculture censuses of Lao PDR reported more than 75 percent households engaged in these sectors. However, in the third round of LAC conducted in 2019/2020 the proportion of households engaged in fisheries and aquaculture dropped to nearly 56 percent. This drop basically seems to be in capture fishing activities rather than in aquaculture activities. As can be seen in the Table 5.1, the proportion of households engaged in aquaculture activities remains almost static though the absolute number of households engaged in aquaculture dropped to 54,000 in 2019/2020 from 68,200 in 2010/2011. On the other, the proportion of households engaged in capture fishing activities remained almost same in the past two LAC 1998/1999 and 2010/2011 but dropped

sharply in the LAC 2019/2020. In terms of absolute number, households involved in capture fishing increased in the second round of LAC but decreased in the third round of LAC. Majority of households from southern region of the country seem to be involved in fishing activities followed by the central region. But aquaculture activities are more popular in central region as compared to north and south. The three LAC witnessed that there were increasing number of households involving aquaculture activities from the central region of the country. In the remaining south and northern region, both aquaculture and fishing activities were shrinking to the lower number of households as compared to the preceding agricultural census periods. Overall, declining in both the proportion and absolute number of households involved in aquaculture and fishing activities in the latest LAC shows that some of the farm households gradually transform their activities from these sectors to other.

Table 5.1: Households engaged in fisheries and aquaculture by region, 1998/99, 2010/11 and 2019/2020

Region	Number of farm households ('000)			Number of households engaged in aquaculture ('000)			Number of households engaged in fishing ('000)		
	1998/99	2010/11	2019/20	1998/99	2010/11	2019/20	1998/99	2010/11	2019/20
North	238.4	288.9	236.7	28.6	28.9	13.7	153.2	187.3	86.4
				(12.0)	(10.0)	(5.8)	(64.3)	(64.8)	(36.5)
Central	285.9	336.4	274.4	21.1	30.2	34.2	208.7	230.3	150.1
				(7.4)	(9.0)	(12.4)	(73.0)	(68.5)	(54.7)
South	136.0	157.5	133.0	5.1	9.1	6.2	102.9	108.6	73.3
				(3.8)	(5.8)	(4.6)	(75.7)	(69.0)	(55.1)
Lao PDR	668.0	782.8	644.1	55.5	68.2	54.0	464.7	526.3	309.8
				(8.3)	(8.7)	(8.4)	(69.6)	(67.2)	(48.1)

Note: Figures in the parentheses are percentage share of households that are engaged in aquaculture or capture fishing with respect to the total farm households. The data are obtained from the three agriculture censuses of Lao PDR.

Farm households engaged in capture fishing and aquaculture activities by province in 1998/99, 2010/11, and 2019/20 is presented in Appendix 5.1. Sekong is the only a single province that reported increasing number of farm households involving in fishing while Chapasack, Vientiane Capital, and Luangprabang reported decreasing number of households engaged in fishing during three LAC period. Remaining 13 provinces reported increased number of farm household engaging fishing during first two rounds of LAC but decreased between second and third round of LAC. There was no data of the province Xaysomboun for the first two rounds of LAC and thus cannot be reviewed the trend during the three LAC period. Chapasack reported the highest number of farm households involving in fishing in all three rounds of LAC followed by Khammuane province. On the other, Xaysomboun province reported the lowest number of farm households involving fishing in the third round of LAC followed by Vientiane Capital. Similarly, figures on farm households involved in aquaculture activities by province shows that only a single

province Savannakhet reported increasing number of farm households engaging in aquaculture activities during the three LAC periods. Number of households involving aquaculture activities in Luangnamtha and Khammuane decreased between first and second LAC while increased between second and third LAC. Eight provinces reported increased number of aquaculture hosting households between first and second LAC while decreased number between second and third LAC. Remaining six provinces reported decreasing number of aquaculture hosting households during the three LAC periods. The third LAC reported the highest number of aquaculture households from Savannakhet followed by Vientiane Province. In contrast, Sekong reported the lowest number of aquaculture households followed by Bokeo in the third round of LAC.

5.2 Sale and Market Access

All the three rounds of LAC show that capture fishing is a major secondary activity of farm households in Law PDR. The third LAC reported that 48 percent of farm households engaged in capture fishing while only 8.4 percent farm households engaged in aquaculture at national level. In the similar fashion, the second LAC had also reported that 67 percent of farm households engaged in capture fishing while only 8.7 percent farm households engaged in aquaculture at national level. These data suggest that most farm household prefer fishing in common water sources and majority of farm households involve in capture fishing and aquaculture mainly for household consumption rather than commercial use. However, 12.8 percent of total aquaculture households received income by selling aquaculture in the census year 2019/2020. In absolute term, central region reported highest number of farm households that sold aquaculture produce while northern region showed the highest proportion. But in southern region number of farm households, aquaculture households, and households that sold aquaculture produce all were lowest as compared to the rest of the regions. A nationwide total of Kip 3655.2 thousand transaction was made from the sales of aquaculture produce during 2019/20. By region, northern region received highest amount of money by selling aquaculture produce followed by southern region and by the central region. As can be seen in the Table 5.2, average income from aquaculture was 1.07 thousand kip at national level. Highest average income was reported from central region and the lowest from southern region.

Province-wise aquaculture households and income is presented in the Appendix 5.2. According to the report of third LAC, Savannakhet reported the highest number of farm households who sold aquaculture produce while Attapeu reported the least among other provinces. Regarding the revenue from the sales of aquaculture produce, Sekong reported the highest amount of money while Attapeu reported the least. Similarly, Oudomxay reported the highest proportion of households who received income from the sales of aquaculture produce while Attapeu reported the least.

Table 5.2: Aquaculture households and income received from aquaculture sales by in FY 2019/20

Region	Number of farm households ('000)	Number of aquaculture households ('000)	Number of households that sold produce from aquaculture activities ('000)	Income from aquaculture ('000)	Percentage of households received income from aquaculture produce
North	236.7	13.7	2.4	4143.2	17.52
Central	274.4	34.2	4.0	3352.0	11.73
South	133.0	6.2	0.5	3745.7	8.42
Lao PDR	644.1	54.0	6.9	3655.2	12.82

Source: LAC 2019/20

Lao PDR Agricultural Census Office (2012) shows that about 6,000 farm households depend on capture fisheries as main source of income while another 111,000 farm households sold some capture fisheries products. Looking at the report of third round LAC, capturing fisheries activities expanded to larger number of households as compared to that of second round LAC. One of the reasons of this expansion might be due to the effect of commercialization of agricultural activities. But only 11.4 percent households sold capture fisheries to raise their income in 2019/20 means that majority (88.6%) farm households undertook capture fisheries for their own consumption. Comparing among the three regions of Lao PDR, southern region reported the highest income while northern reported the lowest. Similarly, highest proportion of farm households who sold capture fisheries and raise household income was noticed in the southern region and the lowest from the northern region. At national level, average income from capture fishing was 5.5 thousand kip, highest from southern region and the lowest from northern region.

Table 5.3: Households engaged in capture fishing and income received from capture fishing sales by province in FY 2019/20

Region	Number of farm households ('000)	Number of households engaged in capture fishing ('000)	Number of households that sold capture fishing ('000)	Income from capture fishing ('000)	Percentage of households earning income from capture fishing	Average income from capture fishing ('000)
North	236.7	86.4	6.5	1633.1	7.5	2.8
Central	274.4	150.1	17.3	1782.2	11.5	6.3
South	133.0	73.3	11.7	2490.2	15.9	8.8
Lao PDR	644.1	309.8	35.4	1987.6	11.4	5.5

Source: LAC 2019/20

Province-wise aquaculture households and income is presented in the Appendix 5.3. In the Northern region, the proportion of households selling some part of their capture fisheries produce ranged between 3.3 percent (Bokeko) and 12.4 percent (Luangprabang). In central region, the proportion ranged between 5.8 percent (Xiengkhouang) and 22.1 percent (Vientiane Capital). In the similar fashion, the proportion of households selling fisheries ranged between 5.2 percent (Sekong) and 26.8 percent (Chapasack). Vientiane Capital had the highest proportion of farm households selling some fraction of their capture fisheries means that the proportion could go further high with the increased access of market. Therefore, it could be claimed that the variation of the proportion among 18 provinces of the Lao PDR could be the effect of different level of market access in different places.

5.3 Source of Fishing

Fisheries from the natural water sources and paddy farm is the important activities in the Lao PDR. Among all sources, river is the most popular site of fishing or aquaculture activities. Province-wise fishing or aquaculture sites are presented in the Appendix Table 5.14.

Table 5.4: Farm households with the fishing or aquaculture sites and by province, 2019/20

Region	Number of households engaged in aquaculture ('000)	Number of households engaged in fishing ('000)	Fishing or aquaculture sites						
			Rivers	Lake/reservoir	Swamp/seasonal floodplain	Rice fields	Irrigation canal	Fish pond	Other
North	13.7	86.4	85.6	85.6	7.9	5.2	4.9	0.3	9.2
Central	34.2	150.1	139.1	139.1	45.0	32.3	9.5	17.5	21.5
South	6.2	73.3	70.2	70.2	22.3	19.7	6.4	4.1	7.9
Lao PDR	54.0	309.8	294.9	294.9	75.2	57.2	20.8	21.8	38.5

5.4 Conclusion

The Lao PDR has extensive freshwater resources since the entire country is a part of the Lower Mekong River Basin and thus potential for the fishery and aquaculture activities. More than 481 species of fish is found in the country. Fisheries and aquaculture activities are the major

secondary activities of farm household in Lao PDR. Fishing in natural water resources very common since 48 percent household were involved in these activities in the year 2019/20. Fisheries play a crucial role to contribute the national GDP in one hand, on the other, this activity creates the employment opportunity to more than 70 thousand labours across the country. Majority of farm population accept fishery as a major secondary activity especially capturing fishery in the public water sources. Almost half of the farm households were engaged in fishery as reported by the LAC 2019/20 however, the number decreased between the second and third round of LAC. In general, purpose of fishing was mainly for their own consumption, however, 12.8% of aquaculture households reported that they earned income by selling aquaculture and 11.4% of farm households earned from capture fishing in 2019/20. The LAC 2019/20 reported river, lake, reservoir as the main source of fishing in the Lao PDR as most farm households used these sources for fishing activities. In spite of ample resources and acceptance of fishery activity among most farm households, fishery and aquaculture is still underdeveloped in the Lao PDR. Basically, small households mostly depend on fishery for their livelihood and most households accepted this activity as secondary activities in the country. Therefore, it can be said that strengthening fishery activities would provide sufficient source for the secondary income in the Lao PDR.

Table 5.1.1: Farm households engaged in capture fishing and aquaculture activities by province in 1998/99, 2010/11, and 2019/20

	Number of farm households (000)			Number of households engaged in aquaculture (000)			Number of households engaged in fishing (000)		
	1998/99	2010/11	2019/20	1998/99	2010/11	2019/20	1998/99	2010/11	2019/20
North	238.4	288.9	236.7	28.6	28.9	13.7	153.2	187.3	86.4
Phongsaly	24.4	28.4	20.6	1.5	2.3	1.4	18.2	22.4	10.6
Luangnamtha	19.8	26.2	24.1	1.7	1.1	1.3	11.6	16.3	9.7
Oudomxay	33.4	44.6	39.1	2.9	4.6	1.8	19.6	29.5	20.1
Bokeo	18.8	24.8	19.0	2.2	1.2	0.6	13.6	15.7	7.5
Luangprabang	55.7	59.5	50.5	3.2	3.1	1.8	35.1	33.7	15.0
Huaphanh	36.9	42.3	30.8	12.4	10.8	4.4	24.9	28.8	11.6
Xayaboury	49.4	63.1	52.5	4.6	5.8	2.3	30.1	40.9	11.7
Central	285.9	336.4	274.4	21.1	30.2	34.2	208.6	230.3	150.1
Vientiane Capital	48.6	42.8	20.4	3.6	2.8	1.8	28.2	20.5	4.2
Xiengkhouang	28.1	36.2	24.3	7.2	7.3	3.8	14.7	19.0	8.7
Vientiane Province	43.7	62.7	41.5	4.0	5.0	4.8	31.8	41.4	21.0
Borikhamxay	26.5	35.0	30.0	0.6	1.3	0.9	22.8	27.6	14.0
Khammuane	43.6	51.2	38.9	0.5	2.0	0.9	35.8	41.7	26.9
Savannakhet	95.4	108.6	110.9	5.3	11.9	21.1	75.3	80.1	71.9
Xaysomboun	na	na	8.5	Na	na	0.8	na	na	3.3
South	136.0	157.5	133.0	5.2	9.1	6.2	102.9	108.6	73.3
Saravane	41.3	50.1	44.5	1.9	4.1	3.5	31.9	36.6	23.8
Sekong	9.7	12.9	14.3	0.7	0.7	0.6	8.3	8.4	8.7
Chapasack	70.2	75.4	58.3	2.1	2.8	1.3	50.7	49.6	29.7
Attapeu	14.8	19.1	16.0	0.4	1.4	0.8	12.1	14.1	11.1
Lao PDR	668.0	782.8	644.1	55.5	68.2	54.0	464.8	526.3	309.8

Table 5.1.2: Aquaculture households and income received from aquaculture sales by province in FY 2019/20

Province	Number of farm households ('000)	Number of aquaculture households ('000)	Number of households that sold produce from aquaculture activities ('000)	Income from aquaculture ('000)	Percentage of households received income from aquaculture produce	Average income from aquaculture ('000)
North	236.7	13.7	2.4	4143.2	17.52	1.01
Phongsaly	20.6	1.4	0.3	1869.9	19.12	1.33
Luangnamtha	24.1	1.3	0.3	8136.5	25.44	1.41
Oudomxay	39.1	1.8	0.6	3699.4	30.79	1.44
Bokeo	19.0	0.6	0.0	5263.1	4.99	0.16
Luangprabang	50.5	1.8	0.4	4731.3	21.09	0.74
Huaphanh	30.8	4.4	0.6	3324.3	14.73	2.09
Xayaboury	52.5	2.3	0.2	2848.3	7.17	0.31
Central	274.4	34.2	4.0	3352.0	11.73	1.46
Vientiane Capital	20.4	1.8	0.3	6279.5	16.54	1.47
Xiengkhouang	24.3	3.8	0.7	5623.1	18.02	2.80
Vientiane Province	41.5	4.8	0.9	4472.4	18.71	2.17
Borikhamxay	30.0	0.9	0.2	4648.3	21.76	0.69
Khammuane	38.9	0.9	0.1	410.5	8.22	0.20
Savannakhet	110.9	21.1	1.7	1342.2	8.16	1.55
Xaysomboun	8.5	0.8	0.1	3242.6	15.46	1.38
South	133.0	6.2	0.5	3745.7	8.42	0.39
Saravane	44.5	3.5	0.2	4929.0	6.53	0.52
Sekong	14.3	0.6	0.0	13500.0	6.20	0.24
Chapasack	58.3	1.3	0.2	1442.1	18.91	0.41
Attapeu	16.0	0.8	0.0	143.8	1.71	0.09
Lao PDR	644.1	54.0	6.9	3655.2	12.82	1.07

Table 5.1.3: Households engaged in capture fishing and income received from capture fishing sales by province in FY 2019/20

Province	Number of farm households ('000)	Number of households engaged in capture fishing ('000)	Number of households that sold capture fishing ('000)	Income from capture fishing ('000)	Percentage of households earning income from capture fishing	Average income from capture fishing ('000)
North	236.7	86.4	6.5	1633.1	7.5	2.8
Phongsaly	20.6	10.6	0.6	934.7	5.9	3.1
Luangnamtha	24.1	9.7	0.4	1655.4	4.5	1.8
Oudomxay	39.1	20.1	1.2	1119.7	5.7	3.0
Bokeo	19.0	7.5	0.3	803.9	3.3	1.3
Luangprabang	50.5	15.0	1.9	1904.7	12.4	3.7
Huaphanh	30.8	11.6	1.0	1354.4	8.2	3.1
Xayaboury	52.5	11.7	1.2	2447.4	10.4	2.3
Central	274.4	150.1	17.3	1782.2	11.5	6.3
Vientiane Capital	20.4	4.2	0.9	1855.7	22.1	4.5
Xiengkhouang	24.3	8.7	0.5	1186.5	5.8	2.1
Vientiane Province	41.5	21.0	2.7	2075.9	13.0	6.6
Borikhamxay	30.0	14.0	2.6	3625.5	18.3	8.6
Khammuane	38.9	26.9	1.9	1446.7	7.2	5.0
Savannakhet	110.9	71.9	8.4	1219.6	11.6	7.5
Xaysomboun	8.5	3.3	0.2	1960.0	6.8	2.6
South	133.0	73.3	11.7	2490.2	15.9	8.8
Saravane	44.5	23.8	1.5	1198.4	6.4	3.4
Sekong	14.3	8.7	0.5	461.2	5.2	3.2
Chapasack	58.3	29.7	8.0	3216.2	26.8	13.7
Attapeu	16.0	11.1	1.7	791.9	15.4	10.7
Lao PDR	644.1	309.8	35.4	1987.6	11.4	5.5

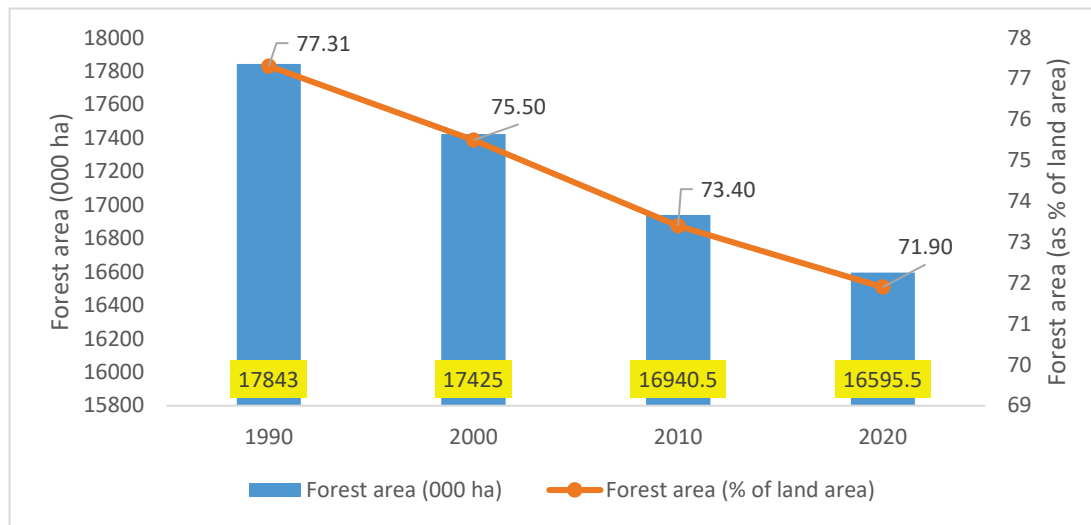
Table 5.1.4: Households with the fishing or aquaculture sites and by province, 2019/20

Province	Number of households engaged in aquaculture ('000)	Number of households engaged in fishing ('000)	Fishing or aquaculture sites						
			Rivers	Lake/reservoir	Swamp/seasonal floodplain	Rice fields	Irrigation canal	Fish pond	Other
North	13.7	86.4	85.6	85.6	7.9	5.2	4.9	0.3	9.2
Phongsaly	1.4	10.6	10.6	10.6	0.4	0.0	0.0	0.0	1.7
Luangnamtha	1.3	9.7	9.7	9.7	2.4	1.5	1.8	0.0	0.6
Oudomxay	1.8	20.1	19.9	19.9	0.7	1.2	0.7	0.1	2.8
Bokeo	0.6	7.5	7.5	7.5	1.8	0.8	1.3	0.0	0.1
Luangprabang	1.8	15.0	14.9	14.9	1.4	0.6	0.9	0.1	1.8
Huaphanh	4.4	11.6	11.5	11.5	0.4	0.1	0.0	0.0	0.8
Xayaboury	2.3	11.7	11.5	11.5	0.8	1.0	0.2	0.0	1.3
Central	34.2	150.1	139.1	139.1	45.0	32.3	9.5	17.5	21.5
Vientiane Capital	1.8	4.2	3.2	3.2	0.6	0.4	0.3	0.5	0.1
Xiengkhouang	3.8	8.7	8.5	8.5	2.0	1.5	1.0	0.1	0.7
Vientiane Province	4.8	21.0	19.9	19.9	4.4	5.3	2.1	0.4	0.4
Borikhamxay	0.9	14.0	12.5	12.5	4.3	1.2	0.4	1.6	4.2
Khammuane	0.9	26.9	24.4	24.4	9.2	4.5	0.8	4.6	2.9
Savannakhet	21.1	71.9	67.3	67.3	24.4	18.6	4.8	10.2	12.8
Xaysomboun	0.8	3.3	3.3	3.3	0.2	0.8	0.1	0.0	0.3
South	6.2	73.3	70.2	70.2	22.3	19.7	6.4	4.1	7.9
Saravane	3.5	23.8	23.2	23.2	3.1	2.7	1.2	0.4	2.2
Sekong	0.6	8.7	8.4	8.4	2.5	1.2	1.1	0.2	0.2
Chapasack	1.3	29.7	28.1	28.1	10.0	10.7	1.8	1.8	3.4
Attapeu	0.8	11.1	10.5	10.5	6.7	5.1	2.3	1.7	2.1
Lao PDR	54.0	309.8	294.9	294.9	75.2	57.2	20.8	21.8	38.5

Chapter 6: Forestry

Forestry is the natural resource-related subsector of the Lao PDR economy. This subsector plays an important role in the Lao PDR national economy since the share of forestry and logging in the Lao PDR national GDP in 2019 was 0.99 percent and in 2020 was 1.02 percent (Lao Statistics Bureau, 2020). Naturally, Lao PDR is rich in forest but due to various region area covered by it has been substantially decreasing. Most probably natural disasters, human, encroachment such as unsustainable wood extraction, expansion of cultivated land, industrialization and urban expansion; are the major causes to shrink the forest land in the recent times. However, the 8th NSEDP (2016) shows that there were 51 National Production Areas for the forest covering 3.1 million hectares land. The Lao PDR Government has put sufficient efforts to avoid deforestation and degradation of forestry. The Lao PDR Government introduced the registration system of tree plantation sites that covered nine provinces till 2016 and aimed to expand gradually throughout the country. In spite of the Government efforts to prevent forest, the area covered by forest in the Lao PDR has been gradually decreasing (Figure 6.1). In the past 30 years, land covered by forest in Lao PDR declined 1248 thousand hectare comprising 71.9 percent as of total land area. With this note, this chapter aims to document and analyses the main results of LAC 2019/20 in forestry subsector of Lao PDR. This chapter also highlights some comparison among first and second and third LAC.

Figure 6.1: Forest area in Lao PDR, 1990-2020



Source: *World Development Indicators*⁵

⁵ <https://data.worldbank.org/indicator/AG.LND.FRST.ZS?locations=LA>, downloaded on 12 September 2021

The LAC 2019/20 collected information on planted forest farm and non-timber forest products by using household level questionnaire. Basically, this chapter is organized into three sections: overview of the trends and current status of the forestry, detail analysis of the result of LAC 2019/20, and summary of the findings. Analysis is mainly based on regional variation and household characteristics.

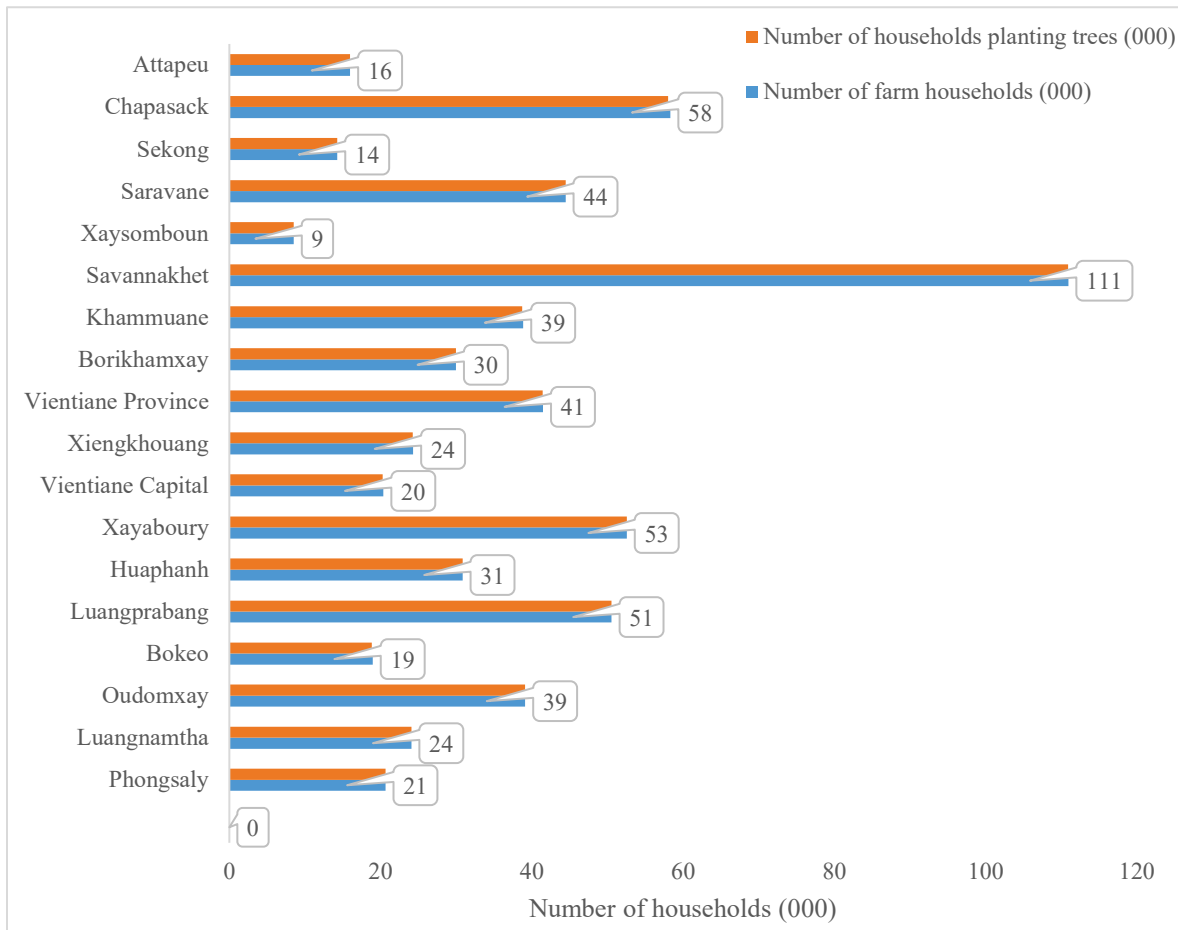
Table 6.1: Forest planted area and reforest area

Region	Forest planted area (hectare)		Reforest area (hectare)	
	2019	2020	2019	2020
North	2037	1811	50414	37884
Central	10462	4552	38650	927
South	2916	1399	28466	34298
Lao PDR	15415	7762	117530	73109

Source: Lao Statistics Bureau, Statistical Year Book, 2020

Lao PDR has been emphasizing on forest plantation and reforestation to prevent the forest in recent years. Due to this reason, certain areas were planted by forest and also carried out reforestation activities across the country. As can be seen in the Table 6.1, Central region has achieved the highest forest planted area as compared to other regions. Nevertheless, forest planted area in 2020 decreased to some level as compared to that of 2019. On the other, Northern regions showed better performance in reforestation activity covering the highest area of 37884 in 2020 followed by the Southern region. However, both forest plantation and reforestation activities seem to be shrank in 2020 as compared to the performance of the year 2019 (Table 6.1).

Figure 6.2: Households planting trees by province, 2019/20



Almost all (99.9%) farm households planted forest in 2019/20. More than 99.9 percent farm households from Northern and Central region reported that they planted forest while the Southern region reported 99.8 percent households planting forest in 2019/20. Overall, 643,284 households reported that they planted forest during the third round of LAC in the Lao PDR. Figure 6.2 presents the number households planting trees by province. The number ranged from 9 thousand (Xaysomboun) to 111 thousand (Savannakhet).

Table 6.2: Households with female head planting forest by village type and geographic location, 2019/20

		<i>North</i>	<i>Central</i>	<i>South</i>	<i>Lao PDR</i>
Female headed households planting trees		2,360	1,211	344	3,915
Village type	Town	918	244	38	1,200
	Town (%)	(39%)	(20%)	(11%)	(31%)
	Rural areas have access roads	1,363	938	275	2,576
	Rural areas have access roads (%)	58%	78%	80%	66%
	Rural areas have no access roads	79	28	31	138
	Rural areas have no access roads (%)	3%	2%	9%	4%
Geographical location	Plains	640	885	255	1,781
	Plains (%)	27%	73%	74%	46%
	Plateau	1,145	127	67	1,339
	Plateau (%)	49%	11%	19%	34%
	Mountain	497	106	6	609
	Mountain (%)	21%	9%	2%	16%
	Mixed	77	92	15	185
	Mixed (%)	3%	8%	5%	5%

Source: LAC 2019/20

Note: the figures in parenthesis represent the share of respective category on the total female headed households planting trees.

Farm households in the Lao PDR was dominated male headed households in 2019/20. The LAC 2019/20 reported that only about 10 percent farm households were headed by female in the Lao PDR. Out of female headed farm household, only 6.28 percent households reported that they planted trees during the third LAC period. The number of female-headed households planting trees reportedly varied according to village type as well as geographical location. The rural village having road access reported the highest share of female-headed household planting trees while rural village having no road access reported the lowest share. In rural village with no road access, female-headed households relatively seem to be reluctant to involve in planting trees as compared to other villages. In the similar fashion, looking by geographic location, plateau reported the highest share while mixed location reported the lowest share of female-headed households planting forest. Regionally, the northern region reported the highest share while southern region reported the lowest share of female-headed households planting trees in 2019/20 (Table 6.2). Overall, a total of 3,915 female-headed households comprising 2360 from north, 1211 from center, and 344 from south engaged in planting trees in 2019/20.

In recent times, rubber became popular among farm households to be planted. Among major eight trees planted in the Lao PDR in 2019/20, majority of farm households planted rubber followed by teak. But wood and the stick were less popular trees since very few farm households planted them in 2019/20 (Figure 6.3a). Province wise number of farm households by type of trees

planted in 2019/20 is presented in Appendix 6.1. There is a significant variation on the number of households planting trees among the provinces. For instance, Luangnamtha reported that 14,850 farm households planted rubber trees which is the highest number as compared to the other provinces. The lowest number of households planting rubber trees was reported by Huaphanh, only 4 households. Only three provinces: Luangnamtha, Borikhamxay, and Khammuane reported the the stick planting households in 2019/20 and southern region had no farm household planning the stick. Trees such as butwood, agarwood, eucalyptus, the stick, bong rubber were planted only in some provinces. Rubber is the single plant that was planted in all provinces. Appendix 6.2 presents the number of households planning trees by type of village and geographic location. According to the result of LAC 2019/20, the mostly planted rubber trees reported by a large number of farm households from the rural villages have access roads and mountain village. Rural villages having no road access reported very few households involved in planting the trees and mixed geographic location and plateau reported relatively few households engaged in forest plantation.

Figure 6.3: Farm households by types of trees planted 2019/20

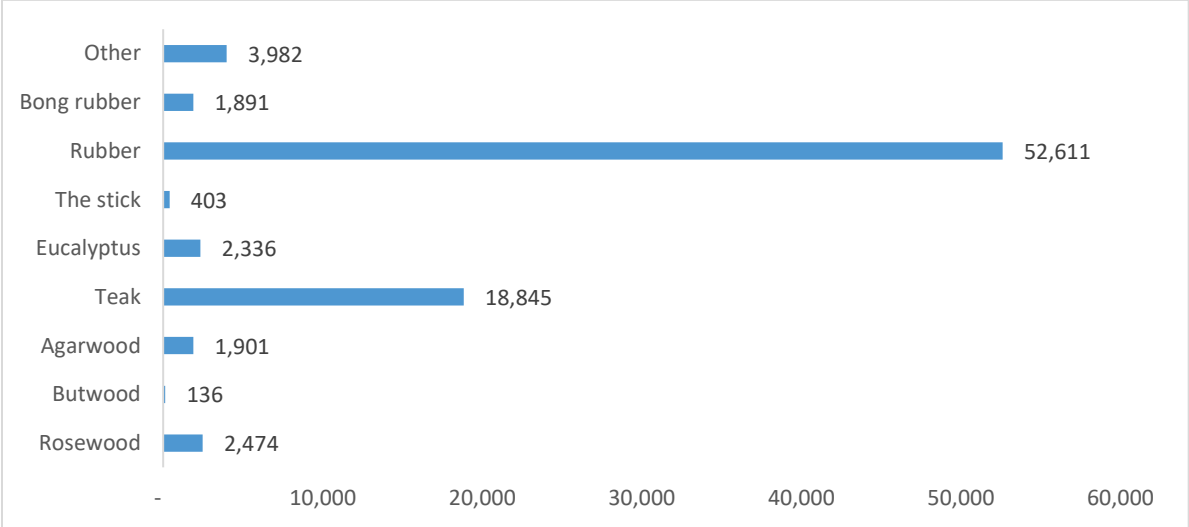
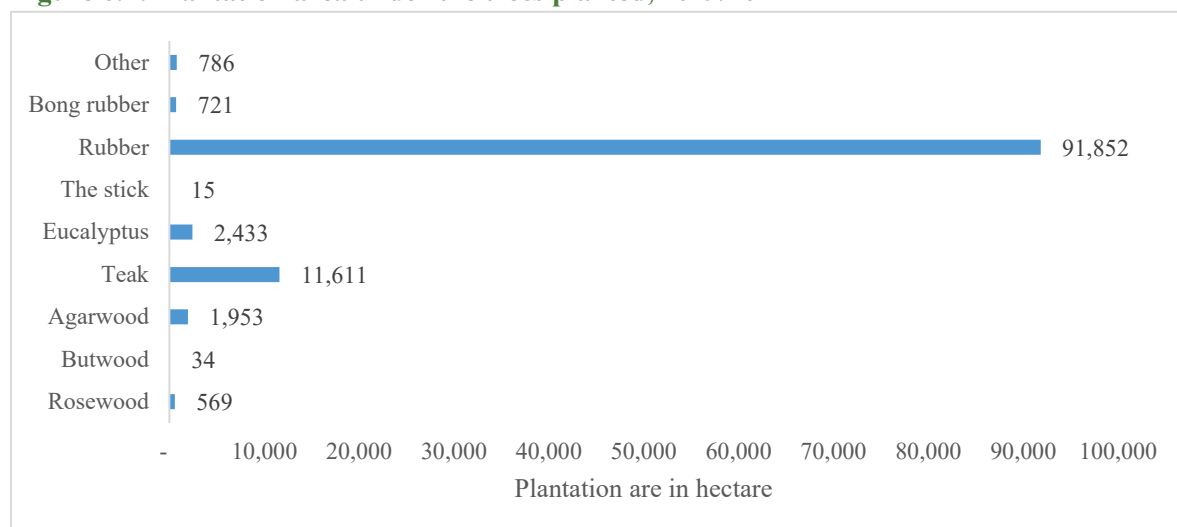


Figure 6.4: Plantation area under the trees planted, 2019/20



As there were the highest number of rubber planters, the LAC 2019/20 reported the highest area under the rubber plantation (Figure 6.4). Among major eight plants planted in 2019/20, area under the rubber plantation was enormously large that covered almost 84 percent of total land planted during the reference year. The second mostly planted teak covered about 11 percent of total planted land and the third one eucalyptus covered only 2.2 percent out of total planted area. Remaining planted trees covered only about 4 percent of total planted area. In addition, forest planted areas significantly varied among various village type and geographic location. Rural villages have access roads reported the highest area while rural villages having no road access reported the lowest planted area. Similarly, the planted area ranged from 8969 hectares (mixed houses) to 43648 hectares (plain village) according to the geographic location of the farm households (Appendix 6.1.3)

There were reportedly differences among the various plantation size groups of households with respect to the forest plantation in 2019/20. Number of farm households that planted trees only in less than one hectare land was the highest as compared to other group of planting land size area. Similarly, total planting area was also the highest for the land size group of less than one hectare plantation area. A total of 622,000 hectares area were reported as forest by planting trees by 79,000 tree planters in 2019/20 (Table 6.3). Regionally, the central region reported the highest land area that was planted while southern region reported the lowest plantation area. On the other, highest number of tree planters were reported from the northern region followed by the central region (Table 6.3). In sum, majority of farm households planted trees in smaller land area and highest plantation area also fell in the same class. As can be seen in the Table 6.3, only 10,000 tree planter planted trees in more than 3 hectares land area which contributes only 12.8 percent of total tree planters. Similarly, only 11,000 hectares area were planted by tree planters by planting more than 3 hectares which contributes 1.7 percent of total planted area in 2019/20.

Table 6.3: Tree planters and plantation area by size of planting area class and region, 2019/20

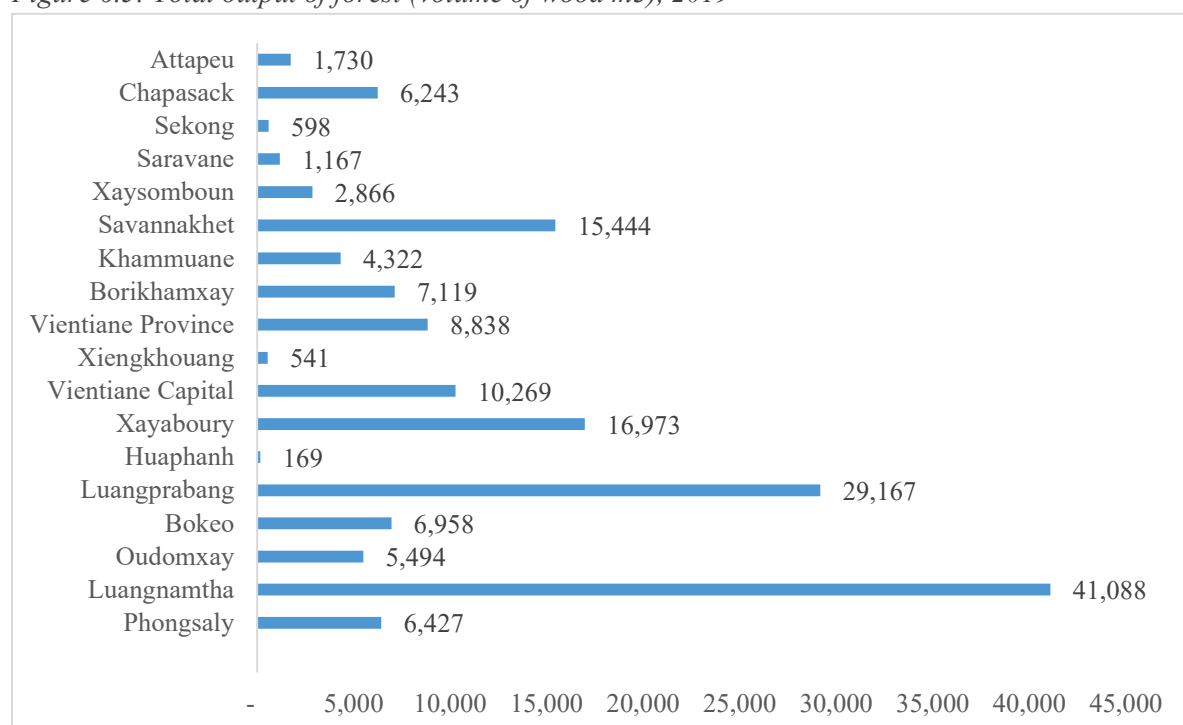
Land size class of planting area	North		Central		South		Lao PDR	
	Number of planters (000)	Plantation area (000 ha)	Number of planters (000)	Plantation area (000 ha)	Number of planters (000)	Plantation area (000 ha)	Number of planters (000)	Plantation area (000 ha)
Less than 1 ha	25	209	6	260	2	108	35	577
1 - 2 ha	17	17	6	6	1	1	23	24
2 - 3 ha	6	6	4	4	1	1	10	10
3 ha and up	5	5	5	5	1	1	10	11
Lao PDR	52	237	21	274	5	111	79	622

Source: LAC 2019/20

6.1: Forest Production

The LAC 2019/20 reports that 165,412 cubic meters wood were produced during the year 2019. Among the major trees planted, production from rubber tree was the highest amount accounted 77,581 cubic meter wood followed by the teak accounted 53,107 cubic meters. Production of rosewood, agarwood and bong rubber was very low as compared to rubber and teak in the reference year. Figure 6.4 presents that Luangnamtha reported the highest amount of production while Huaphanh reported the lowest. Rubber and teak mostly produced in Luangnamtha province while rosewood and teak mostly produced in Huaphanh province. The second highest wood producing province was Luangprabang that produced 29167.3 cubic meter wood of which teak shared 68 percent and rubber shared 32 percent of the total production in the year 2019. Overall, production of rubber led in eight provinces (Phongsaly, Luangnamtha, Oudomxay, and Bokeo), production of teak led in six provinces (Luangprabang, Xayaboury, Saravane, Sekong, Chapasack, and Attapeu), production of Eucalyptus led in three provinces (Xiengkhouang, Khammuane, and Savannakhet), and production of rosewood led only in Huaphanh province (Appendix 6.1.4). Interestingly, Huaphanh reported no production of rubber during the year 2019 though it was being more popular across the country. Similarly, four provinces: Borikhamxay, Khammuane, Savannakhet, and Xaysomboun did not produce teak in the year 2019. Eucalyptus was produced by seven provinces, bong rubber was produced by six provinces, rosewood was produced by five provinces, and agarwood was produced only by four provinces in 2019.

Figure 6.5: Total output of forest (volume of wood m3), 2019



6.2: Non-timber Forest Products

Farm households in the Lao PDR also collect, consume and sell the non-timber forest products (NTFP) such as food, medicinal plants, fibre and bark, raw materials for industries etc. Examples of such products includes fruits, vegetables, mushrooms, bamboo shoots, honey, aquatic animals, wild animals, tubers, khem grass, paper mulberry bark, cardamom, malva nuts, benzoin, resins, oleoresins etc. Various literatures show that collection of non-timber products in Lao PDR is very common and this activity support livelihood of the people to a larger extent as cited in the (Ministry of Agriculture and Forestry, 2014). Collection of non-timber forest product has mainly two aspects of consequences: one it helps to livelihood and raise household income and other if the exploitation of natural products become unmanaged, it may harm the balanced system of the environment. To this end, this subsection aims to analyze the findings of LAC 2019/20 on the recent practices of Lao PDR on consumption of non-timber forest product. The LAC 2019/20 reported that 69 percent farm households engaged in NTFPs in Lao PDR in 2019/20. As can be seen in the Table 6.4, majority of farm households that engaged in NTFPs belonged the Central region. Relatively larger number of households from rural village with road reported that they involved in NTFPs in 2019. Similarly, larger number of farm households from plain areas engaged in NTFPs in 2019. Information on the number of farm households that engaged in NTFPs by province shows that there was wide variation on the number. It ranged from 2,255 (Vientiane Capital) to 86,232 (Savannakhet) households in 2019/20 (Appendix 6.1.5). More interestingly, Vientiane Capital, Xaysomboun, Attapeu reported that none of the farm households from rural area with no road involved in NTFPs in 2019/20. Similarly, some provinces reported that none of

the farm households engaged in NTFPs for some special type of geographic location (see Appendix 6.1.5 for detail).

Table 6.4: Households engaged in NTFPs by region, village type and geographical location of the village, 2019/20

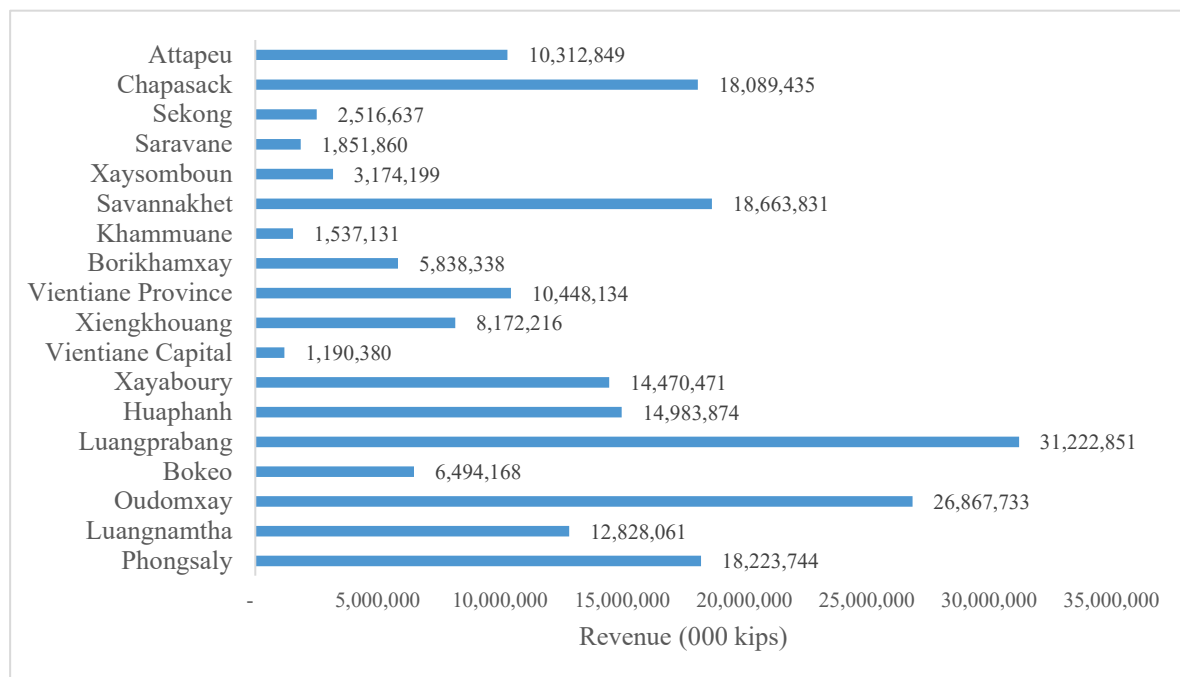
Province	Total no of households	Village type			Geographical location			
		Town	Rural with roads	Rural with no roads	Plains	Plateau	Mountain	Mixed
North	167,721	23,801	130,678	13,242	17,638	94,955	44,665	10,464
Central	188,163	20,510	160,586	7,066	115,028	31,976	36,340	4,819
South	88,131	12,726	71,999	3,406	53,503	8,312	25,800	517
Lao PDR	444,015	57,038	363,262	23,715	186,169	135,242	106,805	15,800

In terms of weight, firewood collection dominated NTFPs in Lao PDR. The second highest output of NTFPs in terms of weight was Type of lump followed by broom. The activities of collection of NTFP were carried out by exploiting own farm's production or collecting from elsewhere. As can be seen in the Appendix 6.1.6, NTFPs collected from elsewhere dominated the overall collection of NTFP in 2019. However, collecting source of NTFPs were largely varied by type of the products. For some product, proportion of collection by type of source varied from one percent to 99 percent respectively from own farm and elsewhere and for some other product the proportion varied from 77 percent to 23 percent respectively from own farm and elsewhere. However, most of the NTFPs were collected from non-owned farm i.e. elsewhere. Nevertheless, only the product, was mostly collected from their own farm in 2019.

6.3: Income Generation from Forest Product (NTFPs and Plantation Products)

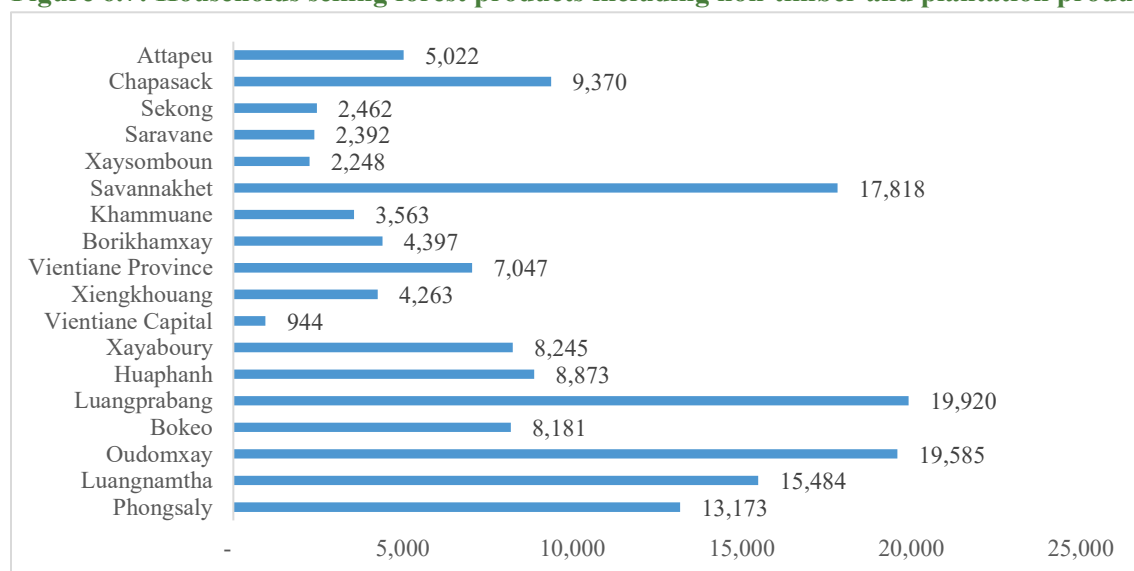
The NTFPs related activities were carried out for own consumption as well as for sale. By following the convention, farm households raised their household income by a significant amount also in the year 2019/20 from the NTFPs. The LAC 2019/20 reported that a total of 206,885,912,809 kips were earned by selling the NTFPs in 2019. Figure 6.6 summarized the results of the LAC 2019/20 on the revenue from the NTFPs that shows Luangprabang province reported the highest amount followed by Oudomxay province. Vientiane Capital, in contrast showed relatively lower performance in income generation from the NTFPs. This shows that income generated by province from NTFPs ranged from 1,190,380,359 kips to 31,222,850,690 kips with a provincial average of 11,493,661,823 kips. It could be concluded that income generation was not uniform across the country from the NTFPs in Lao PDR.

Figure 6.6: Revenue from non-timber forest products by province, 2019/20



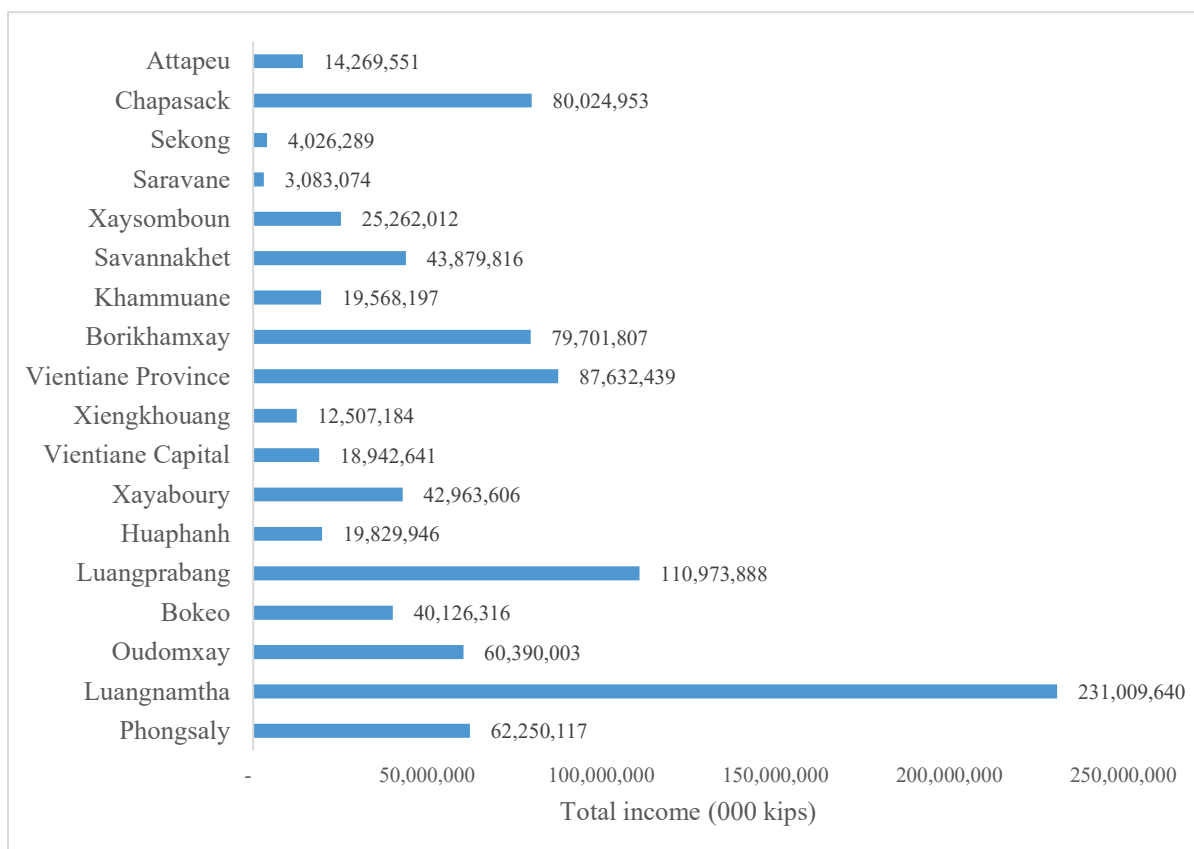
A total of 152,991 farm households sold some of the forest products in 2019/20 collected from both NTFPs and plantation products. Figure 6.6 depicts the provincial farm households number involved in selling forest products in 2019/20. As presented, Luangprabang reported the highest number of farm households selling forest product while Vientiane Capital reported the lowest number of households selling the forest product in 2019/20. Oudomxay province also reported almost same number as of Luangprabang that sold some forest product during the reference period stated above.

Figure 6.7: Households selling forest products including non-timber and plantation products



The LAC 2019/20 reported that a total of 956,441,479,015 kips were earned by selling both the NTFPs and plantation products in 2019. The income ranged from 3,083,073,733 kips (Saravane) to 231,009,639,869 kips (Luangnamtha) in 2019/20 (Figure 6.7). In 2019, the second largest income earning province was Luangpraband followed by Vientiane province. Similarly, the smallest income generating from forest products (NTFPs and plantation) was Saravane followed by Sekong province (Figure 6.8).

Figure 6.8: Revenue from non-timber forest products and plantation products by province, 2019/20



6.4: Conclusion

Lao PDR is very rich in natural-based forest resources since almost 72 percent land is covered by the forest. The forest in Lao PDR has a wide bio-diversity character having large number of various plants and animals. However, in the recent years, deforestation results to shrink the size of forest to some extent. To prevent deforestation, Government of Lao has been promoting farm households in forest plantation. The LAC 2019/20 showed that 643,284 households (99.9% of total farm households) engaged in forest plantation in 2019. Regarding forest plantation, rubber and teak seem to be more popular plants in the Lao PDR in 2019/20. It is because majority of farm households almost from all areas of the country planted these plants during the period of third round of Lao PDR agricultural census covering large area of land as compared to the other plants.

Farm households in Lao PDR also involved in NTFPs basically for self-consumption as well as for sale. By engaging in the forest product related activities, farm households not only substitute their livelihood especially in the food scarcity periods but also generate significant amount of household income by selling the product. In addition, forest products in Lao PDR seem to be potential resource for promoting export but care should be given to maintain the bio-diversity as well as the natural balance.

Appendix 6.1.1: Farm households by types of trees planted by province, 2019/20

Province	No of hh planting trees	Number of farm households by types of trees planted								
		Rosewood	Butwood	Agarwood	Teak	Eucalyptus	The stick	Rubber	Bong rubber	Other
North	236,545	1,106	9	328	14,350	304	389	36,954	57	2,965
Phongsaly	20,647	424	-	21	265	-	-	5,228	-	17
Luangnamtha	24,066	33	-	-	290	-	389	14,850	11	872
Oudomxay	39,097	104	-	92	1,128	301	-	4,655	-	429
Bokeo	18,842	14	-	39	425	-	-	4,156	43	281
Luangprabang	50,524	237	-	176	6,634	-	-	4,602	-	263
Huaphanh	30,836	134	-	-	930	4	-	4	3	851
Xayaboury	52,533	161	9	-	4,678	-	-	3,459	-	252
Central	274,069	957	48	1,529	1,055	1,961	13	14,806	1,131	585
Vientiane Capital	20,285	85	-	26	317	58	-	404	-	68
Xiengkhouang	24,233	45	-	-	26	56	-	170	-	175
Vientiane Province	41,418	384	23	543	603	72	-	4,272	11	54
Borikhamxay	29,961	80	25	827	59	205	3	4,517	191	35
Khammuane	38,736	137	-	-	-	94	10	1,626	15	13
Savannakhet	110,914	226	-	82	50	1,475	-	1,917	914	145
Xaysomboun	8,523	-	-	51	-	-	-	1,900	-	96
South	132,670	410	79	44	3,439	72	-	851	703	432
Saravane	44,452	58	8	44	395	47	-	300	597	264
Sekong	14,252	-	-	-	60	-	-	34	-	25
Chapasack	58,002	178	-	-	1,149	25	-	444	18	72
Attapeu	15,963	175	72	-	1,835	-	-	73	87	72
Lao PDR	643,284	2,474	136	1,901	18,845	2,336	403	52,611	1,891	3,982

Appendix 6.1.2: Households by types of trees planted in the Lao PDR, 2019/20

	Rosewood	Butwood	Agarwood	Teak	Eucalyptus	The stick	Rubber	Bong rubber	Other
Village type									
Urban village	902	-	853	5,954	200	393	15,527	390	1,530
Rural villages have access roads	1,511	136	1,028	12,022	2,136	10	35,741	1,475	2,410
Rural villages do not have access roads	61	-	20	869	-	-	1,343	25	42
Geographic location									
Plain village	726	79	539	8,527	1,332	389	17,967	125	1,413
Plateau village	655	9	300	5,889	269	10	12,676	189	933
Mountain village	1,015	25	927	3,502	534	3	18,102	1,344	1,295
Mixed houses	78	23	135	926	202	-	3,866	233	342
Lao PDR	2,474	136	1,901	18,845	2,336	403	52,611	1,891	3,982

Appendix 6.1.3: Area under planted trees by village type, geographical location and by type of trees planted in 2019/20

Type of village and geographic location	Total tree planting area (000)	Types of trees planted								
		Rosewood	Butwood	Agarwood	Teak	Eucalyptus	The stick	Rubber	Bong rubber	Other
Village type										
Urban village	33,835	125	-	638	4,423	149	-	28,141	33	325
Rural villages have access roads	74,456	435	34	1,309	6,938	2,284	15	62,303	685	453
Rural villages do not have access roads	1,684	9	-	6	250	-	-	1,408	3	7
Geographic location										
Plain village	43,648	243	29	452	5,820	1,239	-	35,718	34	114
Plateau village	27,509	111	-	426	3,867	248	15	22,448	61	333
Mountain village	29,849	199	5	870	1,139	875	-	25,913	591	256
Mixed houses	8,969	17	-	205	785	72	-	7,773	35	82
Lao PDR	109,975	569	34	1,953	11,611	2,433	15	91,852	721	786

Appendix 6.1.4: Production of forest by type of trees planted and province, 2019/20

Province	Total output volume (m3)	Production of trees by types of trees planted								
		Rosewood	Butwood	Agarwood	Teak	Eucalyptus	The stick	Rubber	Bong rubber	Other
North	106,276	106	-	6	44,272	123	-	54,185	12	3,680
Phongsaly	6,427	-	-	-	456	-	-	5,971	-	0
Luangnamtha	41,088	-	-	-	8,438	-	-	25,738	5	3,015
Oudomxay	5,494	-	-	6	2,025	123	-	3,340	-	0
Bokeo	6,958	-	-	-	572	-	-	5,839	7	540
Luangprabang	29,167	-	-	-	19,864	-	-	9,296	-	7
Huaphanh	169	36	-	-	16	-	-	-	-	117
Xayaboury	16,973	70	-	-	12,902	-	-	4,001	-	0
Central	49,399	25	-	141	735	26,279	-	22,078	39	102
Vientiane Capital	10,269	3	-	-	117	9,006	-	1,143	-	0
Xiengkhouang	541	-	-	-	10	384	-	119	-	28
Vientiane Province	8,838	-	-	37	608	-	-	8,194	-	-
Borikhamxay	7,119	-	-	82	-	1,699	-	5,339	-	-
Khammuane	4,322	-	-	-	-	2,228	-	2,017	12	65
Savannakhet	15,444	22	-	-	-	12,963	-	2,423	27	9
Xaysomboun	2,866	-	-	23	-	-	-	2,843	-	-
South	9,736	12	-	-	8,101	43	-	1,318	87	176
Saravane	1,167	-	-	-	805	43	-	62	81	176
Sekong	598	-	-	-	473	-	-	125	-	-
Chapasack	6,243	12	-	-	5,466	-	-	759	6	0
Attapeu	1,730	-	-	-	1,358	-	-	372	-	-
Lao PDR	165,412	143	-	147	53,107	26,445	-	77,581	139	3,957

Appendix 6.1.5: Households engaged in NTFPs by province, village type and geographical location of the village, 2019/20

Province	Total number of households	Village type			Geographical location			
		Town	Rural with roads	Rural with no roads	Plains	Plateau	Mountain	Mixed
North	167,721	23,801	130,678	13,242	17,638	94,955	44,665	10,464
Phongsaly	18,162	3,076	13,945	1,141	-	17,170	991	-
Luangnamtha	17,364	2,698	14,368	298	2,921	12,188	1,971	284
Oudomxay	30,928	2,128	23,513	5,287	344	19,715	8,590	2,280
Bokeo	14,261	1,545	12,129	587	3,538	3,422	4,120	3,181
Luangprabang	30,830	2,215	26,953	1,661	3,233	18,043	8,449	1,105
Huaphanh	26,383	2,229	20,397	3,757	1,546	16,706	4,677	3,454
Xayaboury	29,792	9,909	19,373	510	6,056	7,710	15,866	160
Central	188,163	20,510	160,586	7,066	115,028	31,976	36,340	4,819
Vientiane Capital	2,255	688	1,567	-	2,048	-	75	133
Xiengkhouang	16,767	2,510	13,224	1,032	840	6,663	7,907	1,357
Vientiane Province	29,400	4,633	24,689	77	9,641	3,505	15,757	497
Borikhamxay	19,680	3,846	13,708	2,127	7,965	7,760	2,864	1,091
Khammuane	28,377	1,517	25,257	1,603	22,612	3,091	2,489	185
Savannakhet	86,232	5,337	78,669	2,227	71,905	9,151	4,120	1,057
Xaysomboun	5,451	1,979	3,472	-	18	1,805	3,129	499
South	88,131	12,726	71,999	3,406	53,503	8,312	25,800	517
Saravane	27,175	1,987	23,995	1,193	17,260	2,289	7,627	-
Sekong	11,072	4,157	6,887	29	547	2,438	7,813	274
Chapasack	35,369	3,624	29,560	2,185	24,601	1,206	9,319	243
Attapeu	14,515	2,958	11,557	-	11,095	2,379	1,041	-
Lao PDR	444,015	57,038	363,262	23,715	186,169	135,242	106,805	15,800

Appendix 6.1.6: Production of major non-timber goods by source ownership, 2019/20

Province	Total yield (000 kg)	Collected from own farm (000 kg)	Collected from own farm (%)	Collected from elsewhere (000 kg)	Collected from elsewhere (%)
Firewood	2,808,931	405,382	14%	2,403,550	86
Bamboo	4,682	583	12%	4,099	88
Rattan	1,448	72	5%	1,375	95
Deposit	519	401	77%	118	23
Reservation	1,814	17	1%	1,796	99
Categories and so on	121	28	23%	93	77
Broom	7,232	1,515	21%	5,717	79
Type of deposit	1,268	101	8%	1,167	92
Vine type	345	41	12%	304	88
Root type	107	27	26%	80	74
Head type	1,039	95	9%	944	91
Leaf type	2,712	154	6%	2,558	94
Bark type	635	27	4%	609	96
Type of lump	19,781	735	4%	19,046	96
Seeds or seeds	355	9	3%	346	97
Type of oil	601	16	3%	585	97
Mushrooms	3,075	60	2%	3,015	98
Wild vegetables	2,639	65	2%	2,575	98
Honey	48	1	3%	47	97
Medicinal plants	53	0	1%	53	99
Rubber type (wax, wit)	103	5	4%	99	96
Other	1,077	9	1%	1,068	99
Lao PDR	2,858,585	409,343	14%	2,449,242	86

Chapter 7: Use of Machinery and Equipment

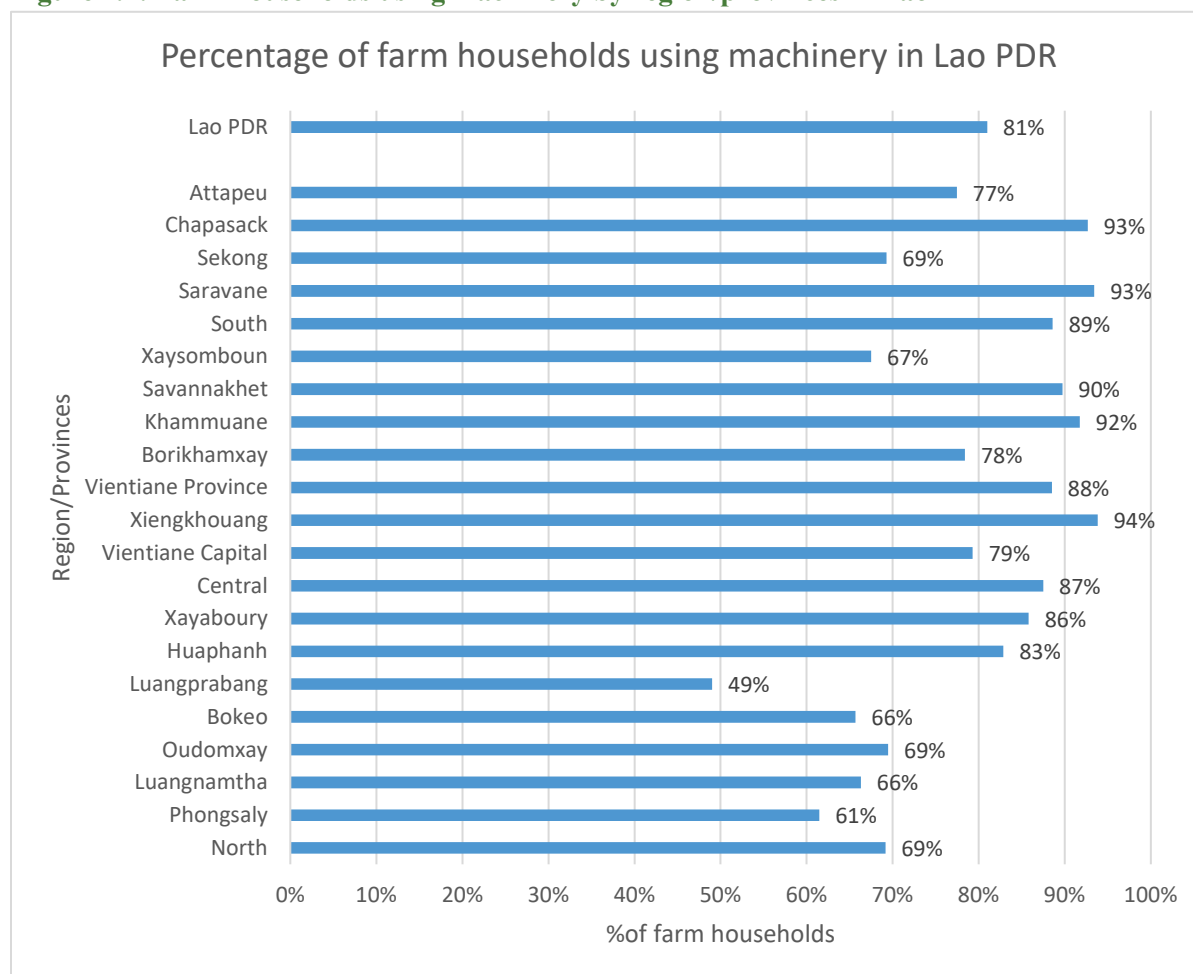
With the growing population, there is a greater demand for agricultural products. Designating appropriate machines and tools to the agricultural production chain is vital to increasing outputs in a sustainable way. Carefully chosen machinery can allow crops to be grown and harvested with minimum-to-no soil disturbance, ensure that the soil surface remains protected by organic cover, manage crop rotations to enhance soil health and conserve crop nutrients (FAO 2016). The type and size of machinery that are available to farmers is also crucial. Use of machinery and tools saves the time and cost to the farmers and helps to achieve the national goal of agriculture commercialization in Lao PDR.

This chapter will take account and discuss special variations across provinces on the issues like number of agricultural households reporting use of ‘machinery and equipment’ during 2019/20 by village types and their geographical location, types of machinery and equipment and their use by farm households in different geographical locations in Lao PDR.

7.1 Households using Machinery by Provinces in Lao PDR

Almost 81% of the total farm households in Lao PDR are using one or another type of machinery in 2019/20. South region has the highest proportion of use followed by central and lowest in the north. Among the 18 provinces of Lao PDR the highest level of mechanization has been observed in Xiengkhouang, followed by Saravane, Chapasack and Khammuane. The lowest level of machinazatio has been observed in the provinces like Luangprabang followed by Phongsaly, Luangnamtha, Bokeo and Sekong.

Figure 7.1: Farm households using machinery by region/provinces in Lao PDR



Southern region of Lao PDR has the highest label of mechanization followed by central and lowest in the Northern provinces.

7.2 Main Machineries used in Lao PDR

There are about 391 thousand two-wheel tractors in Lao PDR in 2019/20 being used by farm households. Lawn mower, rice threshing machine and rice mills are more than 100 thousand as shown in Table 7.2a. There are about 55 thousand trucks being used by farm households of different provinces in Lao PDR in 2019/20. There are more than 10 thousand weed mowers, harvesting machines, injection molding machine and sync cars. Just a little more than 3000 mill grinders, seed planting machines and tillage machines being used by farmers. Very few farmers are using egg sorting machine, milking machine, egg incubator, spreaders, rice dryer, straw compressor and generators.

Table 7.1: Main machineries and equipment used by farm households in 2019/20

Main machinery and Equipment	Number of households using
Egg Sorting Machine	14
Wood deposits	23
Milking machine	46
Egg incubator	197
Spreaders	500
Rice dryer	584
Straw compressor	809
Generator	983
Mill / wood grinder	3,101
Planting or dropping seeds	3,310
Tillage machines	4,656
Weed mowers	13,104
Harvesting machine	24,248
Injection molding machine	31,455
Sync car	37,047
Pumps / water pumps	52,155
Trucks	54,932
4-wheel tractor	72,111
Rice miller / plant	119,429
Rice threshing machine	158,456
Lawn mower	192,962
2 wheel tractor	390,938
<i>Lao PDR</i>	<i>1,161,061</i>

Source: LAC 2019/20

Figure 7.2: Farm households using machinery and equipment by type of village

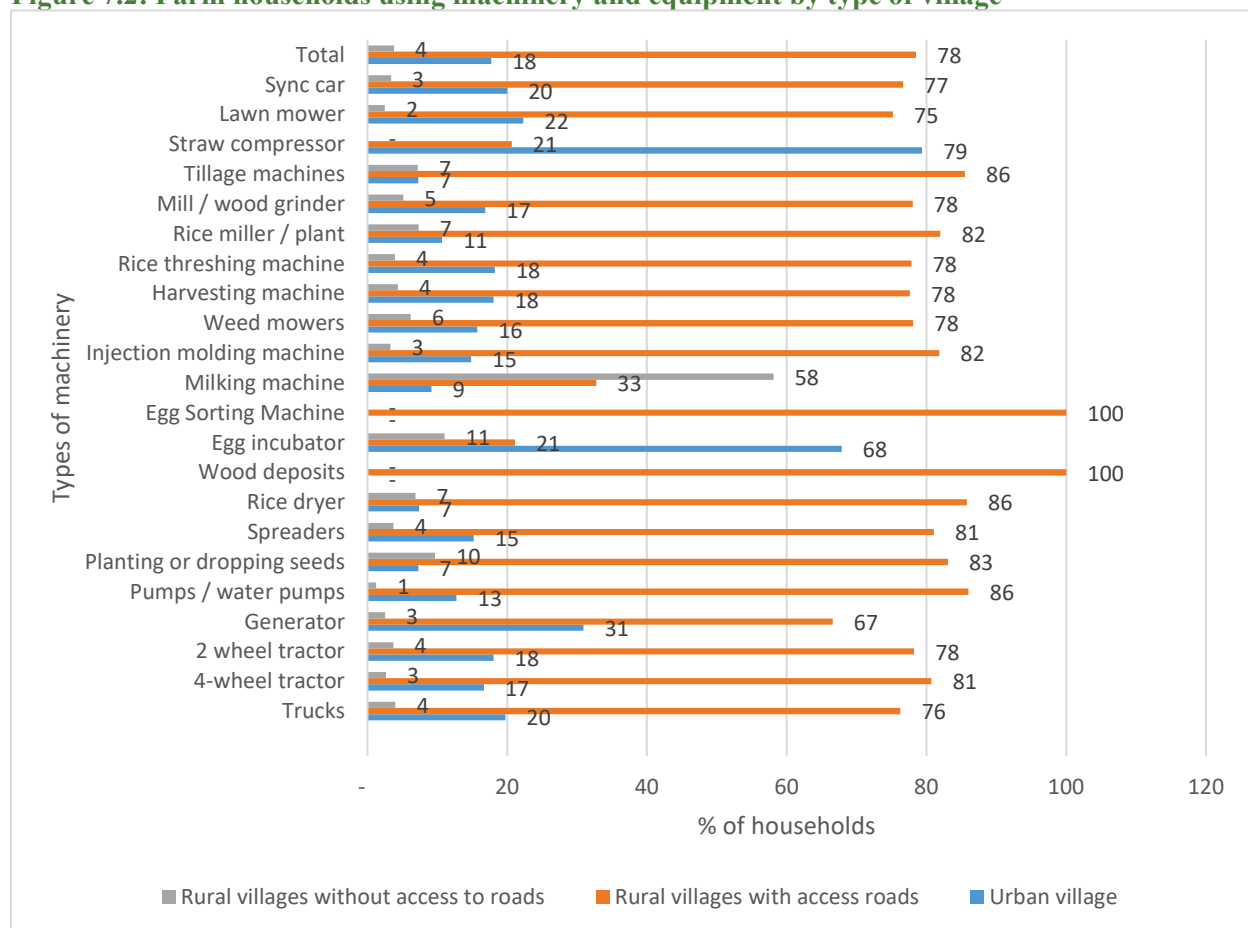


Figure 7.2 presents the percentage of farm households by type of villages and types of machinery. Rural villages with access to roads have the highest proportion of machinery use followed by urban villages and rural villages without access to roads. All types of the machinery except straw compressor and egg incubator are common in rural villages without access to roads, whereas milking machines are very common in rural villages without access to roads. The details of machinery use by farm households in different village types and geographical locations of Lao pDR are presented in Annex table 7.1.2.

7.3 Conclusion

Wise use of machinery and equipment in the agricultural sector increases the productivity in a sustainable way. It also saves time and incur relatively low cost in the production process. In the Lao PDR majority of farm households (81%) reported that they use some kind of machinery and tools in agricultural activities as informed by the LAC 2019/20. However, mechanization in agricultural activities is not uniform across the country. Some provinces have relatively higher level of mechanization while some provinces have relatively the lower level of mechanization as reported by the LAC 2019/20. Looking at this scenario, use of machinery could be further expanded to the remaining 20% households for better productivity in the agricultural sector.

Table 7.1.1: Farm households using machinery and equipment by province, Lao PDR, 2019/20

Province	Number of farm households	Number of households using machinery and equipment
North	236,710	169,206
Phongsaly	20,647	12,746
Luangnamtha	24,066	15,961
Oudomxay	39,113	27,687
Bokeo	18,962	12,606
Luangprabang	50,539	27,773
Huaphanh	30,836	25,565
Xayaboury	52,545	46,867
Central	274,392	240,503
Vientiane Capital	20,361	16,144
Xiengkhouang	24,299	22,976
Vientiane Province	41,470	36,739
Borikhamxay	29,961	23,520
Khammuane	38,854	35,647
Savannakhet	110,925	99,549
Xaysomboun	8,523	5,928
South	132,996	117,850
Saravane	44,452	41,532
Sekong	14,266	9,898
Chapasack	58,306	54,030
Attapeu	15,972	12,389
Lao PDR	644,098	527,559

Table 7.1.2: Farm households using machinery and equipment by type of village by geographical location, FY 2019/20

List of machinery used in agriculture	Total number of households used	Village type			Geographical location			Mixed village
		Urban village	Rural villages have access roads	Rural villages do not have access roads	Plain village	Plateau village	Mountain village	
Trucks	54,932	10,836	41,898	2,199	15,851	22,910	13,936	2,235
4-wheel tractor	72,111	12,006	58,195	1,910	34,504	25,793	9,293	2,521
2 wheel tractor	390,938	70,572	305,859	14,508	228,536	93,213	55,523	13,666
Generator	983	304	654	25	517	184	278	3
Pumps / water pumps	52,155	6,648	44,864	643	40,770	8,488	1,601	1,295
Planting or dropping seeds	3,310	241	2,749	320	1,204	1,241	488	377
Spreaders	500	76	406	19	136	364	-	-
Rice dryer	584	43	501	40	326	88	158	12
Wood deposits	23	-	23	-	21	2	-	-
Egg incubator	197	134	42	22	130	57	10	-
Egg Sorting	14	-	14	-	-	14	-	-
Milking	46	4	15	27	38	-	8	-
Injection molding	31,455	4,670	25,742	1,043	7,169	12,742	10,400	1,144
Weed mowers	13,104	2,057	10,234	813	3,046	4,217	5,187	654
Harvesting	24,248	4,372	18,824	1,052	12,132	5,824	5,272	1,021
Rice threshing	158,456	28,869	123,359	6,228	86,405	42,727	24,610	4,714
Rice miller / plant	119,429	12,762	97,924	8,743	35,309	33,631	45,157	5,331
Mill / wood grinder	3,101	523	2,420	159	1,165	1,187	750	-
Tillage machines	4,656	339	3,982	335	964	2,481	802	408
Straw compressor	809	642	167	-	160	622	26	-
Lawn mower	192,962	43,035	145,130	4,797	67,653	77,864	37,770	9,675
Fast tractor car	37,047	7,407	28,393	1,247	4,672	16,720	14,459	1,197
Lao PDR	1,161,061	205,539	911,394	44,127	540,711	350,370	225,728	44,252

Table 7.1.3: Farm households using machinery and equipment by source of machinery by sex, household type, Lao PDR, 2019/20

List of machinery used in agriculture	Total no of HH using machinery and equipment	No of HH with male head of HH is male	Male				No of HH where the head of HH is female	Female			
			own	Joint ownership	Of others	Other		own	Joint ownership	Of others	Other
Trucks	54,932	7,591	6,712	304	4,160	71	8,480	6,949	190	5,416	72
4-wheel tractor	72,111	12,324	10,218	266	7,141	239	12,277	10,318	311	7,353	206
2 wheel tractor	390,938	61,619	51,286	2,567	27,163	634	63,854	54,100	2,484	28,173	536
Generator	983	233	233	-	95	-	137	137	-	11	-
Pumps / water pumps	52,155	7,122	6,606	297	2,903	403	6,904	6,575	285	2,684	252
Planting or dropping seeds	3,310	480	480	-	215	-	378	297	-	249	-
Spreaders	500	103	103	-	103	-	90	90	-	81	-
Rice dryer	584	82	70	-	61	-	115	115	-	89	-
Wood deposits	23	-	-	-	-	-	21	21	-	21	-
Egg incubator	197	4	4	-	-	-	21	21	-	-	-
Egg Sorting Machine	14	14	14	-	14	-	14	14	-	14	-
Milking machine	46	4	-	4	-	-	15	7	-	7	-
Injection molding machine	31,455	4,734	4,575	195	2,421	109	5,353	4,961	294	3,043	18
Weed mowers	13,104	2,222	2,222	6	804	19	2,340	2,298	5	1,014	-
Harvesting machine	24,248	3,728	3,494	27	2,171	191	3,654	3,441	77	2,108	62

Rice threshing machine	158,456	24,866	20,304	999	21,524	443	26,230	22,031	1,134	22,036	270
Rice miller / plant	119,429	16,116	13,136	849	11,766	300	19,336	15,577	1,036	13,478	241
Mill / wood grinder	3,101	593	584	-	246	-	572	561	10	244	34
Tillage machines	4,656	617	580	-	506	8	824	768	-	608	25
Straw compressor	809	5	5	-	5	-	292	292	-	239	-
Lawn mower	192,962	32,536	31,491	1,370	11,476	299	35,060	33,942	1,493	12,515	338
Fast tractor car	37,047	5,536	4,187	145	4,093	27	6,079	4,489	101	4,527	10
Lao PDR	1,161,061	180,529	156,303	7,028	96,868	2,744	192,047	167,003	7,421	103,913	2,065

Table 7.1.4: Farm households using main machinery and equipment by province, Lao PDR, 2019/20

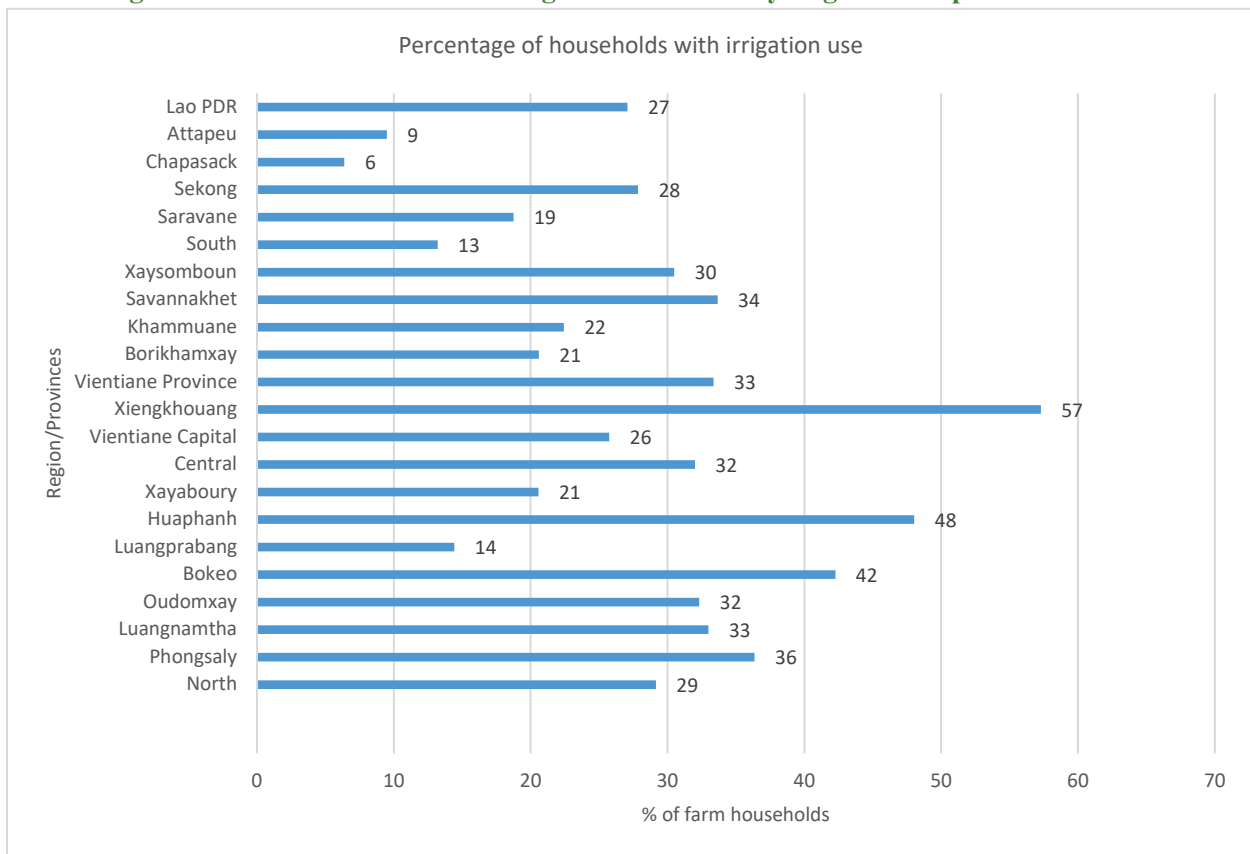
Province	Trucks	4-wheel tractor	2 wheel tractor	Planting or dropping seeds	Harvesting machine	Rice threshing machine	Rice miller / plant	Fast tractor car
North	21,855	19,273	96,806	2,208	6,348	47,772	56,587	27,776
Phongsaly	839	1,681	6,449	47	885	4,733	3,829	140
Luangnamtha	5,343	1,257	9,576	-	104	3,214	2,818	38
Oudomxay	6,306	2,227	15,699	-	51	4,775	10,728	2,570
Bokeo	398	1,050	10,218	-	87	2,362	2,687	239
Luangprabang	3,144	1,713	7,953	60	444	3,131	9,311	8,594
Huaphanh	1,458	1,284	15,918	1,258	2,963	11,578	16,543	330
Xayaboury	4,368	10,060	30,993	844	1,815	17,979	10,671	15,865
Central	16,357	35,237	203,284	1,095	13,347	80,926	47,604	8,718
Vientiane Capital	1,222	5,081	10,783	51	1,181	2,827	123	190
Xiengkhouang	7,574	4,222	15,642	-	2,070	14,523	16,373	4,554
Vientiane Province	1,908	5,315	30,395	30	4,079	14,833	5,028	3,054
Borikhamxay	1,238	6,682	16,092	17	1,416	1,945	2,834	263
Khammuane	587	4,420	33,557	156	1,836	5,129	8,798	-
Savannakhet	3,116	9,405	92,507	840	2,763	41,432	13,979	62
Xaysomboun	712	112	4,308	-	3	237	469	596
South	16,719	17,601	90,848	7	4,553	29,758	15,237	553
Saravane	4,737	4,915	35,415	7	234	14,860	7,623	24
Sekong	347	974	8,421	-	13	767	832	33
Chapasack	11,389	9,663	36,807	-	1,971	6,046	1,865	214
Attapeu	247	2,050	10,205	-	2,335	8,084	4,917	283
Lao PDR	54,932	72,111	390,938	3,310	24,248	158,456	119,429	37,047

Chapter 8: Irrigation

Irrigation refers to purposely providing land with water, other than rain, for improving pastures or crop production. Irrigation usually implies the existence of infrastructure and equipment for applying water to crops, such as irrigation canals, pumps, sprinklers or localized watering systems. However, it also includes manual watering of plants using buckets, watering cans or other devices. Uncontrolled land flooding by overflowing of rivers or streams is not considered irrigation. Irrigation includes any process through which water is moved from a water source to apply to an agricultural crop. Water for irrigation may come from various sources, including rivers, dams or wells (WCA 2020, FAO). In brief, irrigation is the process of applying water to the crops artificially to fulfil their water requirements. It includes fully controlled irrigation and partially controlled irrigation. “Fully controlled” irrigation refers to surface, sprinkler and localized irrigation methods. “Partially controlled” irrigation refers to controlling flood waters to water crops (spate irrigation) or to equipped lowlands (including water control methods in wetland areas and inland valley bottoms, and flood recession cultivation) (WCA, 2020). This chapter discusses on the irrigation facilities available to the farm households in Lao PDR for their agriculture land in 2019/20 for cultivation of different crops.

8.1 Households with Controlled Irrigation

Figure: 8.1: Households with irrigation facilities by region and provinces in Lao PDR.



Source: LAC 2019/20

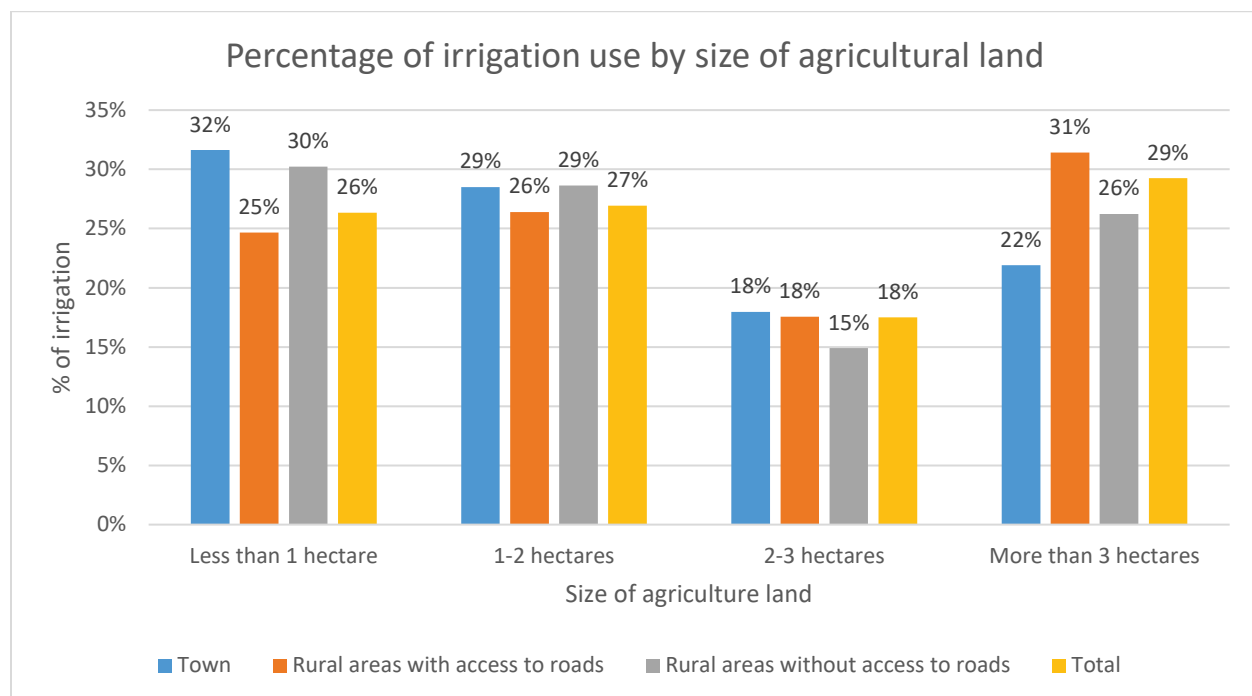
Among the total farm households in Lao PDR, just above one quarter of these households have irrigation facilities over the years in 2019/20. Among the regions, Central region has the highest proportion of farm households having irrigation facilities followed by north and only about 13% of the farm households have regular irrigation facilities in South region.

The Xiengkhouang province has the highest proportion of irrigation land followed by Huaphanh and Bokeo. The lowest proportion of irrigation facility has been observed in the Chapasack province, where only about 6% of land has irrigation facility followed by Attapeu and Luangprabang.

8.2 Households with Controlled Irrigation use by Geographical Location and Village Type

The irrigation facilities are almost homogenously distributed among the different regions of Lao PDR but heterogeneity has been observed in the households with their land size. Lowest proportion of irrigation has been observed in the area between 2-3 hectares and highest proportion of irrigation has been observed in the land areas less than 1 hectare as well as more than 3 hectares. The difference among town, rural villages with access to road and without access to roads has a smaller variation in the irrigation facilities.

Figure 8.2: Irrigation use in percentage by size of land in urban/rural areas of Lao PDR in 2019/20



Irrigation facilities by different village types (plain, plateau, mountain and mixed) in Lao PDR are presented in Figure 8.2. Among the small holders having less than 1 hectare of land mixed

villages has the highest proportion of irrigation facilities followed by plateau, plain and mountain villages. The farm households having 1-2 hectare of land and 2-3 hectares of land have almost similar irrigation facility in all types of the villages while among the farmers having more than 3 hectares of land, mountain villages have the highest proportion of irrigation facility followed by plateau, plain and mixed villages.

Figure 8.3: Percentage of irrigation by size of agriculture land according to village types in Lao PDR in 2019/20

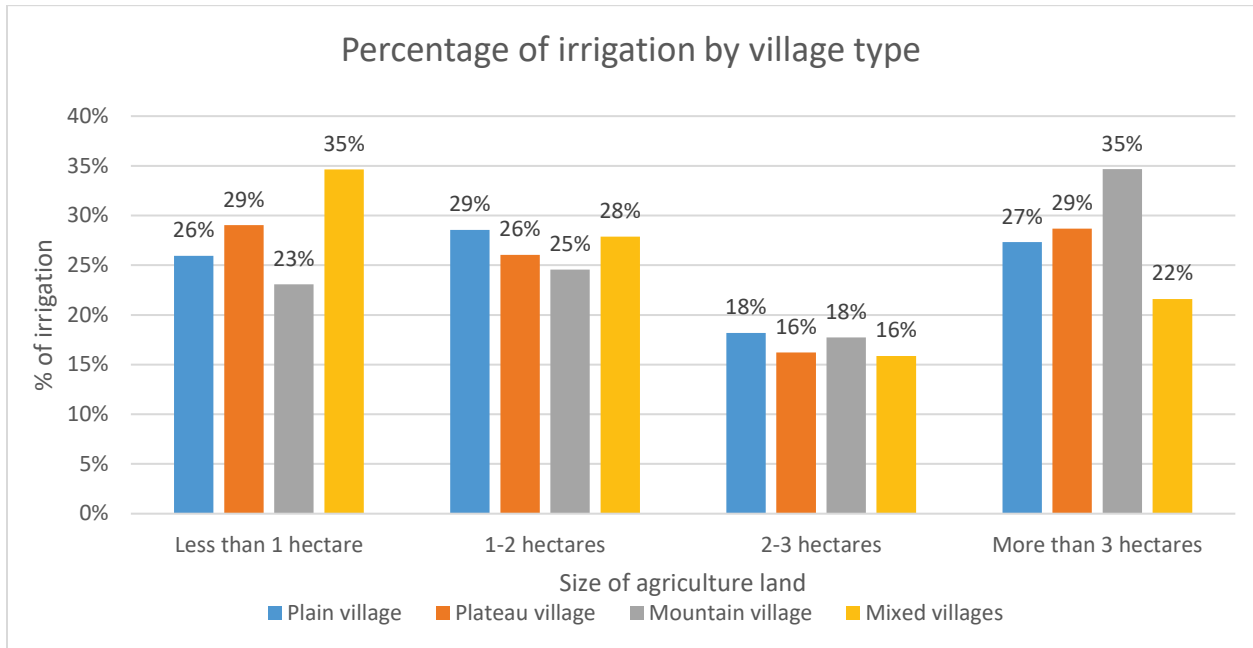


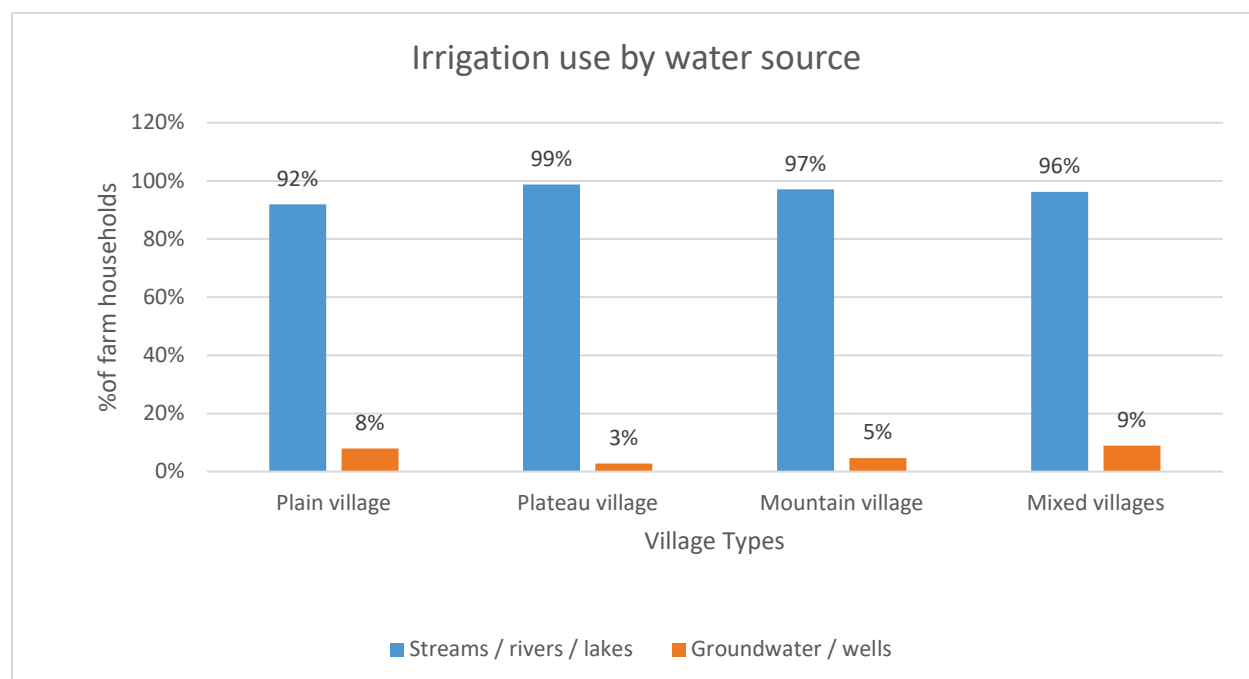
Table 8.1: Area of irrigation by size of agriculture land in Lao PDR in 2019/20

Province	Number of households using irrigation	Area of irrigation use by size of agricultural land tenure			
		Less than 1 hectare	1-2 hectares	2-3 hectares	More than 3 hectares
<i>Village type</i>	174,349	45,896	46,943	30,526	50,985
Town	35,295	11,161	10,063	6,337	7,734
Rural areas with access to roads	130,934	32,280	34,554	22,979	41,121
Rural areas without access to roads	8,121	2,455	2,325	1,210	2,130
<i>Geographical location</i>					
Plain village	81,569	21,172	23,286	14,825	22,286
Plateau village	38,310	11,120	9,982	6,215	10,993
Mountain village	45,489	10,491	11,171	8,061	15,766
Mixed village	8,981	3,112	2,504	1,425	1,940

Source: LAC 2019/20

8.3 Source of Irrigation by Village Types and Geographical Location

Figure 8.4: Irrigation use by source of water in different village types of Lao PDR in 2019/20



The source of irrigation in Lao PDR is dominated by streams, lakes and rivers which are used by more than 95% of the farm households in Lao PDR. Few farm households are found using groundwater, wells and others as a source of irrigation for their farms. The Figure 8.4 and Annex Table 8.1.4 presents the data in detail.

Figure 8.5: Irrigation types by source of water according to village types in Lao PDR

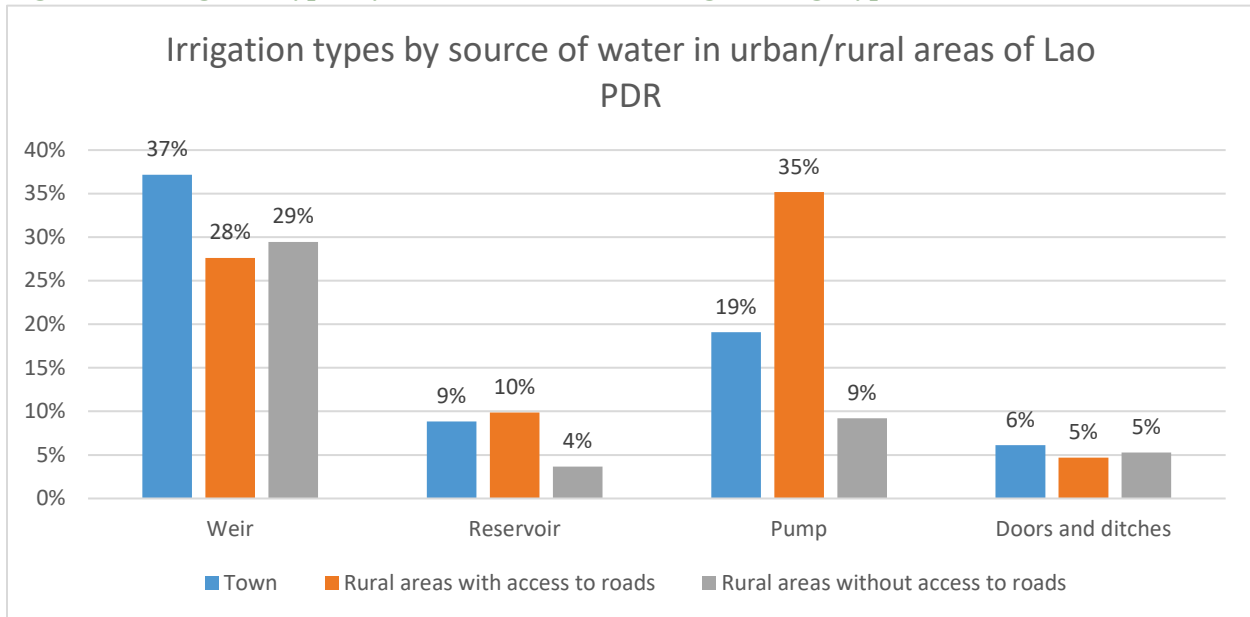
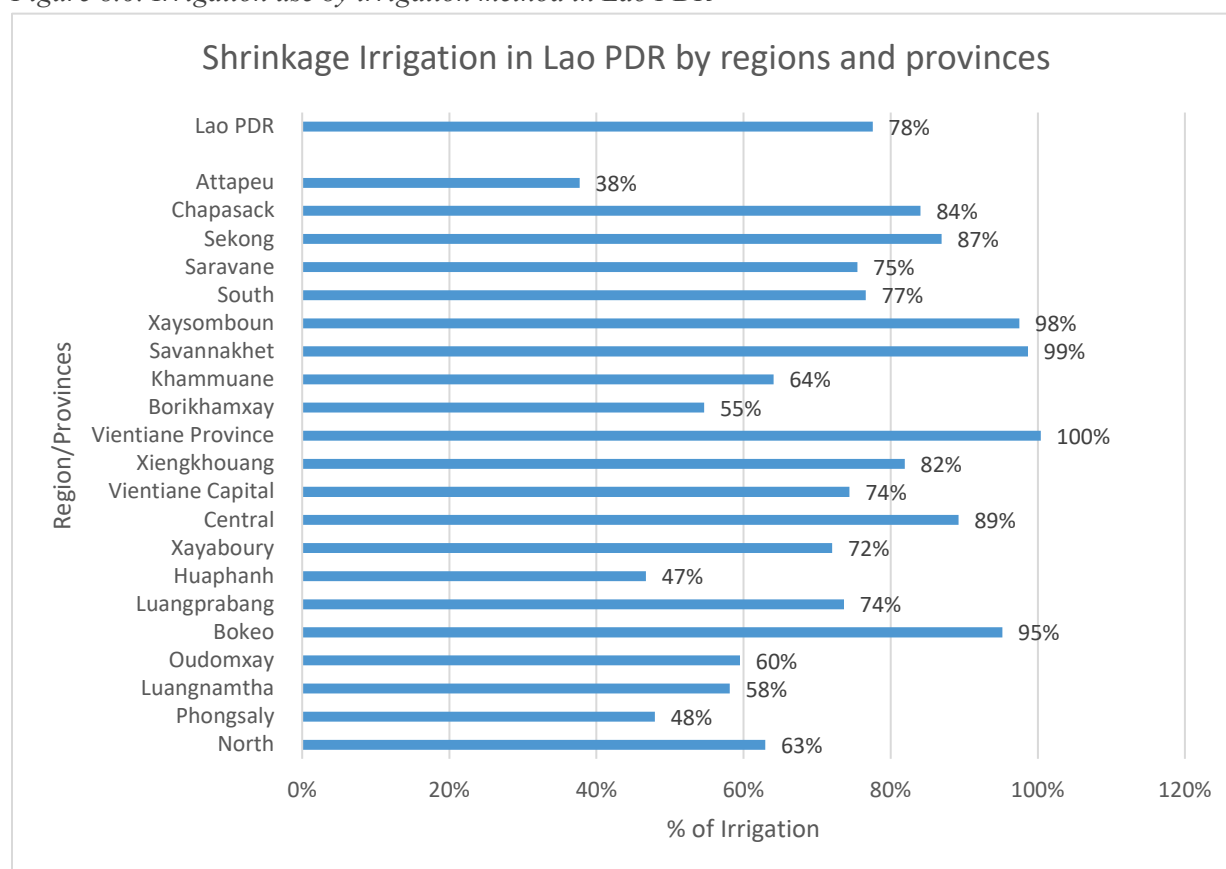


Figure 8.5 presents the source of irrigation by type of villages in Lao PDR in 2019/20. Weirs are the most common source of irrigation in all areas of Lao PDR and dominated by urban villages. Both type of rural villages with access to roads and without access to roads are also using weirs as their main source of water for irrigating their crops. Pumps are more common in rural areas with access to roads followed by urban areas and other rural areas. Reservoirs and doors and ditches are less common compared to other irrigation types in Lao PDR in 2019/20. The details are presented in Annex Table 8.1.5.

8.4 Mode of Irrigation

Figure 8.6: Irrigation use by irrigation method in Lao PDR



Majority of farm households who have the access to irrigation are using shrinkage method as a main method of irrigation (78% of farm households) and very few of these farm households use drop irrigation in Lao PDR. Vientiane province has the highest proportion of 100 followed by Savankhet and Xaysomboun. The lowest proportion of farmers use shrinkage mode in Attapeu province followed by Huaphanh and Phongsaly. The details of mode of irrigation are presented in Annex Table 8.1.6.

8.5 Conclusion

Irrigation is one of the most important inputs in crop cultivation. As rice is the major crop in the Lao PDR, irrigation should be prioritized especially for the dry season cultivation. However, irrigation is not limited to rice and dry season only, it is equally important for other crops and seasons as well. Nevertheless, irrigation service is limited to only 27% of farm households as of 2019/20. Moreover, using this service is not uniform across the country as it ranged from 6% households (Chapasack) to 57% of farm households (Xiengkhouang) with the irrigation service. River, stream and lakes are the major sources of irrigation while only a few farm households use underground water as source of irrigation. Majority of farm households use weir and pump for irrigation service and relatively lesser households use reservoirs, doors and ditches as reported by the LAC 2019/20. It is thus be concluded that expansion of irrigation service across the country would boost up crop production in the Lao PDR.

Table 8.1.1: Households with area of irrigation use by village type and geographical location, FY 2019/20

Province	Number of farm HH	Number of HH using irrigation	%of HH with irrigation use	Village type			Geographical location			
				Urban village	Rural villages with access to roads	Rural villages without access to roads	Plain village	Plateau village	Mountain village	Mixed villages
North	236,710	69,007	29	17,945	46,026	5,036	14,004	28,871	19,284	6,847
Phongsaly	20,647	7,508	36	1,506	5,715	286	-	6,737	771	-
Luangnamtha	24,066	7,939	33	4,123	3,786	30	3,916	3,120	725	178
Oudomxay	39,113	12,640	32	1,812	8,583	2,245	194	6,146	4,899	1,400
Bokeo	18,962	8,015	42	1,432	6,401	181	2,021	1,164	2,461	2,368
Luangprabang	50,539	7,284	14	1,646	5,386	251	2,439	1,988	2,537	320
Huaphanh	30,836	14,813	48	2,201	10,703	1,909	581	7,758	3,906	2,568
Xayaboury	52,545	10,807	21	5,223	5,451	133	4,852	1,959	3,984	12
Central	274,392	87,830	32	13,478	72,247	2,105	55,683	8,769	21,385	1,993
Vientiane Capital	20,361	5,241	26	993	4,248	-	5,209	-	17	15
Xiengkhouang	24,299	13,919	57	3,559	10,258	103	1,506	2,891	8,206	1,316
Vientiane Province	41,470	13,841	33	2,083	11,758	-	3,843	606	9,146	247
Borikhamxay	29,961	6,173	21	656	4,343	1,173	1,416	3,378	1,343	36
Khammuane	38,854	8,712	22	1,490	6,483	738	7,697	733	282	-
Savannakhet	110,925	37,346	34	3,585	33,669	91	36,003	577	587	179

Xaysomboun	8,523	2,599	30	1,111	1,488	-	9	586	1,805	199
South	132,996	17,549	13	3,872	12,698	979	11,919	669	4,821	141
Saravane	44,452	8,338	19	1,167	6,764	407	7,168	20	1,150	-
Sekong	14,266	3,973	28	1,473	2,500	-	393	276	3,163	141
Chapasack	58,306	3,724	6	561	2,591	572	3,323	-	401	-
Attapeu	15,972	1,515	9	671	843	-	1,034	374	107	-
Lao PDR	644,098	174,386	27	35,295	130,971	8,121	81,606	38,310	45,489	8,981

Table 8.1.2: Households with controlled irrigation use by size of their land in different village and geographical location, FY 2019/20

Province	Number of households using irrigation	Percentage of irrigation use by size of agricultural land tenure			
		Less than 1 ha	1-2 ha	2-3 ha	More than 3 ha
Village type	174,386	26.3	26.9	17.5	29.2
Town	35,295	31.6	28.5	18.0	21.9
Rural areas with access to roads	130,971	24.6	26.4	17.5	31.4
Rural areas without access to roads	8,121	30.2	28.6	14.9	26.2
Geographical location	174,386	26.3	26.9	17.5	29.2
Plain village	81,606	25.9	28.5	18.2	27.3
Plateau village	38,310	29.0	26.1	16.2	28.7
Mountain village	45,489	23.1	24.6	17.7	34.7
Mixed villages	8,981	34.7	27.9	15.9	21.6
North	69,007	30.2	26.8	17.0	26.1
Phongsaly	7,508	35.4	30.3	18.2	16.1
Luangnamtha	7,939	21.3	30.9	22.8	24.9
Oudomxay	12,640	18.4	24.4	18.7	38.5
Bokeo	8,015	25.3	30.3	17.3	27.1
Luangprabang	7,284	23.2	25.5	17.4	34.0
Huaphanh	14,813	57.8	28.9	7.8	5.5
Xayaboury	10,807	17.4	19.6	21.6	41.4
Central	87,830	24.6	26.9	17.3	31.1
Vientiane Capital	5,241	48.3	31.5	8.8	11.4
Xiengkhouang	13,919	26.1	32.5	17.4	24.0
Vientiane Province	13,841	21.8	18.0	15.4	44.9
Borikhamxay	6,173	25.6	27.6	22.3	24.5
Khammuane	8,712	36.7	32.4	16.0	14.5
Savannakhet	37,346	20.1	26.9	19.1	33.9
Xaysomboun	2,599	6.4	15.9	10.7	67.1

South	<i>17,549</i>	<i>19.6</i>	<i>27.3</i>	<i>20.8</i>	<i>32.4</i>
Saravane	8,338	15.7	23.9	20.9	39.5
Sekong	3,973	22.3	29.8	23.6	24.3
Chapasack	3,724	28.5	29.0	17.3	25.1
Attapeu	1,515	11.9	35.2	20.9	32.0
Lao PDR	<i>174,386</i>	<i>26.3</i>	<i>26.9</i>	<i>17.5</i>	<i>29.2</i>

Table 8.1.3: Households with controlled irrigation use by village and geographical location, FY 2019/20

Province	Number of HH using irrigation	Percentage of systematically controlled irrigation use					Percentage of uncontrolled irrigation use				
		Total	Less than 1 ha	1-2 ha	2-3 ha	More than 3 ha	Total	Less than 1 ha	1-2 ha	2-3 ha	More than 3 ha
Village type	174,386	42	30	28	17%	25	58	23	26	18	32
Town	35,295	52	36	29	18%	17	48	27	28	18	27
Rural areas with access to roads	130,971	40	29	28	16%	27	60	22	26	18	34
Rural areas without access to roads	8,121	39	22	29	19%	30	61	35	28	12	24
Geographical location	174,386	42	30	28	17%	25	58	23	26	18	32
Plain village	81,606	47	31	30	17%	22	53	21	28	19	32
Plateau village	38,310	36	30	26	15%	29	64	28	26	17	29
Mountain village	45,489	38	25	25	18%	31	62	22	24	17	37
Mixed villages	8,981	50	41	30	15%	14	50	28	26	17	29
Region/Provinces											
North	69,007	49	35	27	17%	22	51	26	27	17	30
Phongsaly	7,508	34	33	35	14%	18	66	36	28	20	15
Luangnamtha	7,939	50	32	33	18%	18	50	11	29	28	32
Oudomxay	12,640	53	20	23	18%	39	47	17	26	20	38
Bokeo	8,015	39	34	31	15%	20	61	20	30	19	32
Luangprabang	7,284	36	35	22	19%	24	64	17	28	16	39
Huaphanh	14,813	61	54	30	9%	6	39	63	26	5	5
Xayaboury	10,807	52	24	16	29%	31	48	11	24	14	52
Central	87,830	32	29	30	16%	25	22	23	25	18	34
Vientiane Capital	5,241	76	46	32	10%	12	24	57	29	4	10
Xiengkhouang	13,919	26	20	37	13%	30	74	28	31	19	22
Vientiane Province	13,841	29	27	18	15%	40	71	20	18	16	47
Borikhamxay	6,173	49	16	30	27%	27	51	34	26	18	22
Khammuane	8,712	66	35	34	17%	14	33	41	30	14	15
Savannakhet	37,346	20	25	30	16%	28	80	19	26	20	35
Xaysomboun	2,599	3	44	5	0%	51	97	5	16	11	68

South	17,549	69	21	26	18%	34	31	16	29	27	28
Saravane	8,338	92	16	24	20%	41	8	15	24	37	24
Sekong	3,973	30	37	30	12%	21	70	16	30	28	26
Chapasack	3,724	70	33	28	16%	24	30	19	32	20	28
Attapeu	1,515	45	12	44	20%	24	55	12	28	22	39
Lao PDR	174,386	42	30	28	17%	25	58	23	26	18	32

Table 8.1.4: Percentage of households with irrigation use by source of water source, FY 2019/20

Province	Number of households using irrigation	Sources of water used for irrigation water	
		Streams / rivers / lakes	Groundwater / wells
Village type	174,386	95	6
Town	35,295	95	5
Rural areas with access to roads	130,971	95	7
Rural areas without access to roads	8,121	98	2
Geographical location	174,386	95	6
Plain village	81,606	92	8
Plateau village	38,310	99	3
Mountain village	45,489	97	5
Mixed villages	8,981	96	9
Region/Provinces			
North	69,007	99	2
Phongsaly	7,508	99	4
Luangnamtha	7,939	99	4
Oudomxay	12,640	100	1
Bokeo	8,015	95	13
Luangprabang	7,284	100	0
Huaphanh	14,813	100	0
Xayaboury	10,807	98	1
Central	87,830	94	7
Vientiane Capital	5,241	81	12
Xiengkhouang	13,919	99	4
Vientiane Province	13,841	97	2
Borikhamxay	6,173	97	14
Khammuane	8,712	97	3

Savannakhet	37,346	92	9
Xaysomboun	2,599	98	0
South	17,549	84	16
Saravane	8,338	85	11
Sekong	3,973	97	3
Chapasack	3,724	79	30
Attapeu	1,515	62	38
Lao PDR	174,386	9	6

Table 8.1.5: Percentage of households with irrigation use by type of irrigation, FY 2019/20

Province	Number of households using irrigation	Irrigation type (%)						
		Weir	Reservoir	Pump	Doors and ditches	Primary weir	Quay weir	Other
Village type	174,386	30	9	31	5	33	4	10
Town	35,295	37	9	19	6	32	4	10
Rural areas with access to roads	130,971	28	10	35	5	33	3	9
Rural areas without access to roads	8,121	29	4	9	5	42	5	20
Geographical location	174,386	30	9	31	5	33	4	10
Plain village	81,606	17	11	60	4	14	1	11
Plateau village	38,310	38	4	4	5	55	6	12
Mountain village	45,489	40	11	5	5	47	6	6
Mixed villages	8,981	51	14	11	12	47	3	3
Region/Provinces								
North	69,007	49	6	3	6	46	5	6
Phongsaly	7,508	28	4	0	1	67	5	9
Luangnamtha	7,939	50	3	6	2	44	4	11
Oudomxay	12,640	54	0	2	9	40	4	11
Bokeo	8,015	43	16	13	5	70	1	1
Luangprabang	7,284	40	1	3	8	45	8	9
Huaphanh	14,813	56	3	1	7	40	10	4
Xayaboury	10,807	59	17	1	5	30	1	1
Central	87,830	15	12	49	4	28	2	12
Vientiane Capital	5,241	3	12	77	8	1	0	4
Xiengkhouang	13,919	30	3	2	3	63	9	12
Vientiane Province	13,841	24	12	9	6	57	3	1
Borikhamxay	6,173	28	28	34	8	25	1	23
Khammuane	8,712	2	10	73	3	5	0	8
Savannakhet	37,346	5	15	78	3	11	0	16
Xaysomboun	2,599	54	0	0	10	68	7	0

South	<i>17,549</i>	<i>27</i>	<i>8</i>	<i>47</i>	<i>6</i>	<i>9</i>	<i>4</i>	<i>14</i>
Saravane	8,338	25	3	63	3	6	0	12
Sekong	3,973	51	11	2	1	21	15	2
Chapasack	3,724	14	9	63	13	3	0	21
Attapeu	1,515	5	26	39	22	7	0	32
Lao PDR	<i>174,386</i>	<i>30</i>	<i>9</i>	<i>31</i>	<i>5</i>	<i>33</i>	<i>4</i>	<i>10</i>

Table 8.1.6: Percentage of households with irrigation use by irrigation method, FY 2019/20

Province	Number of households using irrigation	Irrigation mode (%)		
		Shrinkage	Shrinkage	Drops
<i>Village type</i>	174,386	78	1	0
Town	35,295	70	2	0
Rural areas with access to roads	130,971	81	1	0
Rural areas without access to roads	8,121	53	2	0
<i>Geographical location</i>	174,386	78	1	0
Plain village	81,606	86	2	0
Plateau village	38,310	57	1	0
Mountain village	45,489	83	1	0
Mixed villages	8,981	66	1	0
North	69,007	63	1	0
Phongsaly	7,508	48	0	0
Luangnamtha	7,939	58	2	0
Oudomxay	12,640	60	1	1
Bokeo	8,015	95	0	0
Luangprabang	7,284	74	2	0
Huaphanh	14,813	47	1	0
Xayaboury	10,807	72	0	0
Central	87,830	89	2	0
Vientiane Capital	5,241	74	5	0
Xiengkhouang	13,919	82	1	1
Vientiane Province	13,841	106	0	0
Borikhamxay	6,173	55	2	0
Khammuane	8,712	64	9	0
Savannakhet	37,346	99	1	0
Xaysomboun	2,599	98	1	0

South	<i>17,549</i>	<i>77</i>	<i>2</i>	<i>0</i>
Saravane	8,338	75	0	0
Sekong	3,973	87	1	0
Chapasack	3,724	84	8	0
Attapeu	1,515	38	2	2
Lao PDR	<i>174,386</i>	<i>78</i>	<i>1</i>	<i>0</i>

Table 8.1.7: Irrigation water costs by size, area of irrigation use by season, FY 2019/20

Province	Number of households using irrigation	The area to be used for rainy season irrigation (%)				Limit the area to be used for dry season irrigation (%)			
		Less than 1 ha	1 - 2 ha	2 - 3 ha	3 ha and up	Less than 1 ha	1 - 2 ha	2 - 3 ha	3 ha and up
Village type	174,386	36	23	7	7	15	8	2	2
Town	35,295	37	24	5	3	16	7	1	3
Rural areas with access to roads	130,971	35	24	8	8	15	9	2	2
Rural areas without access to roads	8,121	40	14	1	2	10	5	-	2
Geographical location	174,386	36	23	7	7	15	8	2	2
Plain village	81,606	28	24	8	11	22	14	4	4
Plateau village	38,310	43	17	3	1	7	2	-	-
Mountain village	45,489	43	28	9	5	10	5	1	1
Mixed villages	8,981	41	22	2	-	13	2	-	1
Region/Provinces			-	-	-	-	-	-	-
North	69,007	42	20	4	1	8	2	-	-
Phongsaly	7,508	44	11	2	-	6	-	-	-
Luangnamtha	7,939	39	28	2	-	9	1	-	-
Oudomxay	12,640	40	18	2	1	9	2	-	-
Bokeo	8,015	46	40	7	6	5	5	1	3
Luangprabang	7,284	48	26	2	2	12	5	-	-

Huaphanh	14,813	42	7	-	-	11	1	-	-
Xayaboury	10,807	40	24	12	2	6	2	-	-
Central	87,830	32	26	9	11	18	12	3	4
Vientiane Capital	5,241	26	20	3	5	39	26	4	10
Xiengkhouang	13,919	42	31	8	3	10	3	-	-
Vientiane Province	13,841	41	33	13	12	10	6	1	-
Borikhamxay	6,173	34	24	5	2	21	14	2	2
Khammuane	8,712	7	6	2	4	38	26	12	9
Savannakhet	37,346	31	26	11	19	17	12	4	5
Xaysomboun	2,599	50	42	10	-	3	1	-	-
South	17,549	26	22	7	5	26	16	3	2
Saravane	8,338	21	20	7	6	28	15	3	3
Sekong	3,973	50	31	6	2	18	9	3	-
Chapasack	3,724	16	17	8	6	35	23	7	3
Attapeu	1,515	9	23	10	-	20	19	-	-
Lao PDR	174,386	36	23	7	7	15	8	2	2

Table 8.1.8: Percentage of households receiving insufficient irrigation water to the actual production area in the dry season, FY 2019/20

Province	Number of households using irrigation	Limit the area to be used for dry season irrigation (%)			
		Less than 1 ha	1 - 2 ha	2 - 3 ha	3 ha and up
Village type	174,386	32	5	1	-
Town	35,295	38	5	1	1
Rural areas with access to roads	130,971	30	6	1	-
Rural areas without access to roads	8,121	22	4	-	-
Geographical location	174,386	32	5	1	-
Plain village	81,606	41	9	2	1
Plateau village	38,310	18	2	-	-
Mountain village	45,489	26	3	-	-
Mixed villages	8,981	34	2	-	-
Regions/Provinces		-	-	-	-
North	69,007	21	2	-	-
Phongsaly	7,508	17	-	-	-
Luangnamtha	7,939	22	1	-	-
Oudomxay	12,640	21	2	-	-
Bokeo	8,015	10	3	-	-
Luangprabang	7,284	22	3	-	-
Huaphanh	14,813	32	1	-	-
Xayaboury	10,807	16	2	-	-
Central	87,830	36	8	1	1
Vientiane Capital	5,241	72	18	2	2
Xiengkhouang	13,919	41	2	-	-
Vientiane Province	13,841	19	4	-	-
Borikhamxay	6,173	37	9	1	-
Khammuane	8,712	69	17	5	2
Savannakhet	37,346	29	8	2	1
Xaysomboun	2,599	14	1	-	-

South	<i>17,549</i>	51	10	1	1
Saravane	8,338	56	9	1	1
Sekong	3,973	25	5	1	-
Chapasack	3,724	57	14	2	1
Attapeu	1,515	79	12	-	-
		-	-	-	-
Lao PDR	<i>174,386</i>	32	5	1	-

Chapter 9: Labor and Income

9.1 Labor Force

Population of age 15 years and above in the Lao PDR are supposed to be working age population. According to the labor force survey, 2017, there were a total of 4,758,031 people are under working age (LFS 2017, 2018). Of the total working age population, only 40.77 percent people were under labor force while remaining 59.5 percent people were out of labor force working own-use production activities. Moreover, out of the total labor force, 90.6 percent were employed while remaining 9.4 percent were unemployed. LFS 2017 (2018) reported that the composite rate of labor underutilization was 25.8 percent and Youth unemployment rate, aged 15-24 was 18.2 percent. The average gross monthly income per labor was found to be 2,481,000 kip in 2017. Comparing with the scenario of 2010, labor force participation rate declined reportedly from 79.2 percent in 2010 to 40.8 percent in 2017 while unemployment rate dramatically rose from 1.9 percent to 9.4 percent between 2010 and 2017.

LFS 2017 (2018) reports that 551 thousand persons worked in agriculture, forestry and fishing in 2017, contributing 35.8 percent of the total employment in Lao PDR. Almost 50 percent female workers worked in this sector in 2017. Moreover, the labor force survey report states that prevalence of agricultural employment was high in rural areas. The most prominent feature of Lao PDR labor market was that more than one-third of employed persons worked in the agriculture sector in 2017. Agriculture played a vital role to create employment mainly in rural part of Lao PDR. One of the interesting facts known from the LFS 2017 was that about 9 percent workers worked more than 48 hours a week in the agriculture, forestry and fishing sector. With this note, this chapter documents and analyses the findings of the third round of LAC on labor force engaged in agricultural sector and income generation by them.

Labor force is one of the vital inputs for any sector as does by the agriculture sector. In past, majority of unskilled labors mainly engaged in agriculture sector but with the introduction of mechanization practices, skilled manpower has entered gradually into this sector in recent times. Both men and women almost equally involved in agricultural activities in the Lao PDR as shown by LFS 2017 and the LAC 2019/20. To provide with the detail information on the characteristics of labor force in agricultural sector, Lao PDR has been using the agricultural census questionnaire incorporating the labor force and wage related questions. As a continuous process, the third round of LAC 2019/20 had also collected information on the labor force and labor income for the persons of age 14 to 64 years old. The questionnaire covered both supply and demand of labor force in the agricultural industry in Lao PDR. In addition, it covered the expenditure on hiring labor as well as income received by the labor service provided to the next unit in agriculture industry. Agricultural activities were divided into two activities: main activities and secondary activities categorized by

crops, livestock, fisheries, and forestry. FY 2019/20 was the reference period for the labor related information. Based on this information collected in the LAC 2019/20, this chapter explains the status of labor market in the agricultural industry of the Lao PDR.

A total of 642,991 farm households or 98.8 percent of total farm households reported that they have labor in the Lao PDR during the reference period of the third round LAC. Two provinces Luangnamtha and Borikhamxay reported cent per cent farm households with labor while remaining provinces reported more than 99 percent of farm households with labor. As can be seen in the Table 9.1, the central region reported the highest number of workers while southern region reported the lowest. Province-wise distribution of number of labors ranged from 32,000 (Xaysomboun) to 461,000 (Savannakhet). Six provinces reported more female workers than male workers and remaining provinces reported more male workers than female workers. Proportion of female workers was not less than 45 percent indicates that female participation in agriculture sector in Lao PDR was satisfactory.

Table 9.1: Distribution of farm households and labor by province, 2019/20

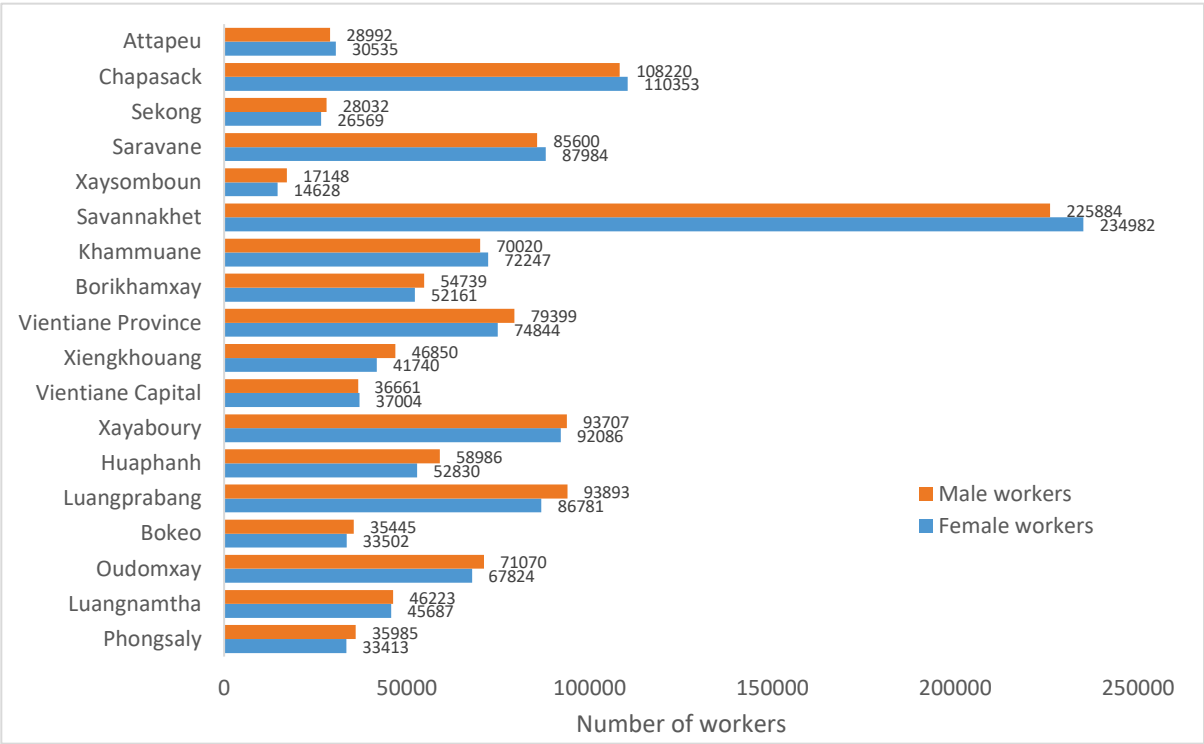
Province	Number of farm households (000)	Number of farm households with labor (000)	Number of farm households with labor (%)	Number of workers (000)	Number of female workers (000)	% of female workers
North	237	236	99.89	847	412	48.6
Phongsaly	21	21	99.87	69	33	48.1
Luangnamtha	24	24	100.00	92	46	49.7
Oudomxay	39	39	99.96	139	68	48.8
Bokeo	19	19	99.31	69	34	48.6
Luangprabang	51	50	99.88	181	87	48.0
Huaphanh	31	31	99.95	112	53	47.2
Xayaboury	53	53	99.98	186	92	49.6
Central	274	274	99.85	1,058	528	49.9
Vientiane Capital	20	20	99.45	74	37	50.2
Xiengkhouang	24	24	99.73	89	42	47.1
Vientiane Province	41	41	99.88	154	75	48.5
Borikhamxay	30	30	100.00	107	52	48.8
Khammuane	39	39	99.65	142	72	50.8
Savannakhet	111	111	99.96	461	235	51.0
Xaysomboun	9	9	99.88	32	15	46.0
South	133	133	99.68	506	255	50.5
Saravane	44	44	99.88	174	88	50.7
Sekong	14	14	99.90	55	27	48.7

Chapasack	58	58	99.48	219	110	50.5
Attapeu	16	16	99.67	60	31	51.3
Lao PDR	644	643	99.83	2,412	1,195	49.6

(Note: Number of households and workers are expressed in 1000 rounded to the unit)

Farm households with labor comprised a total of 2,412,023 workers in 2019/20. Almost 50 percent workers were female in 2019/20 showing that male and female in Lao PDR equally involved in agricultural activities. Figure 9.1 depicts the sex distribution of workers by province in 2019/20. Savannakhet province reported the highest number of workers in 2019/20 while Xaysomboun province reported the lowest number of workers. Comparatively, number of female workers were more than male workers in six provinces, namely Vientiane Capital, Khammuane, Savannakhet, Saravane, Chapasack, and Attapeu and rest of the provinces reported highest number of male workers. In fact, there is no big difference between number of male and female workers in Lao PDR, however, relatively highest difference was reported from Savannakhet province and the lowest difference from Vientiane Capital.

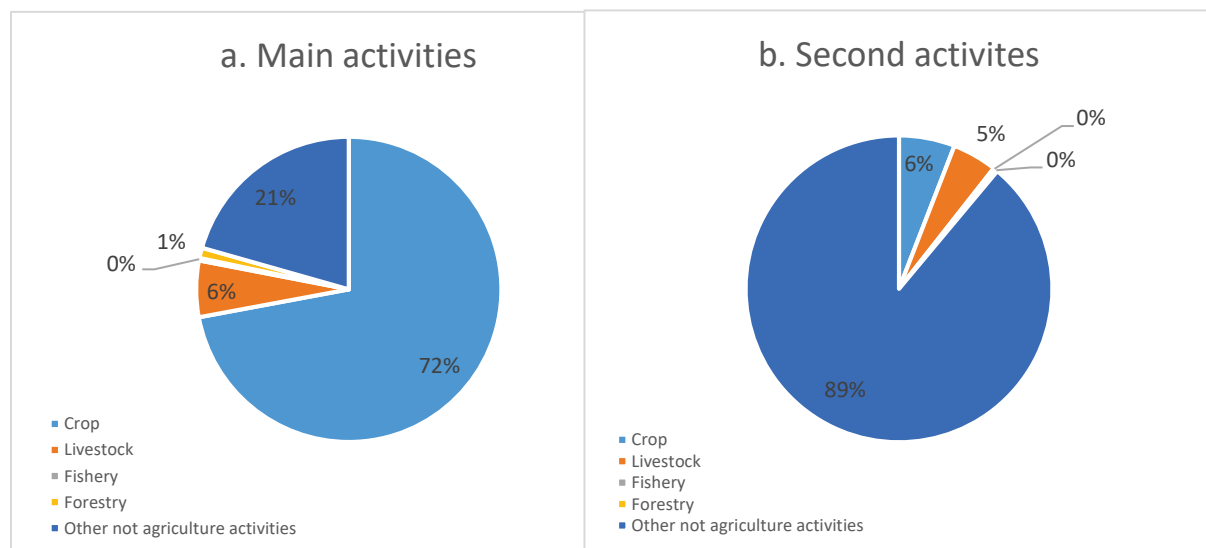
Figure 9.1: Province wise distribution of workers by sex, 2019/20



Majority of workers in Lao PDR engaged in crop cultivation as their main activity in agriculture followed by other activities not the agriculture activities (Figure 9.2 panel a) during the third LAC period. Six percent worker accepted keeping livestock as main activity while relatively

very few people involved in fishery and forestry as their main activity. On the other, majority of workers chose non-agricultural activity as second activity in Lao PDR during the third LAC period. As second activity six percent reported cultivation of crops and five percent reported keeping livestock. As in main activities, nominal worker only accepted forestry and fishery as their secondary activity in 2019/20 (Figure 9.2). Detail information on number of workers by province, region and main activity is presented in Appendix.

Figure 9.2: Labor concentration by type of activities, 2019/20

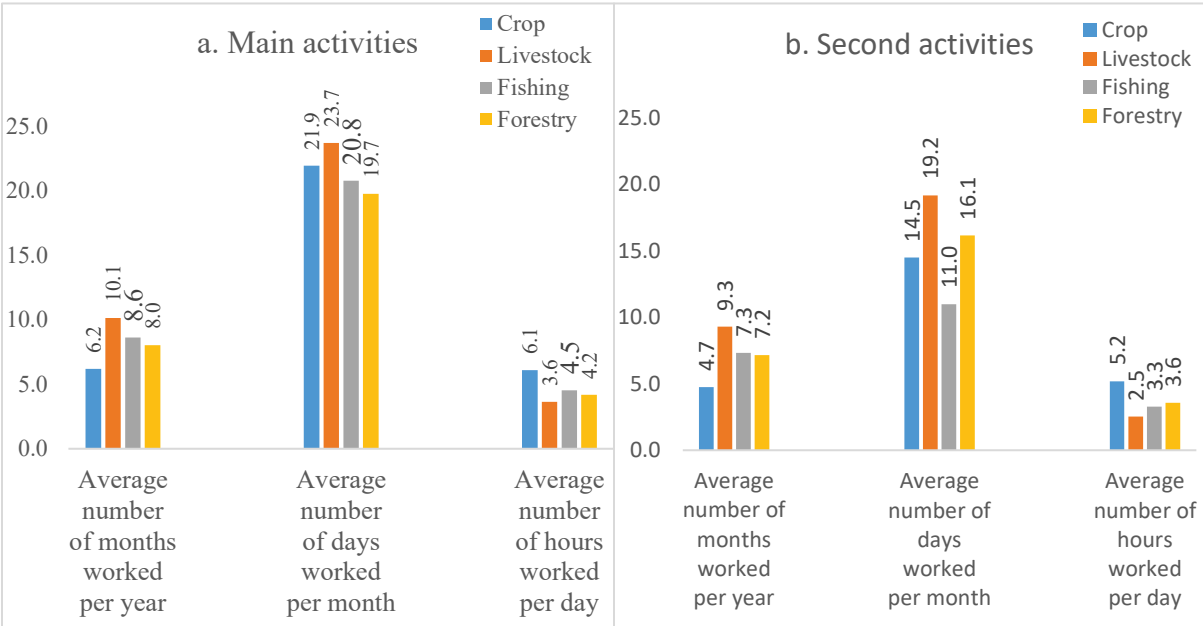


9.2 Time-use in Agricultural Activities

Working time of labor is an important factor in any industries not only to improve the productivity but also the wellbeing of workers. International Labor Organization (2021) argues that unorganized working time of a worker can cause various health problems as well as negative effects on safety, work and family balance. On the other, standardized working time can also create opportunities both to increase productivity and to better meet worker's needs and health. To come up with the standardized working time schedule, the very first International Labor Organization (ILO) convention of 1919 fixed the working time for employees in any industry to a maximum of eight hours a day and 48 hours a week. Further, the article 5 of the ILO convention 1930 highlights the maximum number of hours worked for a day should not exceed 10 hours a day with certain exceptions. Moreover, Success Tax Professionals (2021) highlighted a slogan, "Eight hours labor, Eight hours recreation, Eight hours rest" coined by Robert Owen in 1817 to formulate the goal of eight-hour day. Studies shows that even dropping the working hours from ten/twelve hours to eight hours a day, there was no decrease in the productivity (Success Tax Professionals, 2021). However, countries across the world have not perfectly been practicing the rule of eight-hour day

labor. International Labor Organization (2021) shows that in Australia, the United States, New Zealand, and Japan more than 20 percent labor work for 50 hours a week or more while only less than 10 percent labor in European countries work more than 50 hours a week. On the other, unskilled, and low-earning workers themselves will work more hours mostly in developing countries. The ILO also states that workers in informal sector work as far as they are able to get employment. In this way, there are several dimensions that determine the diversification on the working time of labor such as working sector, working time schedule, type of job, salary, and wage and so on. Referring to these facts, this subsection documents and analyses the facts and figures on the diversification of working time in agricultural sectors and subsectors according to various dimensions.

Figure 9.3: Average time spent on doing agricultural activities by type, 2019/20



People in Lao PDR spent relatively more months to raise livestock while relatively less months in cultivation for their main activities and the average number of months in a year that farm workers spent in fishing and forestry seems to be almost same. In an average a farmer worked 10 months for livestock, 8.6 months for fishing, 8 months for forestry, and 6.2 months for growing crops in a year (Figure 9.3 panel a). Similarly, farm workers worked maximum number of days in a month for raising livestock followed by cultivation. The number of days in a month spent on doing fishing and forestry activities was somewhat similar in 2019/20. The LAC 2019/20 showed that the average number of hours spent doing agricultural activities was less than 8 hours for all agricultural subsectors (Figure 9.3 panel a). In cultivation, farm worker worked relatively the

highest number of hours a day, in an average 6.1 hours. The average number of hours spent doing livestock, fishing, and forestry was respectively 3.6, 4.5, and 4.2 hours (Figure 9.3 panel a).

Average time spent on doing second agricultural activities by type in 2019/20 is presented in the Figure 9.3 panel b. Time use pattern of farm workers seems to be almost indifferent between main and second activities. For instance, relatively more months were spent by farm worker on livestock followed by fishing for both main and second activities. Nevertheless, there was a bit different pattern in the average number of days worked per month in fishing activities as main activity and second activity. Comparing the time use on main and second activities, the LAC 2019/20 reported that farm workers spent more time on main activities. The result also shows an interesting fact that in livestock activities farm workers used respectively more months and days in a year and a month but relatively less hours a day. This indicates that spending few hours a day in a regular basis is sufficient to raise livestock in Lao PDR.

9.3 Labor Force in Rice Cultivation

Rice is one of the most important temporary crops in the Lao PDR and its cultivation basically follows the lowland and upland system. Rice dominated both area under agricultural land and number of farm households engaged in agricultural activities. Obviously, as there were more farm households in the Lao PDR engaged in rice production, there were more labor engaged in rice cultivation activities in 2019/20 following the convention of previous years. The LAC 2019/20 reported that there were altogether 2412 thousand farm labor in the Lao PDR, of which 80.8% labors somehow engaged in various rice cultivation activities. There are many activities to be followed from land preparation to transportation of the produce during the rice production period. In a sequence, the step-by-step major activities to be followed for rice production can be presented as: land preparation, seeding, taking seed off, carry/distribute the seed, transplanting, weeding, fertilizing, pest control, harvesting, threshing, and transportation of the produce. Both mechanical as well as manual process need human force to operate either machine or to proceed the job manually. To some extent, increasing trend of mechanization in the agriculture sector can reduce the number of labor force. Therefore, in some activities there were relatively smaller number of labor while in other a larger number. Table 9.2 presents the distribution of labor by type of jobs and region in Lao PDR using the result of the third LAC.

As can be seen in the Table 9.2, relatively the largest number of labors were used in harvesting followed by transplanting. On the other relatively smaller number of labors were used in pest control followed by the activity of using fertilizer. Regionally, all the regions used the largest number of labors for harvesting while the lowest for pest controlling activities. By region and type of activities, the Southern region used the highest proportion of available agricultural labor in taking seed off, carry/distribute the seed, transplanting, fertilizing, pest control, harvesting, threshing and transportation. Similarly, the Central region used the highest proportion of available

agricultural labor in land preparation, seeding and weeding while the Northern region used the lowest proportion of available agricultural worker in all activities.

Table 9.2: Farm labor force and number of household members involved in rice cultivation by type of jobs FY 2019/20

Type of jobs	North		Central		South		Lao PDR	
	Number (000)	Proportion	Number (000)	Proportion	Number (000)	Proportion	Number (000)	Proportion
Land preparation	129	15.3	263	24.9	115	22.8	508	21.1
Seeding	123	14.5	281	26.5	121	23.9	525	21.7
Taking seed off	93	10.9	310	29.3	165	32.6	568	23.5
Carry/Distribute	74	8.8	229	21.7	117	23.0	420	17.4
Transplanting	89	10.5	360	34.0	195	38.4	643	26.7
Weeding	143	16.8	219	20.7	92	18.1	454	18.8
Fertilizing	17	2.0	153	14.5	76	14.9	246	10.2
Pest control	15	1.8	17	1.6	10	1.9	42	1.7
Harvesting	180	21.3	434	41.0	236	46.7	850	35.2
Threshing	132	15.5	170	16.1	97	19.1	398	16.5
Transportation	106	12.6	193	18.2	109	21.5	408	16.9
Total number of workers in rice cultivation	716	84.5	1061	100.3	172	34.0	1950	80.8
Total number of workers in all agricultural activities	847	100.0	1058	100.0	506	100.0	2412	100.0

Source: LAC 2019/20

The farm households in the Lao PDR hired the highest number of labors from outside for rice cultivation activities in 2019/20 as compared to other agricultural production including livestock and forestry. Rice producing farm households hired 1,691,331 more labor from outside than other production including livestock and forestry in 2019/20. As presented in the Table 9.2, relatively smaller number of labors were hired by the households' farming livestock followed by forestry for the respective activities. Another important information presented in the Table 9.2 is that majority of hired labor was supplied by female workers. In rice production activities, 79% of labor were female and rest of the 21% were male in 2019/20. However, in livestock farming and forest plantation activities, relatively more male were hired but the proportion of male was still below 50% (Table 9.2). In sum, it can be said that female labors were readily available for agricultural activities majority on rice production followed by other crop production. In other words, rice and other crop production in the Lao PDR was dominated largely by female workers and even in livestock farming and forest plantation, female labors themselves had dominated the share of hired labor in 2019/20.

Table 9.3: Hired outside labor in rice cultivation, other agricultural products, livestock farming and forest plantation in Lao PDR, 2019/20

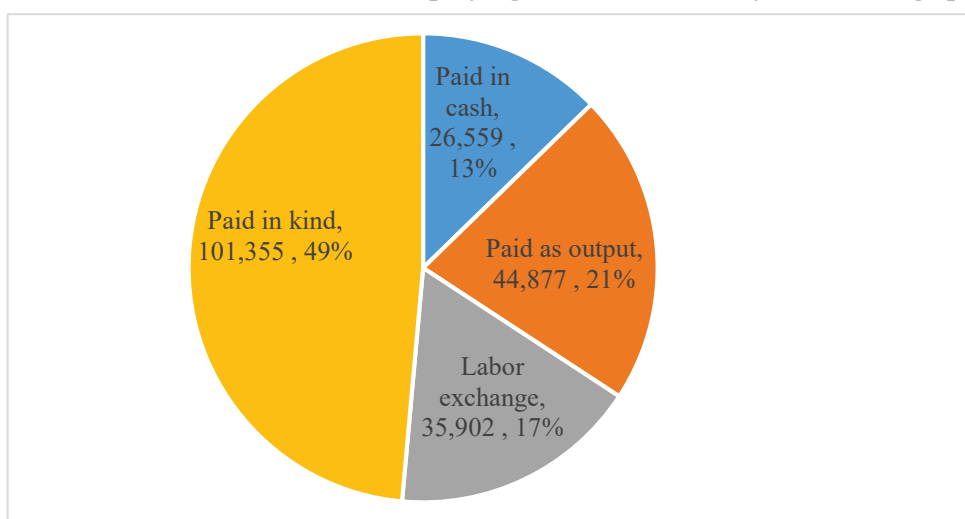
Agricultural activities	Total	Male	Proportion of male (%)	Female	Proportion of female (%)
Rice production	1,949,839	408,519	21.0	1,541,320	79.0
Other production	234,454	63,195	27.0	171,259	73.0
Livestock	4,614	2,125	46.0	2,489	54.0
Forestry	19,439	8,132	41.8	11,307	58.2

Province-wide distribution of hired labor by type of activities is presented in the Appendix. Among 18 provinces, Vientiane Province hired the largest number of labors in rice production and forest plantation. Similarly, Xayaboury and Luangprabang hired the largest number of labors in other crop production and livestock farming respectively. On the other, the smallest number of labors were hired respectively in rice cultivation, other crop production by Sekong and Huaphanh provinces as compared to the other provinces. Reportedly, Xaysomboun hired no labor from outside in livestock farming and Saravane and Attapeu hired no labor in forestry (Appendix).

9.4 Farm Employment and Household Income

Agriculture sector is one of the most important jobs creating economic industries in the Lao PDR. A total of 151,867 (24%) farm households reported that they had some household members employed in agriculture during 2019/20. Obviously, employed agricultural workers contribute to generate household income irrespective of the mode of wage acceptance. Wage payment to the hired labor was made mainly by four modes: pay in cash, pay as output, labor exchange and pay in kind in the Lao PDR. In agriculture sector, paid in kind was more common in the country since the LAC 2019/20 reported that 49% farm households paid in kind to their hired labor in agricultural activities. The next popular mode of paying labor was paid as output. Paying as output is also a kind of in-kind payment. Therefore, in total, in-kind mode of payment covered 70% labor payment in the agricultural labor market of the Lao PDR. This results, only 17% labor payment was made by exchanging labor and remaining 13% payment was made by cash. Interestingly, practice on cash payment to the agricultural labor was less common in the Lao PDR at the time of third round LAC. Alternatively, in-kind payment massively dominated the mode of agricultural labor payment followed by labor exchange in the Lao PDR (Figure 9.4).

Figure 9.4: Number of households employing outside workers by form of wage payment



Agriculture sector significantly contributed to the generation of household income in the Lao PDR. The LAC 2019/20 reported that 24% farm households received income from farm employment contributing 6% household income in the Lao PDR (Table 9.4). A total of 392 (61%) farm households received income from non-farm employment while 100 (16%) farm households received no income at all in 2019/20.

Table 9.4: Household income, 2019/20

Indicators	Total	Receiving income from farm employment	Receiving non-farm income	No income at all
Number of farm households (000)	644	152	392	100
		(24%)	(61%)	(16%)
Income (000 Kips)	7,410,315,567	452,025,075	6,958,290,492	0
		(6%)	(94%)	(0%)

Note: The figures in parenthesis represent the respective share expressed in percentage

9.5 Conclusion

Labor force is an important industrial input that is must to have desired output from any economic industry. In this regard, agriculture sector cannot be the exception and therefore, analysis of supply and demand of labor and generation of household income from the agricultural employment would be the best policy input in this sector. With reference to the results of the LAC 2019/20, it is found that almost 99% households had farm labor in the Lao PDR. A total of 2,412,023 farm labors were supplied in the labor market during 2019/20 with almost 50% female. The highest job creating sub-sector of agriculture was rice production followed by livestock

farming in the Lao PDR. Majority of farm labor in the Lao PDR engaged in crop production activities as their main activity. Average number of hours worked per day was below the international working hour standard. Farm worker spent relatively more hours a day in crop production while relatively less hours in livestock farming. Mechanization in one hand, decreased the total number of farm labor, on the other, commercialization in agriculture increased the number of hired farm labor. In the agricultural employment market, relatively more females were available specially in the crop production sector. From the farm employment, 24% farm households generated some extent of household income that contributed 6% of the total household income. With reference to the findings of farm labor market analysis and household income of the Lao PDR using the data collected from the LAC 2019/20, it can be concluded that mechanization and commercialization of agriculture sector together with strengthening and expanding skilled farm labors would help not only the development of these sector but also the sustainable growth of household income and hence the national income.

Table 9.1.1: Workers aged 15 years and over by province and main activity in 2019/20

Province	Number of workers by main activity (000)					Number of workers by backup activities (000)				
	Cultivation	Livestock	Fisheries	Plant trees	Others	Cultivation	Livestock	Fisheries	Plant trees	Others
North	566.9	63.6	0.7	19.3	197.0	52.8	65.2	1.6	4.7	723.1
Phongsaly	50.1	4.6	0.1	1.7	12.8	2.0	1.1	0.0	0.6	65.7
Luangnamtha	46.4	7.7	0.3	11.1	26.4	6.1	9.0	0.4	3.0	73.5
Oudomxay	101.1	6.5	0.0	0.4	30.9	10.3	16.0	0.6	0.2	111.9
Bokeo	50.3	3.7	0.0	0.8	14.1	5.4	7.6	0.0	0.5	55.4
Luangprabang	112.8	19.2	0.1	4.5	44.1	9.0	3.8	0.0	0.0	167.8
Huaphanh	82.2	2.2	0.0	0.1	27.3	9.5	22.1	0.6	0.3	79.3
Xayaboury	123.9	19.7	0.1	0.6	41.5	10.6	5.6	0.0	0.1	169.5
Central	772.1	59.3	3.4	7.0	216.5	62.5	33.2	1.9	1.8	958.9
Vientiane Capital	38.3	5.2	0.1	0.1	30.0	9.9	1.8	0.1	0.0	61.8
Xiengkhouang	63.7	8.5	0.0	0.0	16.4	4.1	1.5	0.0	0.0	83.0
Vientiane Province	95.6	13.8	0.3	3.0	41.6	7.7	12.4	1.3	1.1	131.7
Borikhamxay	73.3	6.5	0.7	1.8	24.5	12.4	10.8	0.4	0.5	82.7
Khammuane	122.0	2.0	0.3	0.3	17.7	4.7	0.4	0.0	0.0	137.1
Savannakhet	362.1	21.5	1.9	0.5	74.9	20.1	2.1	0.1	0.0	438.5
Xaysomboun	17.1	1.8	0.0	1.3	11.5	3.4	4.1	0.0	0.2	24.2
South	399.4	21.1	2.2	0.2	83.5	26.8	15.3	1.2	0.1	462.9
Saravane	137.9	7.2	0.2	0.1	28.3	9.4	5.9	1.0	0.0	0.0
Sekong	45.0	1.7	0.1	0.0	7.8	3.6	6.2	0.1	0.0	0.0
Chapasack	170.6	8.3	1.4	0.1	38.1	10.7	1.0	0.1	0.0	0.0
Attapeu	45.9	3.9	0.5	0.0	9.3	3.1	2.2	0.0	0.0	0.0
Lao PDR	1738.3	144.0	6.2	26.4	497.0	142.0	113.7	4.8	6.6	2144.9

Table 9.1.2: Hired outside labor in rice cultivation, other agricultural products, livestock farming and forest plantation, 2019/20

Province	Rice production		Other production		Livestock		Forestry	
	Total	Female	Total	Female	Total	Female	Total	Female
North	716,324	549,866	132,058	101,421	3,364	1,878	7,773	4,345
Phongsaly	44,482	34,250	10,953	9,276	27	7	1,335	838
Luangnamtha	29,508	23,398	8,570	5,876	164	58	4,321	2,591
Oudomxay	118,371	93,161	23,992	18,572	543	51	22	-
Bokeo	83,256	61,326	4,395	2,978	349	211	569	227
Luangprabang	160,140	119,317	17,596	12,543	1,541	1,217	796	341
Huaphanh	20,076	15,899	1,378	724	152	76	171	70
Xayaboury	260,490	202,515	65,176	51,451	588	258	559	278
Central	1,061,439	870,398	55,939	40,185	858	505	11,184	6,674
Vientiane Capital	78,412	66,985	7,869	6,004	230	157	931	497
Xiengkhouang	101,865	82,682	4,483	2,987	74	37	71	-
Vientiane Province	347,171	280,878	10,445	6,792	26	13	5,342	4,173
Borikhamxay	116,998	95,043	10,149	8,548	144	92	2,470	789
Khammuane	113,699	101,914	6,023	5,242	176	70	859	495
Savannakhet	276,713	223,908	14,769	9,449	208	136	869	519
Xaysomboun	26,582	18,987	2,201	1,164	-	#REF!	641	202
South	172,076	121,056	46,457	29,654	392	106	482	287
Saravane	47,622	33,593	13,181	7,960	19	6	-	#REF!
Sekong	12,014	9,126	5,674	4,394	279	77	316	249
Chapasack	88,265	58,487	23,924	14,764	89	23	166	39
Attapeu	24,176	19,850	3,679	2,536	5	-	-	#REF!
Lao PDR	1,949,839	1,541,320	234,454	171,259	4,614	2,489	19,439	11,307

Table 9.1.3: Type of payment by region and province 2019/20

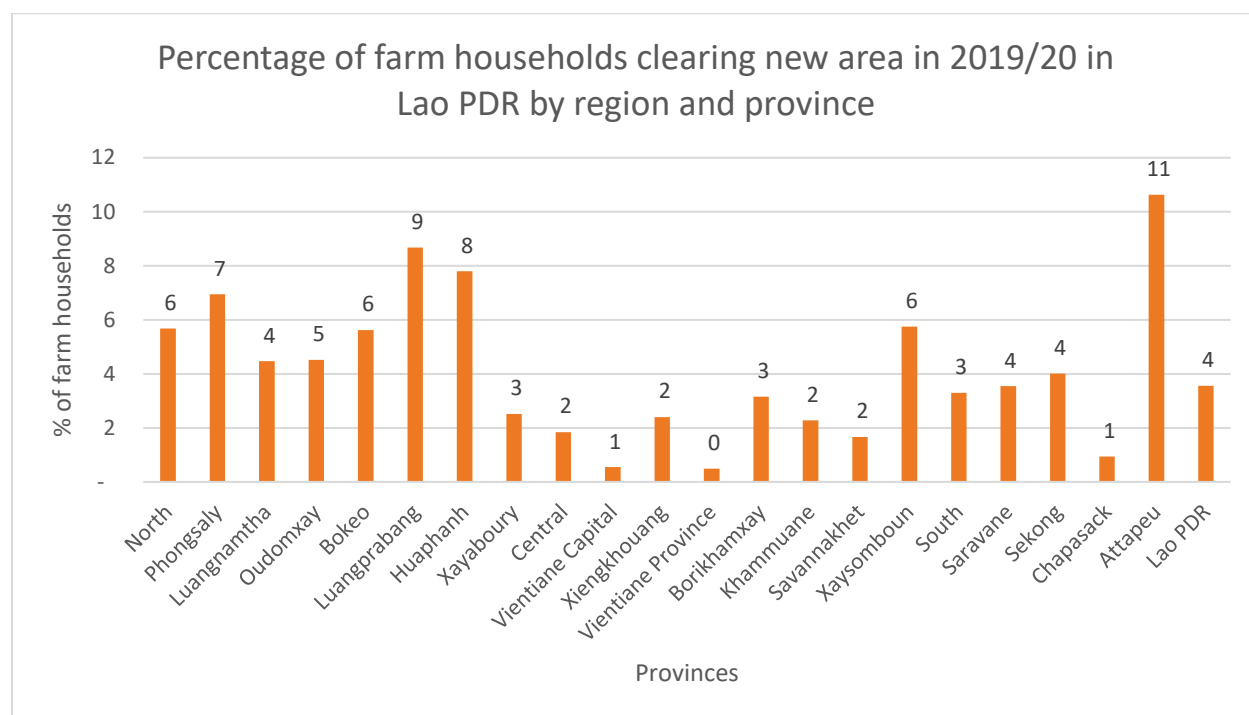
Province	The number of households employing outside labor by type of wage payment				The % of households employing outside labor by type of wage payment			
	Pay in cash	Pay as output	Labor exchange	Paid in kind	Pay in cash	Pay as output	Labor exchange	Paid in kind
North	6,750	27,138	12,054	21,205	10	40	18	32
Phongsaly	456	2,626	520	1,331	9	53	11	27
Luangnamtha	581	1,820	1,283	1,616	11	34	24	30
Oudomxay	969	7,168	1,807	3,608	7	53	13	27
Bokeo	1,707	3,331	621	760	27	52	10	12
Luangprabang	2,330	5,767	2,158	6,683	14	34	13	39
Huaphanh	94	273	1,038	1,145	4	11	41	45
Xayaboury	612	6,155	4,628	6,062	4	35	27	35
Central	15,906	15,788	15,517	61,487	15	15	14	57
Vientiane Capital	606	1,741	1,516	7,733	5	15	13	67
Xiengkhouang	329	1,100	1,726	5,078	4	13	21	62
Vientiane Province	2,473	6,452	3,747	12,706	10	25	15	50
Borikhamxay	1,478	2,984	2,418	4,200	13	27	22	38
Khammuane	1,155	846	2,437	8,156	9	7	19	65
Savannakhet	9,427	2,418	3,656	22,538	25	6	10	59
Xaysomboun	438	246	18	1,076	25	14	1	61
South	3,903	1,950	8,331	18,662	12	6	25	57
Saravane	1,033	598	923	4,556	15	8	13	64
Sekong	32	322	1,029	125	2	21	68	8
Chapasack	2,505	949	4,792	12,435	12	5	23	60
Attapeu	333	81	1,586	1,547	9	2	45	44
Lao PDR	26,559	44,877	35,902	101,355	13	22	17	49

Chapter 10: Environment (Waste) Management Practices

Land preparation is important to ensure that the field is ready for planting. A well-prepared field controls weeds, recycles plant nutrients, and provides a soft soil mass for transplanting and a suitable soil surface for direct seeding. Land preparation covers a wide range of practices from zero-tillage or minimum tillage which minimizes soil disturbance through to a totally 'puddled' soil which actually destroys soil structure (IRRI 2019). It typically involves plowing to "till" or dig-up, mix, and overturn the soil; harrowing to break the soil clods into smaller mass and incorporate plant residue and leveling the field. Initial land preparation begins after last harvest or during fallow period. This is important for effective weed control and for enriching the soil.

In this chapter number of farm households with clearing the new areas, waste management methods for clearing areas, plant waste management methods and tillage patterns for soil preparation has been discussed. Furthermore, land improvement techniques before rice planting and management of livestock waste have been discussed in detail at the subsequent sub sections.

Figure 10.1: Clearing new area, waste management methods and tillage patterns



Source: LCA 2019/20

New land clearance for cultivation purpose is common in most of the agrarian societies and same practice has been observed in Lao PDR during census reference period of 2019/20.

Almost 4% of the farm households have cleared the new area for farming purpose. The highest proportion of these farm households are located in the north followed by south and central.

Among the provinces, almost 11% of the farm households have cleared the new land for cultivation purpose in Attapeu province followed by Luangprabang and Huaphanh. The lowest proportion of these farm households who cleared the new land for farming purpose in 2019/20 are residing in the province Vientiane province followed by Vientiane Capital and Chapsack.

10.1 Environment Management methods for clearing areas

Table 10.1: Waste management methods for clearing areas

Province	Waste management methods for clearing areas (%)	
	Slice and burn	Clear and save
North	88.2	11.8
Phongsaly	92.8	7.2
Luangnamtha	89.3	10.7
Oudomxay	89.4	10.6
Bokeo	82.8	17.2
Luangprabang	90.5	9.5
Huaphanh	92	8
Xayaboury	69.4	30.6
Central	81	19
Vientiane Capital	52.2	47.8
Xiengkhouang	95.2	4.8
Vientiane Province	100	0
Borikhamxay	73.2	26.8
Khammuane	83.1	16.9
Savannakhet	75.5	24.5
Xaysomboun	99.5	0.5
South	83.6	16.4
Saravane	72.8	27.2
Sekong	93.2	6.8
Chapasack	79.5	20.5
Attapeu	94.2	5.8
Lao PDR	85.6	14.4

Source: LCA 2019/20

Among the farm households who cleared area for farming in 2019/20 almost 96% of them sliced and burn the waste. Remaining 4% of them cleared the area without burning the waste. Highest proportion of burn is in north followed by south and Central region. Among the provinces

highest burning of waste is observed in Vientiane Province followed by Xaysomboun and lowest proportion is in Vientiane capital followed by Savannakhet.

10.2 Plant Waste Management Methods

Table: 10.2 Waste management methods of plants

Province	Plant waste management methods (no. of farm households)			Plant waste management methods (% of farm households)		
	Burn	Save	Naturally	Burn	Save	Naturally
North	25,961	3,930	33,374	41.0	6.2	52.8
Phongsaly	1,310	43	1,900	40.3	1.3	58.4
Luangnamtha	2,695	216	2,009	54.8	4.4	40.8
Oudomxay	6,099	752	3,152	61.0	7.5	31.5
Bokeo	1,443	476	3,406	27.1	8.9	64.0
Luangprabang	7,416	1,148	7,110	47.3	7.3	45.4
Huaphanh	2,494	717	1,634	51.5	14.8	33.7
Xayaboury	4,503	578	14,163	23.4	3.0	73.6
Central	7,797	8,004	50,542	11.8	12.1	76.2
Vientiane Capital	355	355	623	26.6	26.6	46.8
Xiengkhouang	1,047	1,312	5,264	13.7	17.2	69.1
Vientiane Province	981	2,044	9,111	8.1	16.8	75.1
Borikhamxay	1,589	1,397	3,465	24.6	21.7	53.7
Khammuane	822	1,383	3,597	14.2	23.8	62.0
Savannakhet	2,404	1,392	27,563	7.7	4.4	87.9
Xaysomboun	600	121	919	36.6	7.4	56.0
South	6,215	3,418	17,180	23.2	12.7	64.1
Saravane	1,952	709	3,504	31.7	11.5	56.8
Sekong	593	67	1,801	24.1	2.7	73.2
Chapasack	1,565	1,880	8,245	13.4	16.1	70.5
Attapeu	2,106	763	3,630	32.4	11.7	55.9
Lao PDR	39,973	15,352	101,096	25.6	9.8	64.6

Source: LCA 2019/20

Natural waste management is quite popular in Lao PDR for managing plant waste. Almost two third of the plant waste is managed by farm household naturally in Lao PDR. About one fourth of the farm households have managed their plant waste by burning them and remaining 10 %of the farm households have kept them save in Lao PDR during 2019/20 Lao Census reference period.

10.3 Tillage Pattern for Soil Preparation

The latest results from Lao Agriculture Census exhibits that in the process of land preparation almost two thirds of farm households are using the machines for soil tillage, almost more than one third of them use zero tillage (no ploughing) and negligible proportion (about 1%) of these farm households are using animal labor for soil preparation.

Table 10.3: Tillage pattern for soil preparation

Region/Province	Tillage patterns for soil preparation		
	Animal labor	Mechanical	No plowing
North	0.8	47.2	51.9
Phongsaly	2.9	34.0	63.0
Luangnamtha	0.1	40.4	59.6
Oudomxay	0.7	45.8	53.5
Bokeo	0.6	52.6	46.8
Luangprabang	0.5	21.6	77.9
Huaphanh	1.3	55.3	43.4
Xayaboury	0.7	70.1	29.2
Central	1.3	77.0	21.7
Vientiane Capital	0.9	78.2	21.0
Xiengkhouang	1.4	67.0	31.6
Vientiane Province	1.6	75.2	23.2
Borikhamxay	2.6	69.4	28.1
Khammuane	0.9	79.2	19.9
Savannakhet	1.2	82.6	16.3
Xaysomboun	0.0	59.4	40.6
South	0.6	70.0	29.4
Saravane	0.4	80.4	19.2
Sekong	0.5	51.4	48.1
Chapasack	1.0	68.4	30.6
Attapeu	0.0	65.7	34.3
Lao PDR	1.0	64.5	34.5

Source: LCA 2019/20

10.4 Land Improvement before Rice Planting

Rice is the number one cereal crop in Lao PDR, Among the total farm households in Lao PDR almost 84% of them grow at least rice along with other crops and vegetables. The land improvement techniques before planting this important crop are presented in Table 10.1.2.

10.5 Livestock Waste Management

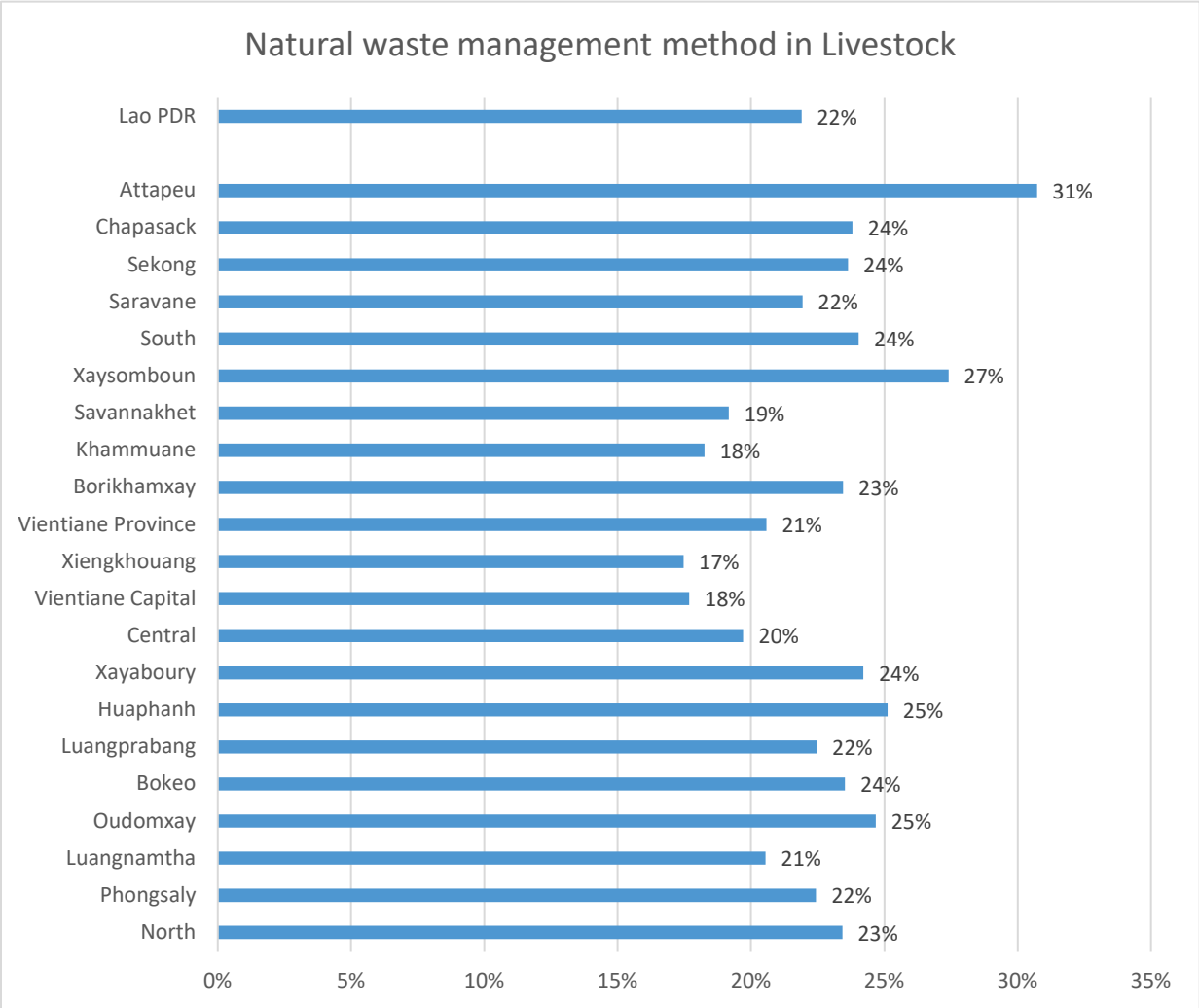
Livestock is another important economic sector in Lao PDR. Major livestock grown in Lao PDR are buffaloes, Cattle, Pigs, Sheep etc. More than 80% of the farm households among total farm households have at least one or more livestock with them. The waste management practices in livestock sector are quite important as they are directly associated to the health and wellbeing of the livestock, and it contributes positively to the production of milk and meat among others. The waste management practices in Lao PDR by farm households during census reference period of 2019/20 are presented in the following tables.

Table 10.4: Percentage of households with managed livestock waste and use by province in 2019/20

Province	Number of farm households	Number of livestock households	Waste management methods (%)		
			Store	Card and split	Naturally
North	236,710	189,435	1	1	23
Phongsaly	20,647	17,678	1	0	22
Luangnamtha	24,066	20,062	2	4	21
Oudomxay	39,113	31,883	1	0	25
Bokeo	18,962	15,874	1	0	24
Luangprabang	50,539	40,708	1	0	22
Huaphanh	30,836	25,042	1	0	25
Xayaboury	52,545	38,187	3	1	24
Central	274,392	228,950	8	1	20
Vientiane Capital	20,361	13,151	6	1	18
Xiengkhouang	24,299	22,480	10	1	17
Vientiane Province	41,470	34,941	5		21
Borikhamxay	29,961	23,090	6	1	23
Khammuane	38,854	32,476	8	3	18

Savannakhet	110,925	95,178	9	1	19
Xaysomboun	8,523	7,633	4	0	27
South	132,996	98,169	5	0	24
Saravane	44,452	36,047	7	0	22
Sekong	14,266	10,798	1		24
Chapasack	58,306	37,963	2	0	24
Attapeu	15,972	13,361	9	0	31
Lao PDR	644,098	516,554	5	1	22

Figure 10.2: Natural method of waste management in Livestock sector of Lao PDR



Natural waste management is very popular in livestock sector of Lao PDR. Only about 1% of the livestock farm households' card and spilt the waste, about five percent of them store the waste and almost 22% of them manage the waste in natural way. This natural method of waste management is very common in Attapeu province followed by Xaysomboun, Huaphanh and Oudomxay.

10.7 Conclusion

Waste materials are mainly the byproduct of agricultural activities such as plant residue, feces of livestock and poultry, waste from clearing farms. Well management of such waste materials not only prevents the degradation of the environment but also enrich the crop manure. Obviously, all farm households produce some kind of agricultural waste and about 4% farm households produced waste while clearing new farm area in 2019/20 as reported by the third LAC. Basically, farm households producing waste used three methods: (a) burn, (b) save, and (c) naturally disposal and households who cleared land for farming used two methods: (a) slice and burn; and (b) clear and save for waste management. Majority of farm households who cleared area for farming (85.6%) sliced and burnt the waste while 14% cleared the area without burning the waste. More than one quarter of households burnt plant waste and about two third households naturally disposed. In fact, activities of burning waste materials produced harmful smoke and deteriorate the environment and lead the air pollution, on the other, this is the lost opportunity to produce useful manure for the crops. Therefore, burning waste activities is to be discouraged and waste can be converted to manure. The details of the livestock sector management practices are presented in Annex Table 10.1.3.

Table 10.1.1: Farm households clearing of new areas, waste management methods and land preparation models by province, 2019/20

Province	No of farm households	No of households clearing new area	Waste management methods for clearing areas		Plant waste management methods			Tillage patterns for soil preparation		
			Slice and burn	Clear and save	Burn	Save	Naturally	Animal labor	Mechanical	No plowing
North	236,710	13,453	12,472	1,668	25,961	3,930	33,374	512	28,553	31,418
Phongsaly	20,647	1,435	1,393	108	1,310	43	1,900	149	1,731	3,207
Luangnamtha	24,066	1,076	1,058	127	2,695	216	2,009	4	2,452	3,619
Oudomxay	39,113	1,765	1,587	187	6,099	752	3,152	67	4,472	5,220
Bokeo	18,962	1,066	905	188	1,443	476	3,406	30	2,487	2,212
Luangprabang	50,539	4,383	4,290	451	7,416	1,148	7,110	54	2,559	9,226
Huaphanh	30,836	2,404	2,321	202	2,494	717	1,634	111	4,748	3,725
Xayaboury	52,545	1,324	919	405	4,503	578	14,163	97	10,103	4,208
Central	274,392	5,062	4,620	1,086	7,797	8,004	50,542	895	53,062	14,968
Vientiane Capital	20,361	111	68	62	355	355	623	38	3,413	915
Xiengkhouang	24,299	583	576	29	1,047	1,312	5,264	84	3,982	1,876
Vientiane Province	41,470	205	205	-	981	2,044	9,111	163	7,734	2,391
Borikhamxay	29,961	945	787	288	1,589	1,397	3,465	205	5,493	2,223
Khammuane	38,854	885	877	179	822	1,383	3,597	83	7,709	1,936
Savannakhet	110,925	1,842	1,619	525	2,404	1,392	27,563	323	23,171	4,560
Xaysomboun	8,523	490	488	3	600	121	919	-	1,560	1,066

South	132,996	4,390	4,082	800	6,215	3,418	17,180	205	23,683	9,933
Saravane	44,452	1,576	1,442	539	1,952	709	3,504	39	8,697	2,076
Sekong	14,266	571	545	40	593	67	1,801	18	1,847	1,731
Chapasack	58,306	546	472	122	1,565	1,880	8,245	148	9,781	4,372
Attapeu	15,972	1,697	1,623	100	2,106	763	3,630	-	3,358	1,755
Lao PDR	644,098	22,906	21,174	3,555	39,973	15,352	101,096	1,612	105,298	56,319

Table 10.1.2: Households with land improvement before rice planting by province in 2019/20

Province	Number of farm households	Number of households growing rice	Soil improvement before planting rice						
			Plow straw for more than 30 days	Plow straw for less than 30 days	Add the crumbs	Add compost	Add manure	Apply fresh plant fertilizer	Did not do anything
North	236,710	195,884	17,443	3,937	282	303	1,907	500	38,299
Phongsaly	20,647	15,497	1,194	124	-	29	36	3	3,706
Luangnamtha	24,066	17,126	2,125	200	28	12	97	50	3,780
Oudomxay	39,113	34,612	2,552	307	-	8	228	66	6,812
Bokeo	18,962	17,033	1,404	930	27	26	136	11	2,768
Luangprabang	50,539	37,752	1,469	179	58	47	295	61	9,958
Huaphanh	30,836	27,986	3,217	1,393	12	135	114	54	4,032
Xayaboury	52,545	45,878	5,483	803	157	47	1,001	255	7,243
Central	274,392	248,021	32,973	13,234	9,943	2,694	16,473	1,665	20,750
Vientiane Capital	20,361	15,805	2,058	1,100	348	317	725	72	1,046
Xiengkhouang	24,299	21,279	2,403	867	111	107	1,149	112	2,275
Vientiane Province	41,470	35,720	4,992	1,257	545	95	1,131	50	3,374
Borikhamxay	29,961	25,024	3,073	1,062	683	429	1,188	427	3,717
Khammuane	38,854	37,037	4,339	878	1,867	359	2,549	139	3,059
Savannakhet	110,925	106,275	15,210	7,430	6,389	1,388	9,575	864	6,161
Xaysomboun	8,523	6,883	897	641	-	-	156	-	1,116
South	132,996	96,961	13,170	3,590	4,585	1,351	6,932	1,205	14,019
Saravane	44,452	35,142	4,996	1,006	2,361	234	3,160	311	3,597
Sekong	14,266	10,871	794	190	14	25	269	31	2,404
Chapasack	58,306	37,536	5,424	1,870	1,924	700	2,950	494	5,636
Attapeu	15,972	13,412	1,956	524	285	391	552	370	2,381
Lao PDR	644,098	540,866	63,585	20,762	14,810	4,348	25,312	3,370	73,068

Table 10.1.3: Households with managed livestock waste and use by province in 2019/20

Province	No of farm HH	No of livestock HH	Waste management methods			Use of pet waste				
			Store	Card and split	Natural	Natural	Used as fuel	Use as fertilizer	Used as animal feed	Other
North	236,710	189,435	2,792	1,131	44,372	40,302	74	6,122	1,269	5,721
Phongsaly	20,647	17,678	182	37	3,966	3,783	7	347	-	466
Luangnamtha	24,066	20,062	339	741	4,122	3,721	-	1,457	15	682
Oudomxay	39,113	31,883	329	17	7,868	6,631	-	1,021	38	1,045
Bokeo	18,962	15,874	209	17	3,734	3,683	23	346	412	322
Luangprabang	50,539	40,708	294	23	9,145	8,525	19	839	116	951
Huaphanh	30,836	25,042	192	39	6,290	5,688	-	662	46	774
Xayaboury	52,545	38,187	1,247	258	9,247	8,270	25	1,449	642	1,481
Central	274,392	228,950	18,034	1,986	45,119	39,132	794	25,826	2,099	7,694
Vientiane Capital	20,361	13,151	762	187	2,326	1,538	-	1,685	46	338
Xiengkhouang	24,299	22,480	2,233	141	3,927	3,304	290	2,572	302	1,124
Vientiane Province	41,470	34,941	1,652	-	7,189	6,267	10	2,607	374	608
Borikhamxay	29,961	23,090	1,411	121	5,415	4,184	-	2,438	52	2,234
Khammuane	38,854	32,476	2,714	938	5,927	5,429	303	4,670	227	872
Savannakhet	110,925	95,178	8,961	597	18,244	16,395	178	11,536	1,092	2,472
Xaysomboun	8,523	7,633	302	3	2,092	2,014	12	318	5	45
South	132,996	98,169	4,647	130	23,600	20,423	557	6,885	369	3,890
Saravane	44,452	36,047	2,396	5	7,905	6,471	23	3,288	105	1,569
Sekong	14,266	10,798	118	-	2,552	2,540	-	331	-	142
Chapasack	58,306	37,963	881	97	9,038	7,895	-	1,650	7	1,689
Attapeu	15,972	13,361	1,252	27	4,106	3,517	534	1,616	257	490
Lao PDR	644,098	516,554	25,473	3,248	113,091	99,857	1,425	38,833	3,737	17,305

Chapter 11: Natural Disaster and Household Food Security

Lao PDR is rich in various natural resources and beauties, nevertheless it is vulnerable to several types of natural disasters such as: floods, drought, crop and animal disease epidemics, storms and others. Various factors such as rapid population growth and improper and unplanned land use practices have contributed to increased vulnerability of natural disasters and disease outbreaks. Floods and droughts are the most recurrent natural disasters that annually cause significant material and human losses affecting food security situation of Laotian people. Lao PDR is prone to the impacts of climate change and this can have multiple effects on agriculture sector of the country. In Lao PDR, irrigation facilities are limited and crop production is highly affected by unusual weather patterns. The impact of various natural disasters mainly flood, drought, storm, plant and animal disease and others on farm household can be seen on the following tables.

Table 11.1: Farm households affected by natural disasters by province and region 2019/20, Lao PDR

Region/Province	Number of farm households	Number of total households affected	% of affected household
North	236,710	120,776	51.02
Phongsaly	20,647	9,069	43.92
Luangnamtha	24,066	10,290	42.76
Oudomxay	39,113	28,449	72.74
Bokeo	18,962	12,833	67.68
Luangprabang	50,539	27,724	54.86
Huaphanh	30,836	13,600	44.10
Xayaboury	52,545	18,811	35.80
Central	274,392	135,135	49.25
Vientiane Capital	20,361	6,725	33.03
Xiengkhouang	24,299	9,721	40.01
Vientiane Province	41,470	10,802	26.05
Borikhamxay	29,961	9,193	30.68
Khammuane	38,854	20,907	53.81
Savannakhet	110,925	75,559	68.12
Xaysomboun	8,523	2,229	26.16
South	132,996	76,941	57.85
Saravane	44,452	26,917	60.55
Sekong	14,266	9,461	66.32
Chapasack	58,306	27,565	47.28
Attapeu	15,972	12,999	81.39
Lao PDR	644,098	332,853	51.68

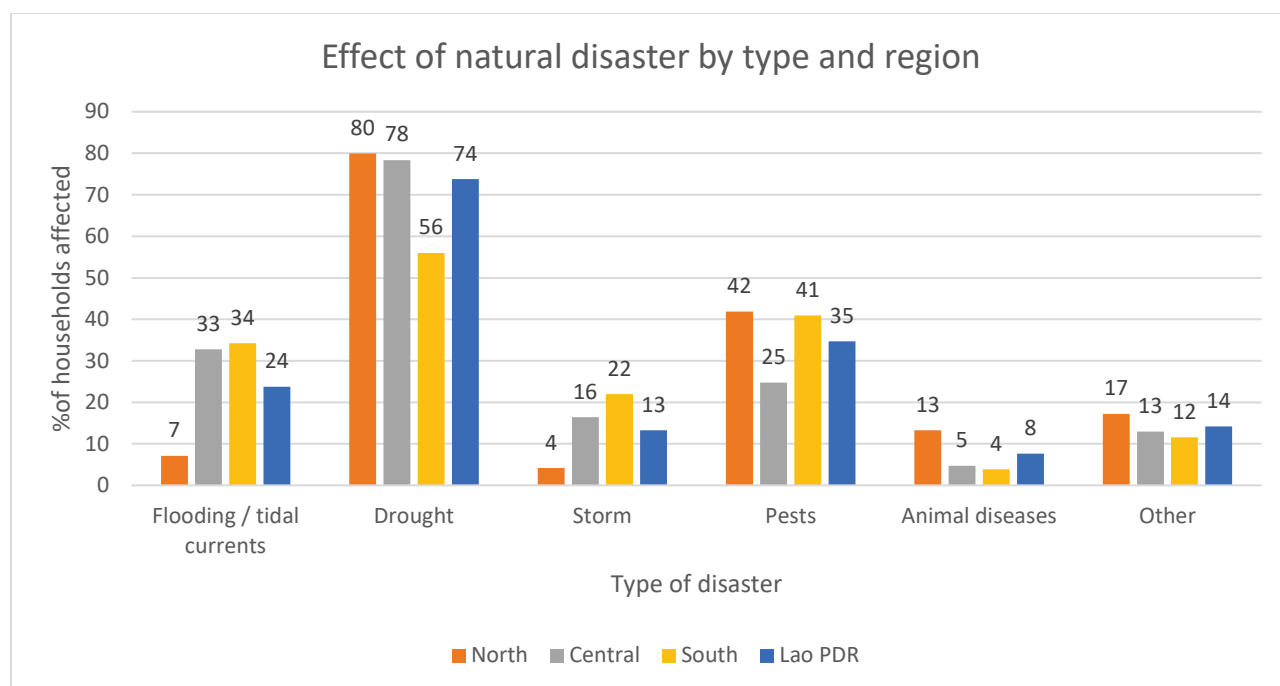
Source: LAC 2019/20, Lao Statistics Bureau, Lao PDR

Data from Lao Census of Agriculture 2019/20 as presented in Table 10.1 shows that more than half of the farm households in Lao PDR are affected by one or more types of the natural disasters during the census reference period in 2019/20.

Attapeu province in the south region is highly (more than 80% of its population) affected by the natural disasters during the census reference period followed by Oudomxay and Bokeo in the north, Savannakhet in the central region and Sekong province from south.

11.1 Effect of Natural Disaster by their Types

Figure 11.1: Effect of natural disasters by their type and region



Source: LCA 2019/20

Drought affects most to the farm households in Lao PDR. Among the total households affected by different natural disasters in Lao PDR drought has affected almost three among four households in 2019/20 followed by pests, flooding which includes tidal waves as well, storm, others and animal disease. It has to be noted here that the same household has been affected by more than one type of natural disasters totaling the aggregate percentage more than 100.

In the northern region drought has affected almost 80% of the households followed by pests, others and animal disease. Northern region is relatively less affected by storms as well as floods. Central region is vulnerable to drought, followed by floods, pests storms and others. Southern region is also vulnerable to multiple disasters like drought, flood, pests, storm and others.

Table 11.1 presents the effect of various types of natural disasters by province. Among the 18 provinces of Lao PDR, flood has highly affected the households in provinces Khammuane, Xayosomboun and Saravane where as it has least affected the farm household in Phongsaly, Bokeo and Luangprabang. Drought has affected most of the provinces in Lao PDR and it has highest proportion of farm households in the provinces like Bokeo, Luangprabang and Oudomaxy where as it has comparatively less effect in Sekong, Xayosomboun and Phongsaly. Storm has relatively less effect in most of the provinces compared to other natural disasters except in the provinces Sekong, Attapeau and Khammunnae.

Pests has also affected most of the households in Phongsaly, Huaphanh and Attapeu. Animal disease has also affected a lot of farm households in Phongsaly, Luangmantha and Odomaxy. The other type of disasters has also affected Phongsaly, Borikhamxay and Laungnamtha. Relatively less affected farm households by other types of disasters are located in the provinces like Vientiane province, Sekong and Saravane.

11.2 Effect of Natural Disasters by Village Types

Following figures discuss about the effect of natural disasters on farm households of Lao PDR in 2019/20 according to the location of those farm households in different areas. The villages are classified basically into two categories; urban villages and rural villages and these rural villages are further classified into rural villages with access to roads and without access to roads. The drought has highly affected the farm households located in the rural households without access to roads followed by rural villages with access to roads and least affected are the farm households located in urban villages. Floods, pests and other type of natural disaster has affected more even in the rural villages with access to roads. Urban villages are relatively less affected by different types of natural disasters compared to rural villages with and without access to roads in Lao PDR.

Figure: 11.2: Effect of natural disasters by village types

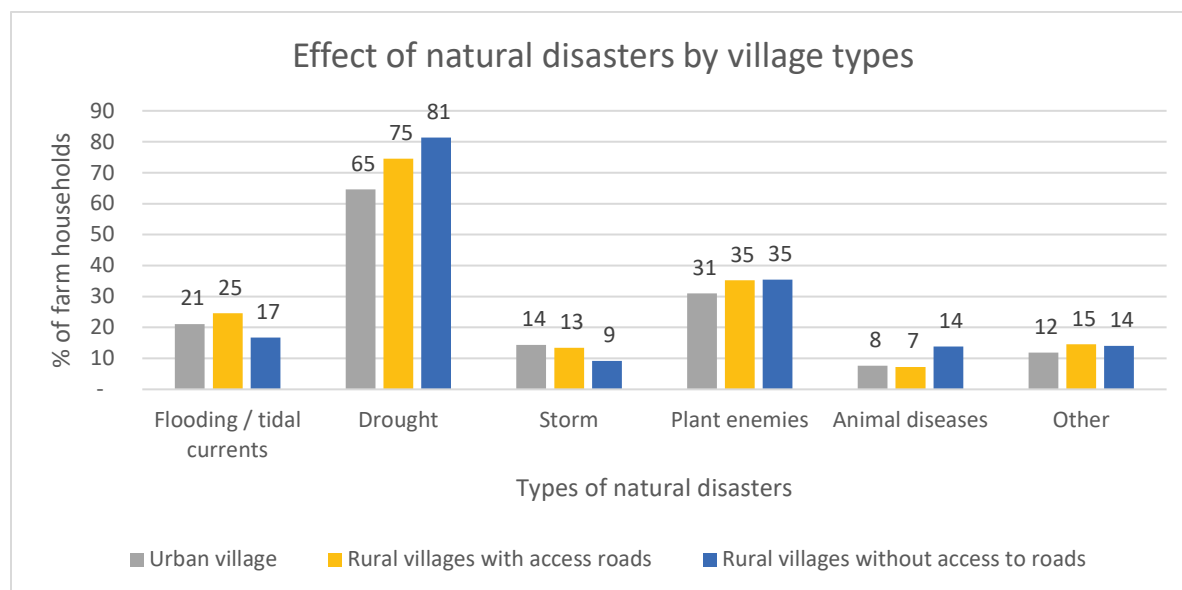
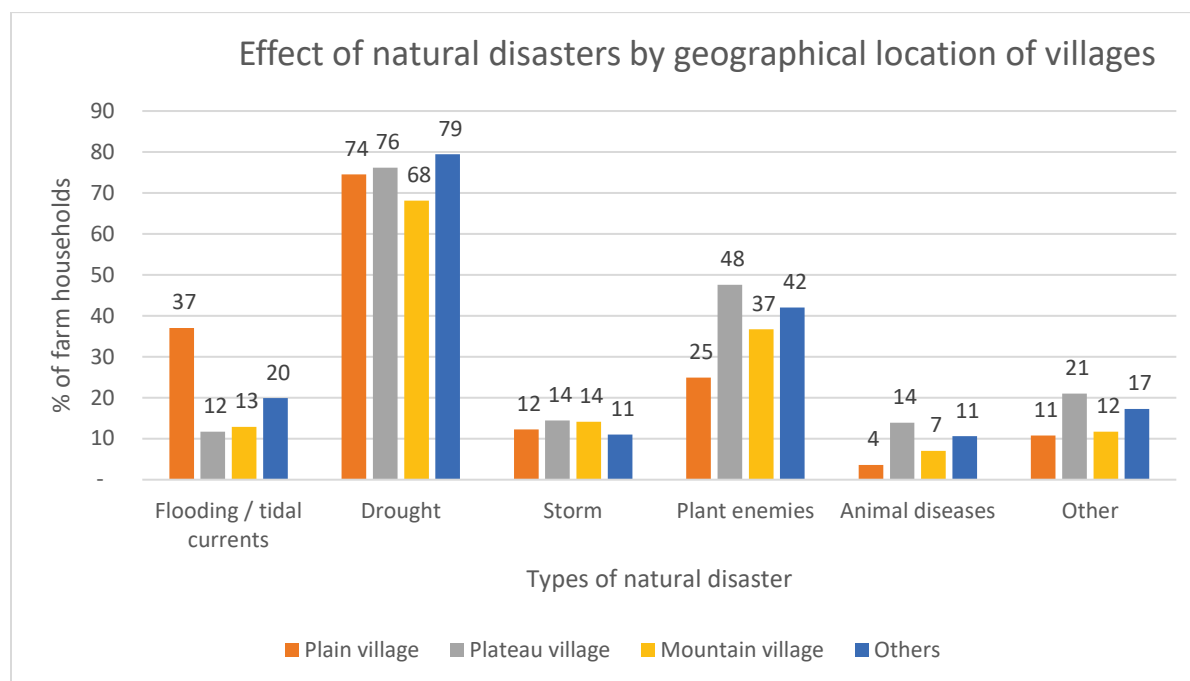


Figure 11.3: Effect of natural disasters by geographical location of villages



Villages in Lao PDR are further classified as plain villages, plateau villages, mountain villages and others according to their geographical location. Figure 10.3 discusses the effect of various types of natural disasters on farm households in Lao PDR in 2019/20 according to the geographical location of these villages. Villages located in the plain are mostly affected by drought as like other villages followed by floods, pest, storms and others. Plateau villages are also affected by drought, pests, animal disease, others and least affected by floods and tidal currents. The mountain villages are again affected by drought, followed by pests, storms, floods and others. Other types of the villages also follow the similar pattern of effect in Lao PDR in 2019/20.

Province wise details of these tables are presented in Annexes.

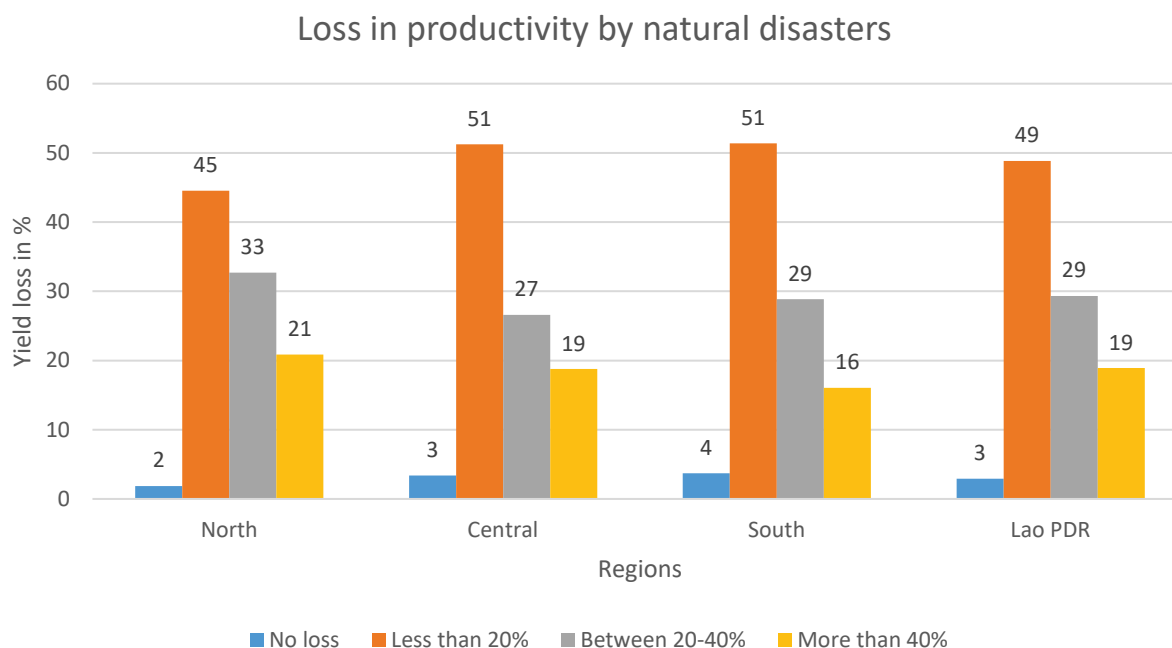
11.3 Loss in Agriculture Productivity by Natural Disasters

Natural disasters have caused a significant loss on the productivity of different crops in Lao PDR in 2019/20. Among the 332853 farm households who were affected by one or another type of natural disaster in Lao PDR in 2019/20 only 3% of them have reported that there was no loss in the agriculture productivity. Almost half of the farm households affected by natural disaster have reported that they have lost almost 20% of their crop productivity while about 29% reported that they have lost between 20 to 40 of their crop productivity. Almost 19% of them have reported that the natural disasters have caused more than 40% loss in their agriculture productivity.

There is not much difference among the different regions of Lao PDR on the productivity loss by natural disasters. Northern provinces have relatively lost more than 40% of their agriculture productivity compared to central and south. 20 to 40% productivity loss is also highest in northern

region followed by south and central region. Proportion on loss on agricultural productivity less than 20% is almost similar in central and south and less in north regions of Lao PDR in 2019/20.

Figure 11.4: Loss in agriculture productivity by different types of natural disasters



The provincial details on loss of productivity by different types of the natural disasters are presented in preceding tables

11.4 Food Security Status among Farm Population in Lao PDR

Food security is a multifaceted condition of complex analysis, which is defined in different ways by international organizations and researchers depending on their context and requirement. In early 80s, availability was considered as major component of food security analysis, in which household food sufficiency was one of the major indicators for food security measurement. Later, Sen (1981) defined food security as ensuring access to food, not merely increasing supplies, should be considered as major pillar of food security. Furthermore, households can be considered food secure when the household members do not live in hunger or fear of starvation.

The widely accepted definition of food security (FAO, 2009) is, “all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preference for an active and healthy life”. Based on this definition, food security involves four aspects entitled the four dimensions: availability, access, utilization and stability of food security. These four dimensions can be extracted and are, together, equally useful as a tool for food security analysis.

Food Security framework is influenced by two factors mainly physical and temporal. The physical factors are related to food flow; availability, accessibility, use and utilization. On the other, temporal factor refers to stability, which affects all three physical factors. Availability refers to physical existence of food, either from own production or from the markets. Food availability at national level is the quantity of net available food estimated as total production minus intermediate consumption such as seed, post-harvest loss, feed use, processing loss, industrial use, alcoholic and other use plus net imports. It can also be referred to as food supplies available at household level. In World Food Summit (WFS) definition, it refers to term “sufficient”. Access is ensured when all households and all individuals have sufficient resources to obtain food (FAO, 2009). The adequate level of access can be achieved without households being self-sufficient in food production. The important factors are the physical, financial, cultural which together with own production can be used to meet food needs for a healthy life. Regular availability and accessibility can be hampered by natural disasters or social conflict. In WFS definition, it refers to “have physical, economic and social access” (FAO, 2009). Use of food is related to socio-economic aspect of household. Unequal distribution of foods within households may cause food insecurity to some members, even if the measured aggregate access is sufficient. Knowledge and food habits as well as social taboos are the determining factors of socio-economic aspect of food security, especially for infants, pregnant and lactating women. Utilization is related to the individual level. The utilization aspect of food security means biological utilization of food and refers to ability of human body to absorb nutrients to perform body functions: providing energy, helping growth, and maintaining other vital functions. Similarly, other prerequisites to utilization are safe drinking water, minimum sanitary facilities, proper health care, food preparation methods etc. In WFS definition it refers to “safe and nutritious food which meets their dietary needs” (FAO, 2009).

Dietary intake must be adequate in terms of quantity and quality so as to provide required nutrients such as energy, protein, fat, vitamins and minerals. It also can be said that nutritional status is the function of dietary intake and that is also influenced by health status of the concerned individual. Stability or sustainability refers to temporal dimension that is time frame over which food security is being considered. Furthermore, a distinction is made between chronic food insecurity and transitory or acute food insecurity. The former is the case of inability to meet food needs on an ongoing basis, while the latter is the inability to meet food needs temporarily. There are two forms of transitory food insecurity: cyclical and temporary (IPC Global Partners, 2012). In cyclical food insecurity, there is a regular pattern to food insecurity during ‘lean season’ or ‘hungry season’, especially just before harvest. In the WFS definition it refers to “at all times”.

The contributing factors to food security comprises vulnerability, policies, institutions, and processes. Similarly, the acute or ongoing hazards like natural, socio-economic, conflict, climate, diseases and others, which affect four dimensions of food security, are also taken as contributing factors to food security.

Thus food security is an aggregate measure and it is explained in SDG Goal 2 Target 2.1 and indicators 2.1.1 and 2.1.2. The indicator 2.1.2 is associated with the experience based food security/insecurity measurement and details have been collected according to the recommendation from FAO.

The FIES module includes the following 8 yes/no questions to measure the severity of food insecurity among adult individuals.

During the last 12 MONTHS, was there a time when, because of a lack of money or other resources:

1. You were worried you would run out of food?
2. You were unable to eat healthy and nutritious food?
3. You ate only a few kinds of foods?
4. You had to skip a meal?
5. You ate less than you thought you should?
6. Your household ran out of food?
7. You were hungry but did not eat?
8. You went without eating for a whole day?

In this chapter a detail analysis on effect of natural disasters on farm households, crop production and productivity, impact on livestock and household food security has been analyzed in detail.

Table 11.2: Proportion of food insecure households by region and village types according to FIES questions

Region	Anxiety about not having enough food to eat	Do not eat healthy food	Eat only certain foods	Fasted for some food	Eat less than required	No food at all	Hungry for food but not eating	Fasting
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
North	0.33	0.30	0.28	0.12	0.10	0.09	0.10	0.04
Central	0.30	0.20	0.21	0.08	0.08	0.07	0.08	0.04
South	0.39	0.31	0.29	0.13	0.11	0.10	0.09	0.04
<i>National</i>	0.33	0.26	0.25	0.11	0.09	0.08	0.09	0.04
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Urban village	0.18	0.10	0.12	0.05	0.05	0.03	0.04	0.02
Rural villages with access to roads	0.35	0.28	0.27	0.11	0.10	0.09	0.10	0.04
Rural villages without access to roads	0.50	0.47	0.44	0.23	0.16	0.17	0.19	0.07
<i>Other Types</i>	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Plain village	0.32	0.21	0.20	0.08	0.07	0.06	0.06	0.03
Plateau village	0.42	0.41	0.38	0.18	0.14	0.12	0.15	0.06
Mountain village	0.26	0.20	0.21	0.09	0.08	0.08	0.07	0.03
Other villages	0.21	0.19	0.17	0.09	0.09	0.08	0.09	0.04

Source: Derived from LAC 2019/20

Almost one third of the Laotian people have experienced or are worried that there was a situation of food insecurity in the past 12 months. The proportion is slightly higher in south region compared to north and central. Almost one fourth of people didn't eat healthy food or eat only certain foods over the last 12 months. Almost 11 percent of the Laotian people fasted in some days over the last 12 months due to unavailability of food. Eight to 9 percent of the total farm population either ate less than required or they didn't had any food stock or stay hungry due to unavailability/unaffordability of food. Almost 4 percent of these farm population stayed fully fasting for at least a day during last 12 months. The regional distribution of these indicators is almost similar with a slightly severe case in south and comparatively less severe in the central region.

According to the type of the villages and their geographical location, the data are presented in above table.

11.5 Conclusion

In spite of ample natural resources, and production possibilities, Lao PDR is suffering from several types of natural disasters that hinders the socio-economic development and pushing people below the unsecured livelihoods situation. Flood, tidal currents, drought, storm, pests, animal diseases are the main natural disasters suffered Lao PDR in 2019/20. Among them, drought was the major problem in 2019/20 as reported by the third LAC. In addition, Lao PDR is prone to the impacts of climate change and this can have multiple effects on agriculture sector of the country. As a result, more than half of farm households were affected directly by the natural disaster in 2019/20 as reported by the third round of LAC. According to the affected households, the natural disaster resulted in significant loss of agricultural productivity.

Food insecurity is bitterly prevailing in the Lao PDR as almost one third of the Laotian people have experienced or are worried that there was a situation of food insecurity in the past 12 months. Moreover, almost 11 percent of the Laotian people fasted in some days over the last 12 months due to unavailability of food. One of the major causes of food insecurity in the Lao PDR is the natural disaster which is a big challenge of the country. Therefore, a detail and comprehensive contingency and rescue plan is essential to deal with the unexpected and uncontrolled challenges.

Detail tables are presented in Appendix

Table 11.1.1: Farm Households Affected by Natural Disasters in Each Province 2019/20

Province	Number of farm households	Number of total households affected	Village type			Geographical location		
			Urban village	Rural villages with road access	Rural villages without road access	Plain village	Plateau village	Mountain village
North	236,710	120,776	14,180	96,008	10,588	67,542	31,951	8,539
Phongsaly	20,647	9,069	1,086	7,412	571	8,914	155	-
Luangnamtha	24,066	10,290	1,621	8,423	246	7,680	1,208	106
Oudomxay	39,113	28,449	1,899	21,401	5,149	17,488	8,161	2,596
Bokeo	18,962	12,833	1,216	11,148	470	2,942	3,340	2,537
Luangprabang	50,539	27,724	3,053	23,248	1,422	16,650	5,975	1,422
Huaphanh	30,836	13,600	916	10,449	2,235	9,095	1,969	1,878
Xayaboury	52,545	18,811	4,390	13,927	494	4,772	11,144	-
Central	274,392	135,135	13,758	116,357	5,021	22,807	17,519	2,936
Vientiane Capital	20,361	6,725	2,300	4,424	-	38	15	133
Xiengkhouang	24,299	9,721	1,129	7,918	674	4,005	4,440	676
Vientiane Province	41,470	10,802	1,940	8,826	36	843	5,378	139
Borikhamxay	29,961	9,193	1,777	6,130	1,286	5,745	1,568	545
Khammuane	38,854	20,907	1,377	18,418	1,112	2,364	1,112	216
Savannakhet	110,925	75,559	4,444	69,200	1,914	8,856	3,747	1,228
Xaysomboun	8,523	2,229	790	1,440	-	956	1,260	-
South	132,996	76,941	11,916	62,508	2,518	6,557	23,502	393
Saravane	44,452	26,917	2,830	23,310	777	1,895	7,637	-

Sekong	14,266	9,461	3,250	6,186	25	2,124	6,498	164
Chapasack	58,306	27,565	3,722	22,127	1,715	378	8,469	229
Attapeu	15,972	12,999	2,114	10,885	-	2,159	898	-
Lao PDR	644,098	332,853	39,854	274,873	151,106	96,906	72,973	11,868

Table 11.1.2: Farm households affected by natural disasters in each province and by type of impact, 2019/20

Province	Number of households affected	Types of effects from natural disasters					
		Flooding / tidal currents	Drought	Storm	Pests	Animal diseases	Other
North	120,776	8,555	96,535	5,030	50,588	16,019	20,811
Phongsaly	9,069	306	3,035	58	7,278	2,983	3,706
Luangnamtha	10,290	1,376	7,383	425	5,440	1,918	2,512
Oudomxay	28,449	1,812	24,509	326	13,523	4,294	5,513
Bokeo	12,833	555	12,188	757	2,544	940	1,258
Luangprabang	27,724	1,298	24,475	2,224	8,809	3,677	4,240
Huaphanh	13,600	1,911	9,786	243	7,814	1,392	1,520
Xayaboury	18,811	1,297	15,159	996	5,180	814	2,062
Central	135,135	44,240	105,906	22,238	33,438	6,378	17,507
Vientiane Capital	6,725	1,496	5,165	105	924	234	512
Xiengkhouang	9,721	663	7,572	366	3,613	1,418	2,300
Vientiane Province	10,802	1,090	8,331	297	1,953	559	478
Borikhamxay	9,193	2,308	6,158	2,135	4,010	968	3,363
Khammuane	20,907	9,606	15,424	4,910	2,138	440	2,522
Savannakhet	75,559	28,515	62,349	14,302	20,030	2,611	8,099
Xaysomboun	2,229	562	906	124	769	148	234
South	76,941	26,330	43,074	16,888	31,528	2,954	8,918
Saravane	26,917	10,223	18,952	3,706	7,471	648	2,328
Sekong	9,461	1,789	2,265	5,727	4,473	145	790
Chapasack	27,565	9,587	11,715	4,068	12,353	842	4,174
Attapeu	12,999	4,730	10,143	3,387	7,230	1,319	1,626
Lao PDR	332,853	79,125	245,515	44,156	115,554	25,351	47,236

Table 11.1.3: Farm households affected by natural disasters by type, 2019/20

Province	Number of households affected	Types of effects from natural disasters					
		Flooding / tidal currents	Drought	Storm	Plant enemies	Animal diseases	Other
North	120,776	8,555	96,535	5,030	50,588	16,019	20,811
Urban village	14,180	1,367	10,038	1,172	4,305	1,545	1,409
Rural villages with access to roads	96,008	6,766	77,060	3,301	42,422	13,095	17,391
Rural villages without access to roads	10,588	422	9,437	557	3,861	1,378	2,012
Other Classification							
Plain village	12,744	1,237	10,307	306	3,652	859	1,336
Plateau village	67,542	4,160	50,690	3,374	34,456	11,739	14,960
Mountain village	31,951	2,228	28,329	1,094	8,886	2,681	3,422
Mixed villages	8,539	930	7,209	257	3,594	740	1,093
Central	135,135	44,240	105,906	22,238	33,438	6,378	17,507
Urban village	13,758	4,523	10,121	1,156	3,212	1,306	2,070
Rural villages with access roads	116,357	37,854	92,186	20,062	28,573	4,369	15,076
Rural villages without access to roads	5,021	1,863	3,599	1,021	1,652	703	361
Other Classification							
Plain village	91,873	33,444	71,135	10,598	21,578	2,961	10,205
Plateau village	22,807	5,430	19,059	8,683	6,794	1,436	4,856
Mountain village	17,519	3,979	13,833	2,036	3,873	1,465	1,617
Mixed villages	2,936	1,387	1,878	921	1,192	517	829
South	76,941	26,330	43,074	16,888	31,528	2,954	8,918
Urban village	11,916	2,525	5,573	3,383	4,852	179	1,247
Rural villages with access roads	62,508	23,061	35,782	13,424	25,756	2,351	7,489
Rural villages without access to roads	2,518	744	1,719	81	920	425	182
Other Classification							
Plain village	46,490	21,276	31,124	7,594	12,401	1,665	4,728

Plateau village	6,557	1,804	4,058	1,961	4,863	315	546
Mountain village	23,502	3,202	7,554	7,199	14,060	975	3,519
Mixed villages	393	48	338	134	204	-	125
<i>National</i>							
Urban village	39,854	8,415	25,731	5,710	12,368	3,030	4,726
Rural villages with access roads	274,873	67,681	205,029	36,787	96,752	19,815	39,956
Rural villages without access to roads	18,126	3,028	14,755	1,659	6,433	2,506	2,555
<i>Other Classification</i>							
Plain village	151,106	55,957	112,566	18,498	37,632	5,484	16,269
Plateau village	96,906	11,394	73,808	14,017	46,113	13,489	20,362
Mountain village	72,973	9,410	49,716	10,329	26,818	5,121	8,559
Mixed villages	11,868	2,364	9,425	1,312	4,990	1,257	2,047
Lao PDR	332,853	79,125	245,515	44,156	115,554	25,351	47,236

Table 11.1.4: Farm households with loss of agricultural productivity in each province, 2019/20

Province	No of total households affected	Total no of households lost	Village type			Geographical location		
			Urban village	Rural villages have access roads	Rural villages do not have access roads	Plain village	Plateau village	Mountain village
North	120,776	53,797	8,147	41,270	4,381	27,825	15,498	3,703
Phongsaly	9,069	6,241	679	5,249	313	6,151	90	-
Luangnamtha	10,290	4,358	969	3,371	18	2,764	608	66
Oudomxay	28,449	11,252	400	8,486	2,366	6,730	3,170	1,224
Bokeo	12,833	5,232	689	4,311	232	955	1,275	1,290
Luangprabang	27,724	10,220	1,363	8,462	395	5,672	2,191	379
Huaphanh	13,600	5,907	538	4,471	898	3,628	1,168	743
Xayaboury	18,811	10,587	3,509	6,920	159	1,924	6,997	-
Central	135,135	69,220	6,482	61,131	1,606	9,812	8,040	1,098
Vientiane Capital	6,725	2,251	724	1,526	-	-	-	74
Xiengkhouang	9,721	4,776	639	3,866	271	1,919	2,036	351
Vientiane Province	10,802	5,198	839	4,339	21	469	2,403	46
Borikhamxay	9,193	4,003	887	2,559	556	2,272	887	364
Khammuane	20,907	10,407	515	9,459	433	990	626	49
Savannakhet	75,559	41,321	2,486	38,509	326	3,519	1,477	214
Xaysomboun	2,229	1,264	391	872	-	643	611	-

South	<i>76,941</i>	<i>39,523</i>	<i>5,049</i>	<i>32,822</i>	<i>1,653</i>	<i>3,679</i>	<i>13,389</i>	<i>215</i>
Saravane	26,917	13,129	1,863	10,854	412	1,163	3,858	-
Sekong	9,461	4,274	891	3,380	4	719	3,169	49
Chapasack	27,565	16,068	1,259	13,571	1,238	378	5,983	167
Attapeu	12,999	6,051	1,036	5,016	-	1,419	379	-
Lao PDR	<i>332,853</i>	<i>162,540</i>	<i>19,678</i>	<i>135,222</i>	<i>7,640</i>	<i>41,315</i>	<i>36,927</i>	<i>5,016</i>

Table 11.1.5: Farm households experiencing malnutrition by province, 2019/20

Province	No of households that used to be short of food	Anxiety about not having enough food to eat	Do not eat healthy food	Eat only certain foods	Fasted for some food	Eat less than required	No food at all	Hungry for food but not eating	Fasting
North	60,549	19,720	18,092	17,109	7,550	6,023	5,218	6,162	2,210
Phongsaly	5,109	1,285	1,224	1,219	757	694	769	679	294
Luangnamtha	6,223	1,551	1,035	655	154	97	196	100	30
Oudomxay	9,735	5,288	5,066	4,896	2,436	1,691	1,623	2,005	833
Bokeo	4,719	2,313	2,060	2,114	862	698	547	571	186
Luangprabang	11,830	4,096	3,837	3,974	1,722	1,291	1,193	1,424	418
Huaphanh	8,560	3,118	3,234	2,591	1,002	700	664	841	414
Xayaboury	14,373	2,069	1,635	1,659	617	852	226	542	34
Central	68,511	20,796	13,821	14,257	5,527	5,171	4,674	5,507	2,995
Vientiane Capital	4,347	513	238	257	177	150	107	122	38
Xiengkhouang	5,959	1,573	1,408	1,326	498	529	460	463	149
Vientiane Province	10,232	1,749	1,370	1,415	281	384	409	304	258
Borikhamxay	7,799	974	754	896	472	496	501	470	504
Khammuane	9,692	4,575	3,231	2,828	1,341	1,154	1,031	1,234	865
Savannakhet	27,838	11,051	6,657	7,409	2,759	2,414	2,132	2,910	1,181

Xaysomboun	2,644	362	162	126	-	43	35	3	-
South	34,127	13,374	10,501	9,844	4,511	3,844	3,248	2,977	1,364
Saravane	11,105	4,267	2,966	3,068	1,561	1,240	1,132	1,147	641
Sekong	3,596	1,540	1,538	1,559	990	837	592	588	223
Chapasack	14,313	3,875	2,487	1,950	415	491	404	191	169
Attapeu	5,113	3,692	3,510	3,267	1,546	1,276	1,120	1,051	331
Lao PDR	163,188	53,890	42,413	41,209	17,588	15,038	13,140	14,646	6,569

Table 11.1.6: Experiencing food insecurity over the last 12 months, 2019/20

Questions on experiencing food insecurity over the last 12 months									
Province	Number of HH that used to be short of food	Anxiety about not having enough food to eat	Do not eat healthy food	Eat only certain foods	Fasted for some food	Eat less than required	No food at all	Hungry for food but not eating	Fasting, fasting
North	60,549	19,720	18,092	17,109	7,550	6,023	5,218	6,162	2,210
Phongsaly	5,109	1,285	1,224	1,219	757	694	769	679	294
Luangnamtha	6,223	1,551	1,035	655	154	97	196	100	30
Oudomxay	9,735	5,288	5,066	4,896	2,436	1,691	1,623	2,005	833
Bokeo	4,719	2,313	2,060	2,114	862	698	547	571	186
Luangprabang	11,830	4,096	3,837	3,974	1,722	1,291	1,193	1,424	418
Huaphanh	8,560	3,118	3,234	2,591	1,002	700	664	841	414
Xayaboury	14,373	2,069	1,635	1,659	617	852	226	542	34
Central	68,511	20,796	13,821	14,257	5,527	5,171	4,674	5,507	2,995
Vientiane Capital	4,347	513	238	257	177	150	107	122	38
Xiengkhouang	5,959	1,573	1,408	1,326	498	529	460	463	149
Vientiane Province	10,232	1,749	1,370	1,415	281	384	409	304	258
Borikhamxay	7,799	974	754	896	472	496	501	470	504
Khammuane	9,692	4,575	3,231	2,828	1,341	1,154	1,031	1,234	865

Savannakhet	27,838	11,051	6,657	7,409	2,759	2,414	2,132	2,910	1,181
Xaysomboun	2,644	362	162	126	-	43	35	3	-
South	34,127	13,374	10,501	9,844	4,511	3,844	3,248	2,977	1,364
Saravane	11,105	4,267	2,966	3,068	1,561	1,240	1,132	1,147	641
Sekong	3,596	1,540	1,538	1,559	990	837	592	588	223
Chapasack	14,313	3,875	2,487	1,950	415	491	404	191	169
Attapeu	5,113	3,692	3,510	3,267	1,546	1,276	1,120	1,051	331
Lao PDR	163,188	53,890	42,413	41,209	17,588	15,038	13,140	14,646	6,569

Table 11.1.6: Farm households experiencing nutritional deficiencies by village type and geography, 2019/20

Province	Number of households that used to be short of food	Anxiety not having enough food to eat	Do not eat healthy food	Eat only certain foods	Fasted for some food	Eat less food than required	No food at stock	Hungry for food but not eating	Fasting
North	60,549	19,720	18,092	17,109	7,550	6,023	5,218	6,162	2,210
Urban village	13,032	1,674	1,098	1,154	584	606	297	423	175
Rural villages with access to roads	43,356	15,520	14,449	13,744	5,801	4,733	4,165	4,780	1,705
Rural villages without access to roads	4,161	2,526	2,544	2,211	1,165	684	755	959	330
Other Types									
Plain village	10,325	2,419	2,233	1,999	865	759	310	526	108
Plateau village	29,600	12,380	11,864	11,164	5,027	3,801	3,344	4,080	1,578
Mountain village	16,690	4,079	3,189	3,227	1,286	1,080	1,212	1,143	387
Mixed villages	3,934	842	806	720	373	384	352	413	137
Central	68,511	20,796	13,821	14,257	5,527	5,171	4,674	5,507	2,995
Urban village	10,090	1,943	916	1,138	388	576	412	299	190
Rural villages with access to roads	56,595	17,926	12,112	12,273	4,695	4,127	3,849	4,809	2,601
Rural villages without access to roads	1,825	927	793	845	444	469	413	399	204
Other Types									
Plain village	43,068	13,168	7,196	7,870	2,614	2,620	2,161	2,462	1,495
Plateau village	10,980	4,158	3,972	3,756	1,919	1,472	1,295	2,037	809
Mountain village	12,977	3,180	2,494	2,484	877	980	1,138	941	604
Mixed villages	1,485	291	159	146	117	100	78	67	86
South	34,127	13,374	10,501	9,844	4,511	3,844	3,248	2,977	1,364
Urban village	5,681	1,460	993	1,112	427	315	252	327	95
Rural villages with access to roads	26,797	11,533	9,236	8,442	3,941	3,439	2,876	2,589	1,237
Rural villages without access to roads	1,649	381	271	291	143	89	120	61	32
Plain village	20,852	8,457	6,298	5,314	2,397	1,886	1,691	1,741	877
Plateau village	2,931	1,721	1,803	1,747	700	688	554	420	143
Mountain village	10,141	3,124	2,304	2,691	1,383	1,266	964	797	340

Others	204	72	96	92	32	4	38	19	4
National	163,188	53,890	42,413	41,209	17,588	15,038	13,140	14,646	6,569
Urban village	28,804	5,077	3,008	3,404	1,398	1,497	962	1,049	460
Rural villages with access to roads	126,748	44,979	35,797	34,458	14,437	12,299	10,890	12,179	5,542
Rural villages without access to roads	7,636	3,835	3,608	3,347	1,753	1,242	1,288	1,418	567
Other Types									
Plain village	74,245	24,044	15,727	15,183	5,875	5,265	4,162	4,729	2,481
Plateau village	43,511	18,258	17,638	16,666	7,646	5,960	5,194	6,538	2,529
Mountain village	39,808	10,383	7,987	8,402	3,547	3,325	3,314	2,881	1,330
Others	5,623	1,205	1,061	957	521	487	469	498	228

Chapter 12: Village Infrastructure and Access to Facilities

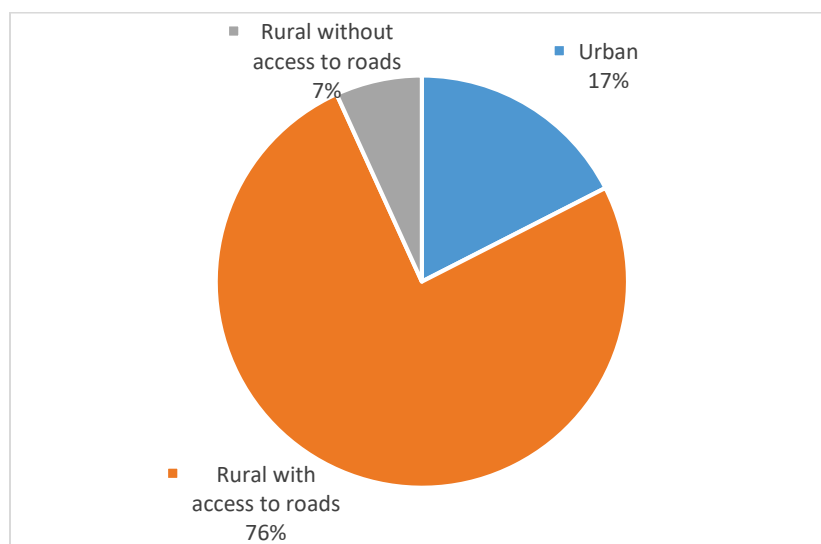
12.1 Village Infrastructure

Infrastructure plays a key role in the socio-economic development of the community that applies for the people dependent on agriculture termed as farm households. Infrastructures lower the cost of production, increase the wage rates of the farm population and assist in reducing poverty and malnutrition from those areas. Agriculture infrastructures include wide range of public services that facilitate production, procurement, processing, preservation and trade. Roads and electricity are the significant determinants of the agriculture productivity.

In this chapter, the access to social and physical infrastructures to the villages and communities, sources of power, water as well as agriculture infrastructures like irrigation, market, financial institutions etc has been analyzed and presented up to the province level.

12.2 Village Types in Lao PDR

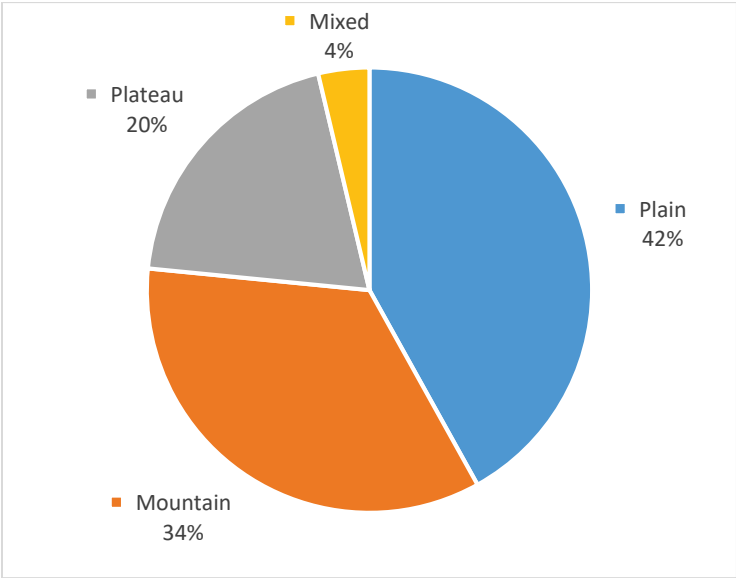
Figure 12.1: Types of villages in Lao PDR



There are more than 8400 villages in Lao PDR, among them only about 17% are categorized as urban villages while rest of them are rural. The rural villages are further categorized according to with access to roads and without access to roads. More than three fourth of these total villages have access to roads and only about 7% of them are not connected to the roads.

The villages are also categorized as mountain villages, plateau villages, plain villages and mixed villages according to their geographical location.

Figure 12.2: Types of villages in Lao PDR according to their geographical location



Plain villages are highest in numbers covering more than 42% of share among the total villages followed by mountain and plateau villages. The mixed type of villages are very few in Lao PDR comprising just 4% among the total villages.

12.3 Access to Education Infrastructure in Lao PDR

Table 12.1: Access to education in the villages of Lao PDR

Region/Province	Primary School	Elementary School	Elementary School less than a hour walk
North	82%	12%	9%
Phongsaly	68%	25%	11%
Luangnamtha	81%	14%	8%
Oudomxay	82%	13%	5%
Bokeo	77%	11%	16%
Luangprabang	87%	9%	10%
Huaphanh	88%	7%	6%
Xayaboury	87%	5%	9%
Central	83%	9%	10%
Vientiane Capital	77%	8%	16%
Xiengkhouang	74%	8%	19%
Vientiane Province	83%	9%	13%
Borikhamxay	83%	12%	5%
Khammuane	84%	10%	12%
Savannakhet	88%	9%	4%
Xaysomboun	89%	9%	2%
South	81%	15%	6%
Saravane	76%	19%	7%
Sekong	92%	6%	2%
Chapasack	79%	16%	6%
Attapeu	92%	6%	3%
Urban	79%	6%	15%
Rural with access to roads	83%	12%	7%
Rural without access to roads	84%	13%	6%
Plain	81%	11%	9%
Mountain	84%	13%	6%
Plateau	82%	10%	10%
Mixed	81%	10%	12%
Lao PDR	82%	11%	9%

Among the total villages in Lao PDR more than 80% of the villages have at least a primary school, 11% of them have elementary school and among these elementary school almost 90% are within the distance of half an hour. Among all three regions the access to primary schools is more than 80%. Among the provinces Sekong and Attapeu has the highest access while Xiengkhouang and Saravane has the lowest access on the educational institutions.

Urban villages have the highest access to elementary schools within half an hour followed by rural with access to roads and without access to roads. Among the villages in different

geographical location mountain villages has the highest proportion of primary school followed by plateau and plains. Again the access to elementary schools is highest in mountains followed by plain and plateau. Interestingly the highest proportion of villages within a distance of half an hour is in mixed villages followed by plateau, plain and lowest in mountain villages.

12.4 Access to Power in Lao PDR

Power source plays a significant role in the household welfare and agriculture process. This chapter tries to analyze the access to power source of farm households in Lao PDR by regions, provinces and village types. All urban villages have the access to electricity followed by rural villages with access to roads and lowest level of electrification has been observed in rural villages without access to roads.

Figure 12.3: Access to power by urban rural in Lao PDR

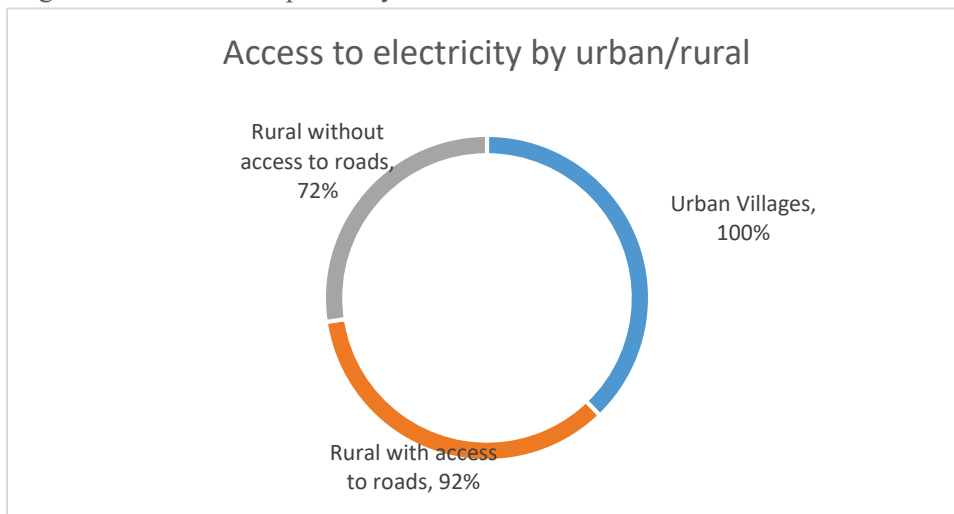
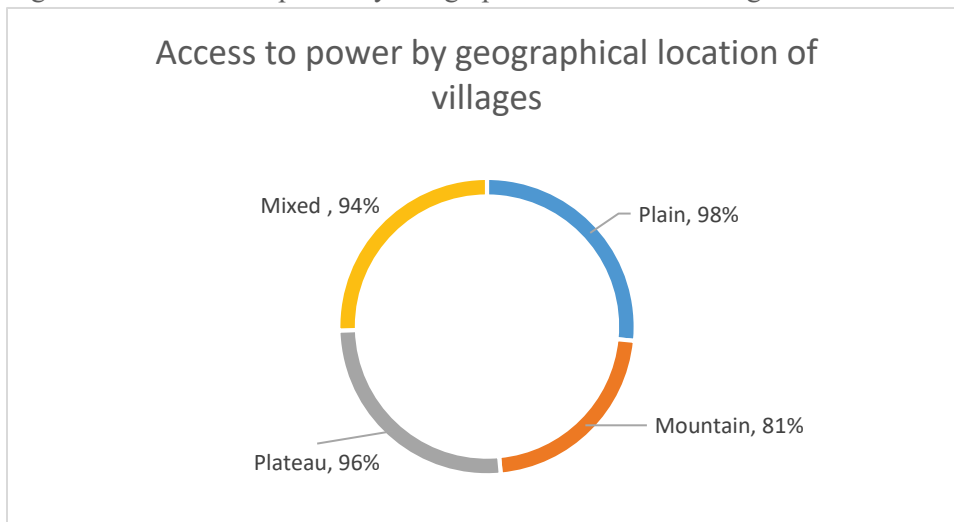
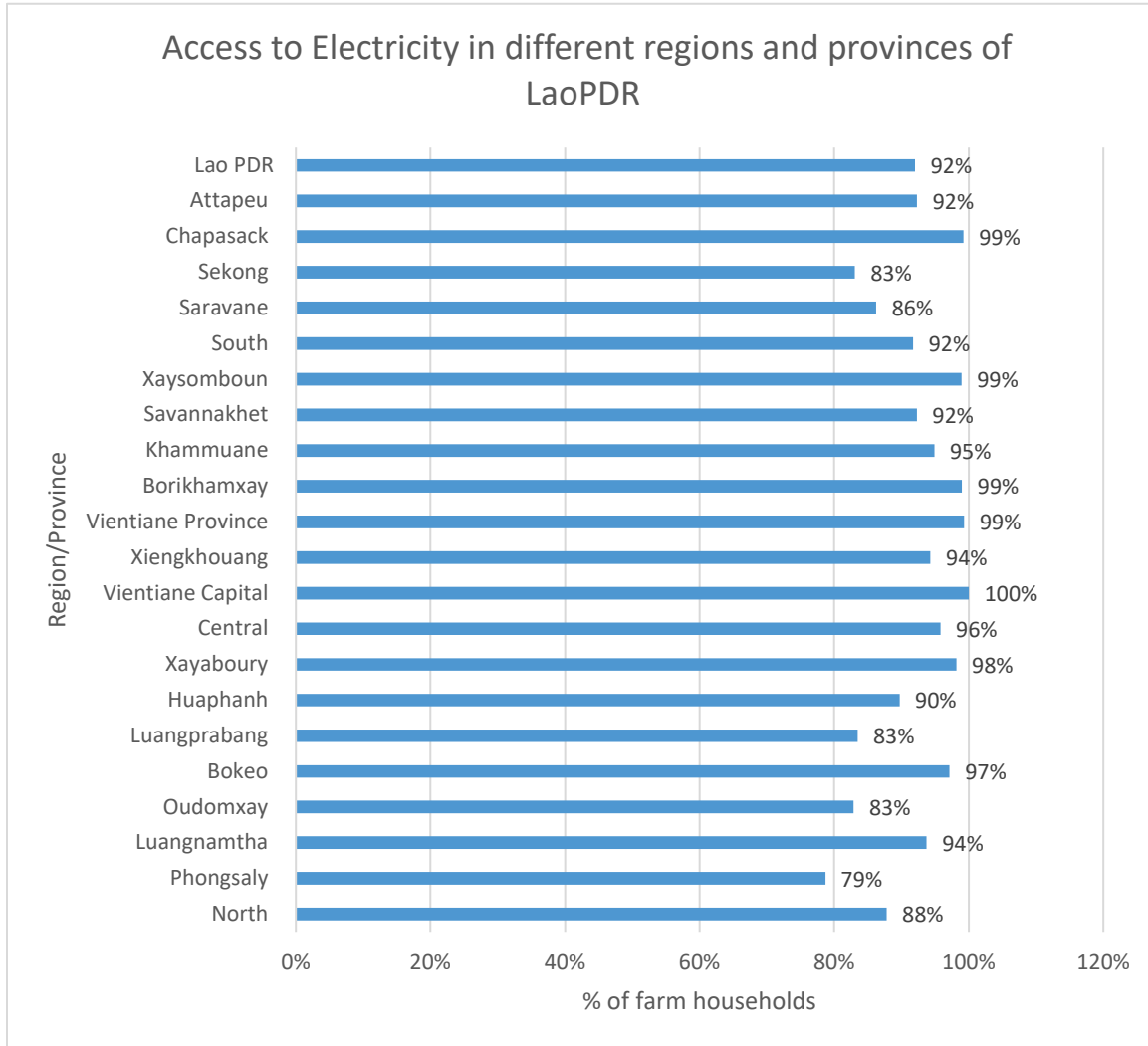


Figure 12.4: Access to power by Geographical location of villages in Lao PDR



Among the villages according to their geographical location, plain villages have the highest level of electrification followed by plateau and mixed villages. The lowest level of electrification is observed in mountain villages.

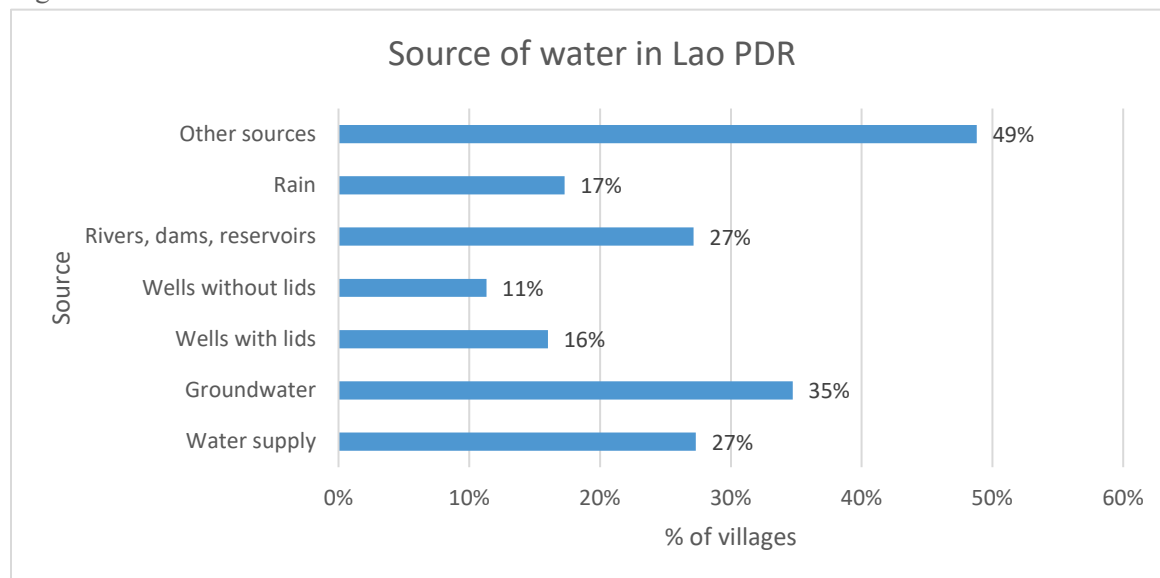
Figure 12.5: Access to electricity in different regions/provinces in Lao PDR



Among the regions and provinces of Lao PDR highest level of electrification has been observed in central region followed by south and lowest in the north. Among the provinces of Lao PDR Vientiane Capital has the 100% access to electricity to all the farm households followed by Chapasack and many others. The lowest level of electrification has been observed in the province of Phongsaly followed by Sekong and others.

12.5 Access to Water Source in Lao PDR

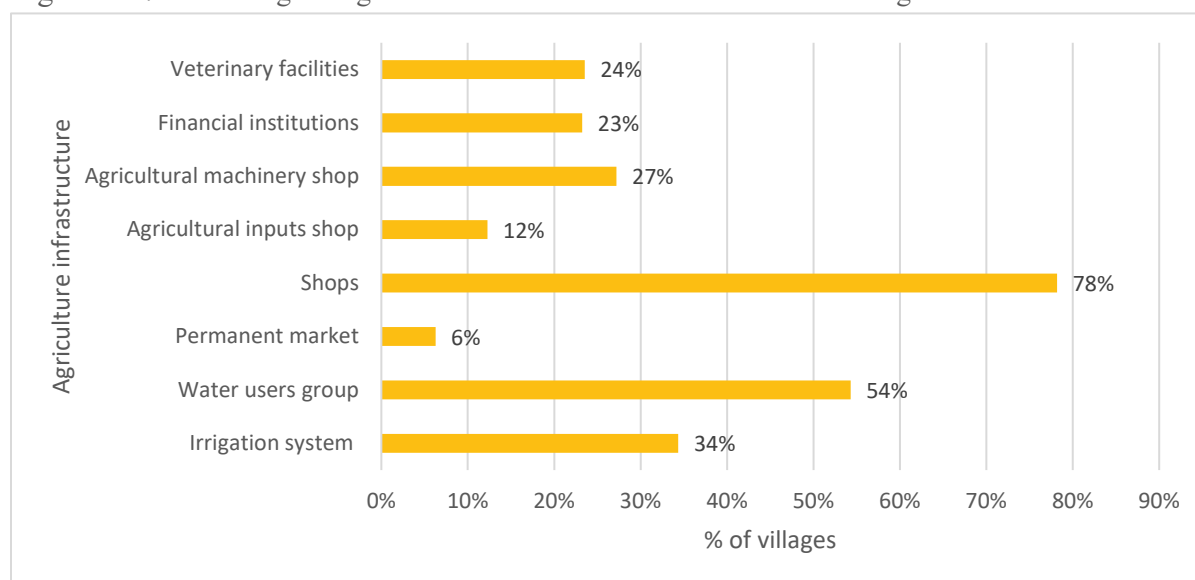
Figure 12.6: Access to water source



Villages in Lao PDR use different sources of water for household as well as agriculture purpose. Groundwater as a main source of their water need followed by rivers, dams and reservoirs. Water supply from formal sector is also common source of water in Lao PDR. Villages are also using a significant amount of wells with and without lids. Rain water is also taken as a very good source of water in Lao PDR. The details are presented in Table 12.1.3.

12.6 Access to Agriculture Infrastructure in Rural Villages of Lao PDR

Figure 12.7: Percentage of agriculture infrastructure facilities in rural villages of Lao PDR



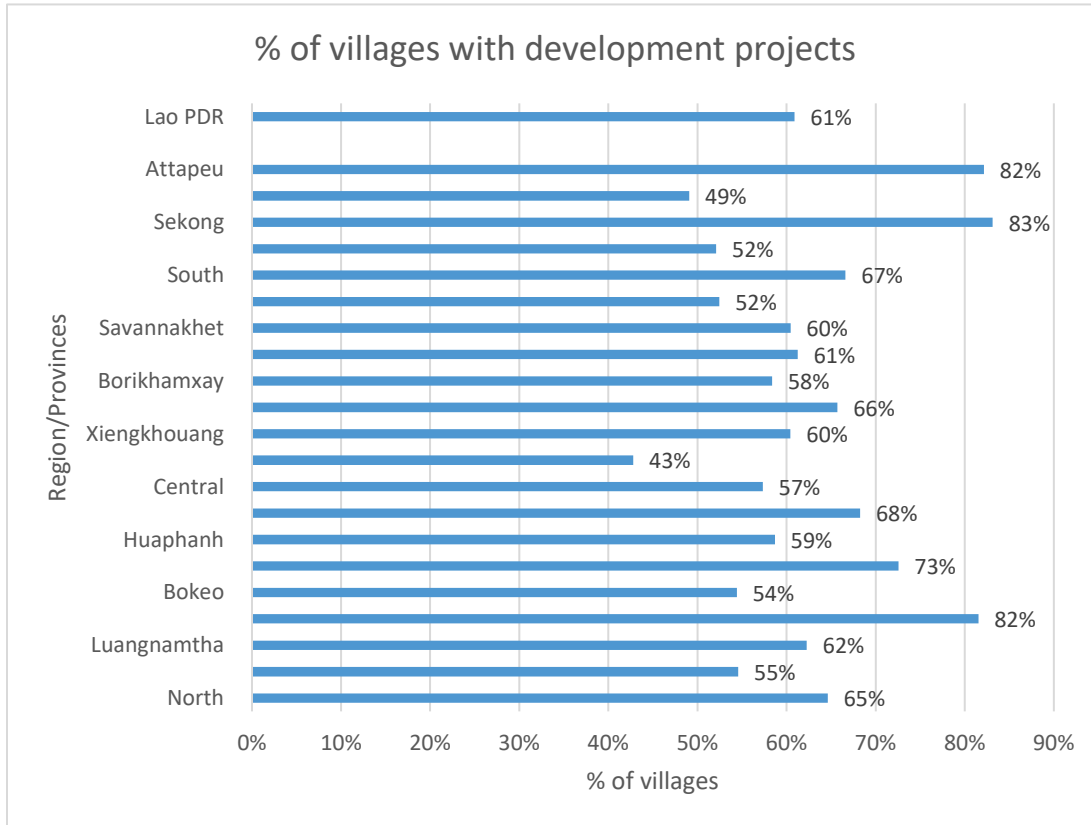
Among about 6900 rural villages in Lao PDR, 6% of those villages have permanent markets, 12% of them have agriculture input shops. About one fourth of these villages have access

to financial institutions, veterinary facilities and agriculture machinery shops. More than one third of these villages have irrigation system. More than half of these villages have water users groups and more than three fourth of these villages have shops for transaction.

12.7 Rural Villages with Development Projects

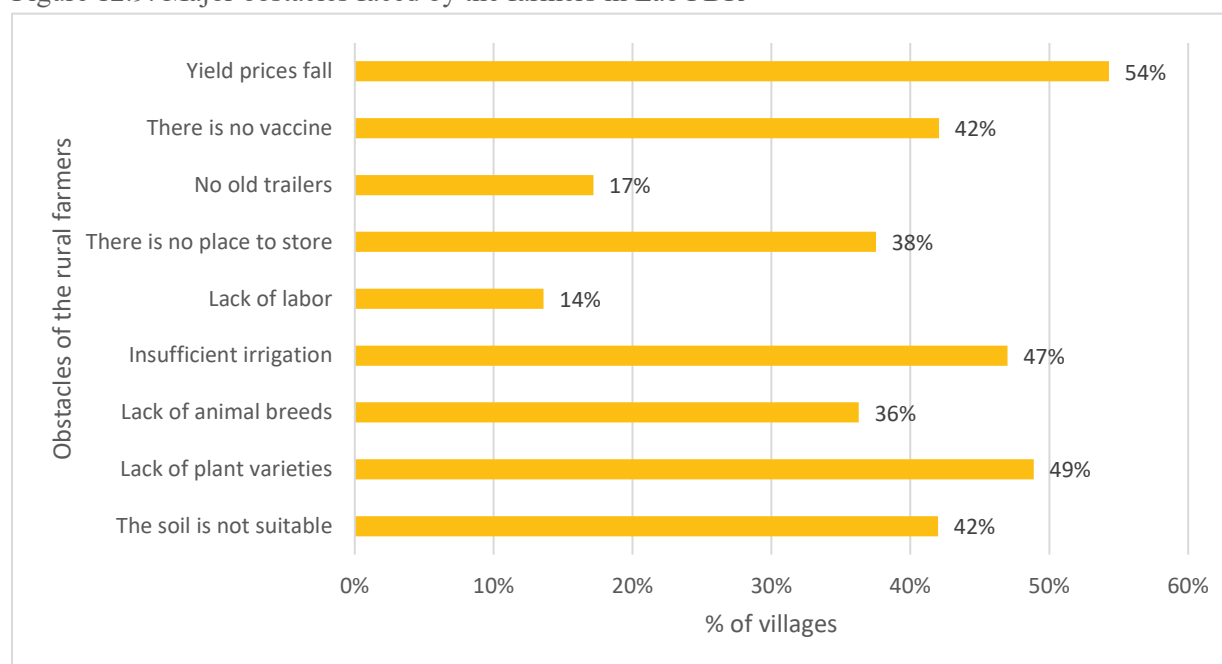
Projects are considered as tools for development. In Lao PDR there are many projects implemented in rural villages by government, local bodies, private sector as well as international partners. The major type of the projects are in the sectors crop, livestock, fisheries, forestry and environment. More than 60% of rural Lao villages have one or another type of the project. Among the regions south has the highest proportion of projects followed by north and lowest in central. Among the province of Lao PDR, highest proportion of project implemented villages are in Sekong followed by Attapeu and Oudomxay. The lowest proportion of project implementing villages are in the province of Vientiane capital followed by Chapasak and Saravane.

Figure 12.8: Rural villages with development projects



12.8 Constraints/Obstacles to Farmers in rural Villages

Figure 12.9: Major obstacles faced by the farmers in Lao PDR



In the rural villages of Lao PDR, farmers are facing many obstacles among them highest constraint reported by them is fall in production prices. Other problems faced by rural households are lack of modern plant varieties, insufficient irrigation, lack of vaccines, unsuitable soil, lack of animal breed as well as lack of labours.

Table 12.2: Major obstacles faced by rural farmers in Lao PDR by region

Reasons	Lao PDR	North	Central	South
The soil is not suitable	42	42	43	40
Lack of plant varieties	49	41	51	61
Lack of animal breeds	36	34	37	39
Insufficient irrigation	47	48	50	40
Lack of labour	14	11	15	17
No place to store	38	39	36	36
No old Trailers	17	20	15	16
No Vaccine	42	43	39	45
Yield prices fall	54	60	49	52
Others	8	9	7	7

Among the regions highest proportion of obstacles have been experienced by north followed by south and lowest in the central region.

12.9 Conclusion

Well-developed infrastructure lowers the cost of production, increase the wage rates of the farm population and assist in reducing poverty and malnutrition. Agricultural infrastructure in fact facilitates the production, procurement, processing, preservation and trade of the agricultural activities and produce. Major infrastructure includes road, irrigation, electricity and farm house etc. There are three types of villages: urban (17%), rural with road (76%), and rural without road (7%) in the Lao PDR. More than 80% villages have at least a primary school, 11% of village have elementary school. Obviously, more villages from urban areas have well access to school followed by rural with road access. Urban villages have 100% access to electricity while 92% from rural with road and only 72% from rural without road have the access to electricity. Supply of water is expanded only up to 27% villages and rest of the villages use other water sources such as ground water, wells, rivers, dams, reservoirs, rain and other. Veterinary services are accessible to only 24% village, irrigation service to 34%, permanent market to 6%, agricultural input shop to 12%, agricultural machinery shop to 27%, financial institution to 23% and so on. Major problems faced by farm households are: yield prices fall (54%), lack of plan varieties (49%), insufficient irrigation (47%), unsuitability of soil and no vaccine (42%), lack of store (38%), lack of animal breed (36%), lack of labour (14%) and so on. Based on these facts, it can be concluded that policy makers and stakeholder prioritized the development of the agricultural infrastructure to strengthen the agricultural activities in the Lao PDR.

Table 12.1.1: Infrastructure by province, village type, land type, of each province, 2019/20

Province / Type of village / Soil type	No of villages	Clearance of each type of base (% of the village)										
		Complete primary school	Elementary School	Elementary school less than an hour's walk	Home pharmacy or medicine	District or Village Hospital	City Hall or bookstore takes at least 2 hours	Homes that use electri city	Homes that use state grid	Clean water supply inside the house	Year- round bus route to the city	No Route Year- round bus
North	3,497	2,878	404	298	1,375	740	2,257	3,070	2,825	554	3,289	208
Phongsaly	516	351	128	59	122	71	314	406	310	45	479	37
Luangnamtha	351	284	48	27	103	79	231	329	301	95	340	11
Oudomxay	473	390	61	23	226	90	307	392	372	64	417	56
Bokeo	245	188	26	38	100	64	168	238	234	44	244	1
Luangprabang	751	650	69	72	252	162	468	627	573	143	727	24
Huaphanh	729	640	51	41	337	128	496	654	620	46	654	75
Xayaboury	432	375	21	38	235	146	273	424	415	117	428	4
Central	3,361	2,773	304	340	1,532	952	2,209	3,219	3,136	745	3,303	58
Vientiane Capital	482	369	37	76	294	214	266	482	475	321	481	1
Xiengkhouang	474	349	40	88	186	80	349	447	435	60	452	22
Vientiane Province	430	357	39	56	232	138	286	427	414	98	426	4
Borikhamxay	295	246	36	15	177	91	183	292	282	66	289	6
Khammuane	566	473	57	66	169	140	390	537	522	74	556	10
Savannakhet	1,023	898	87	37	429	258	684	944	920	118	1,008	15
Xaysomboun	91	81	8	2	45	31	51	90	88	8	91	0
South	1,558	1,260	232	86	568	378	1,060	1,429	1,375	279	1,508	50
Saravane	581	443	112	41	162	102	443	501	494	61	572	9
Sekong	195	179	12	4	67	43	109	162	126	55	194	1
Chapasack	639	507	100	37	264	177	430	634	623	140	599	40
Attapeu	143	131	8	4	75	56	78	132	132	23	143	0
Village types												
Urban	1,472	1,164	92	224	780	679	789	1,466	1,440	1,071	1,472	0
Rural with access to roads	6,372	5,266	773	466	2,481	1,311	4,425	5,840	5,562	499	6,372	0

Rural without access to roads	572	481	75	34	214	80	312	412	334	8	256	316
<i>Geographical location</i>												
Plain villages	3,529	2,863	375	330	1,533	1,052	2,357	3,460	3,390	1,068	3,475	54
Mountain	2,914	2,435	370	183	1,097	535	1,801	2,366	2,098	170	2,689	225
Plateau	1,661	1,360	164	174	692	402	1,162	1,599	1,571	287	1,634	27
Mixed	312	253	31	37	153	81	206	293	277	53	302	10

Table 12.1.2: Power sources by province, village type and land type, 2019/20

Province / Type of village /	Number of villages	% of villages that use electricity	Power source (Number of village)			
			Grid of the state	Generators Of the state	Electric drops	Powered by Solar
North	3,497	88%	2,825	32	133	201
Phongsaly	516	79%	310	4	38	97
Luangnamtha	351	94%	301	4	9	30
Oudomxay	473	83%	372	4	7	20
Bokeo	245	97%	234	6	1	5
Luangprabang	751	83%	573	3	33	40
Huaphanh	729	90%	620	9	43	4
Xayaboury	432	98%	415	2	2	5
Central	3,361	96%	3,136	39	16	86
Vientiane Capital	482	100%	475	1	0	12
Xiengkhouang	474	94%	435	10	4	7
Vientiane Province	430	99%	414	6	1	3
Borikhamxay	295	99%	282	1	1	0
Khammuane	566	95%	522	6	2	9
Savannakhet	1,023	92%	920	12	4	55
Xaysomboun	91	99%	88	3	4	0
South	1,558	92%	1,375	12	36	90
Saravane	581	86%	494	4	3	35
Sekong	195	83%	126	0	32	39
Chapasack	639	99%	623	7	1	5
Attapeu	143	92%	132	1	0	11
Urban/Rural						

Urban Villages	1,472	100%	1,440	14	5	21	
Rural with access to roads	6,372	92%	5,562	66	136	303	
Rural without access to roads	572	72%	334	3	44	53	
<i>Geographical Location</i>							
Plain	3,529	98%	3,390	30	9	100	
Mountain	2,914	81%	2,098	28	157	235	
Plateau	1,661	96%	1,571	14	14	27	
Mixed	312	94%	277	11	5	15	
Lao PDR	8,416	92%	7,336	83	185	377	

Table 12.1.3: Water sources used by households by province, village type and land type, 2019/20

Province / Type of village / Soil type	No of villages	Source of water used by household (% of village)						
		Water supply	Groundwater	Wells with lids	Wells without lids	Rivers, dams, reservoirs	Rain	Other sources
North	3,497	17%	10%	13%	6%	30%	10%	80%
Phongsaly	516	8.7%	1.6%	2.9%	2.1%	37.8%	8.5%	86%
Luangnamtha	351	27.1%	6.6%	9.7%	5.1%	19.9%	4.6%	83%
Oudomxay	473	13.5%	4.4%	4.0%	7.0%	34.5%	12.1%	87%
Bokeo	245	18.0%	18.0%	28.6%	11.0%	39.2%	12.7%	74%
Luangprabang	751	19.0%	5.9%	2.5%	2.0%	27.7%	8.8%	82%
Huaphanh	729	6.3%	1.2%	2.6%	1.8%	16.5%	5.5%	100%
Xayaboury	432	27.1%	35.6%	37.5%	14.4%	31.9%	19.2%	50%
Central	3,361	23%	48%	31%	24%	22%	17%	41%
Vientiane Capital	482	66.6%	62.7%	30.3%	14.5%	6.0%	2.9%	1%
Xiengkhouang	474	12.7%	7.6%	27.6%	15.0%	19.0%	12.7%	93%
Vientiane Province	430	22.8%	64.2%	55.1%	38.6%	24.2%	12.3%	33%
Borikhamxay	295	22.4%	41.0%	40.3%	29.8%	18.0%	13.6%	51%
Khammuane	566	13.1%	60.4%	32.7%	36.9%	26.0%	26.5%	13%
Savannakhet	1023	11.5%	81.9%	17.5%	23.6%	31.0%	35.8%	11%
Xaysomboun	91	8.8%	19.8%	16.5%	11.0%	28.6%	15.4%	82%
South	1,558	19%	67%	9%	13%	38%	36%	33%
Saravane	581	10.5%	85.7%	3.1%	11.0%	34.3%	43.0%	24%
Sekong	195	28.2%	31.8%	7.2%	12.8%	42.6%	26.2%	67%
Chapasack	639	21.9%	84.4%	8.3%	9.4%	43.5%	37.6%	7%
Attapeu	143	16.1%	67.8%	18.9%	18.9%	30.1%	39.2%	36%

<i>Urban/Rural</i>								
Urban Villages	1472	73%	46%	27%	14%	14%	11%	18%
Rural with access to roads	6372	8%	42%	16%	15%	31%	21%	56%
Rural without access to roads	572	1%	17%	5%	4%	37%	20%	73%
<i>Geographical Location</i>								
Plain	3529	30%	70%	26%	22%	23%	26%	11%
Mountain	2914	6%	9%	5%	5%	33%	12%	90%
Plateau	1661	17%	40%	22%	16%	30%	19%	59%
Mixed	312	17%	20%	13%	10%	25%	16%	79%
Lao PDR	8,416	18%	34%	17%	13%	28%	18%	60%

Table 12.1.4: Agricultural infrastructure in rural villages by province, village type and land type, 2019/20

Province/Type of village / Soil type	No of rural villages	Irrigation system	Leader group Use water	Market Permanent	Shops	Agricultural inputs shop	Agricultural machinery shop	Financial institutions	Veterinary facilities
North	2,969	1,135	1,845	204	2,139	202	529	595	519
Phongsaly	460	127	243	18	269	11	36	39	24
Luangnamtha	273	102	166	6	224	6	56	112	50
Oudomxay	417	236	469	14	322	21	96	88	44
Bokeo	204	85	139	12	171	10	60	46	38
Luangprabang	627	122	202	32	524	39	105	88	85
Huaphanh	673	291	324	52	323	66	74	116	191
Xayaboury	315	172	302	70	306	49	102	106	87
Central	2,639	917	1,481	132	2,186	477	999	638	787
Vientiane Capital	201	101	123	12	195	64	103	59	69
Xiengkhouang	407	149	323	15	265	16	56	56	50
Vientiane Province	344	209	334	23	318	132	203	107	144
Borikhamxay	233	94	161	21	226	35	109	91	84
Khammuane	498	124	214	33	404	90	139	142	147
Savannakhet	895	211	273	16	736	131	368	168	272
Xaysomboun	61	29	53	12	42	9	21	15	21
South	1,336	334	445	99	1,103	174	361	380	327
Saravane	524	140	156	9	423	28	134	99	100
Sekong	160	74	165	3	100	15	28	18	44
Chapasack	540	105	108	76	492	115	170	199	145
Attapeu	112	15	16	11	88	16	29	64	38
Lao PDR									
Urban village									

Rural areas have roads	6372	2255	3548	409	5132	813	1845	1521	1540
Rural areas have no roads	572	131	223	26	296	40	44	92	93
<i>Geographical Location</i>									
Plains	2530	800	1011	161	2247	467	1013	709	774
Mountain	2768	828	1376	149	1810	158	383	528	475
Plateau	1392	623	1120	103	1162	204	429	308	319
Mixed	254	135	264	22	209	24	64	68	65
<i>Lao PDR</i>	<i>6,944</i>	<i>2,386</i>	<i>3,771</i>	<i>435</i>	<i>5,428</i>	<i>853</i>	<i>1,889</i>	<i>1,613</i>	<i>1,633</i>

Table 12.1.5: Development projects in rural villages of Lao PDR, 2019/20

Province / Type of village / Soil type	No of rural villages	% Of villages with development projects	Development projects: Sector (no of rural villages)						
			Cultivation	Livestock	Fisheries	Forest	Stop slash- and-burn farming	Protect the environment	Other
North	2,969	65%	1937	1090	1084	82	314	310	277
Phongsaly	460	55%	251	170	102	11	35	13	14
Luangnamtha	273	62%	170	108	105	17	50	39	46
Oudomxay	417	82%	340	205	199	16	57	53	51
Bokeo	204	54%	111	69	62	7	22	36	32
Luangprabang	627	73%	455	254	281	12	66	65	54
Huaphanh	673	59%	395	170	196	6	29	49	40
Xayaboury	315	68%	215	114	139	13	55	55	40
Central	2,639	57%	1572	936	893	97	236	289	254
Vientiane Capital	201	43%	86	67	49	6	16	15	10
Xiengkhouang	407	60%	246	164	177	6	20	59	49
Vientiane Province	344	66%	226	123	119	15	50	77	47
Borikhamxay	233	58%	136	79	67	7	33	45	46
Khammuane	498	61%	305	215	195	24	27	63	53
Savannakhet	895	60%	541	266	262	34	84	27	46
Xaysomboun	61	52%	32	22	24	5	6	3	3
South	1,336	67%	763	454	427	95	171	102	123
Saravane	524	52%	273	133	113	12	51	17	20
Sekong	160	83%	133	98	101	27	40	25	42
Chapasack	540	49%	265	151	144	34	49	42	42
Attapeu	112	82%	92	72	69	22	31	18	19

Urban									
Rural with access to roads	6,372	62%	3928	2331	2226	256	688	656	602
Rural without access to roads	572	60%	344	149	178	18	33	45	52
<i>Geographical Location</i>	<i>6,944</i>	<i>62%</i>	<i>4,272</i>	<i>2,480</i>	<i>2,404</i>	<i>274</i>	<i>721</i>	<i>701</i>	<i>654</i>
Plain	2,530	54%	1378	788	696	109	214	177	155
Mountain	2,768	68%	1869	1079	1085	100	327	274	295
Plateau	1,392	62%	865	527	529	58	155	214	174
Mixed	254	63%	160	86	94	7	25	36	30
<i>Lao PDR</i>	<i>6,944</i>	<i>61%</i>	<i>4,272</i>	<i>2,480</i>	<i>2,404</i>	<i>274</i>	<i>721</i>	<i>701</i>	<i>654</i>

Table 12.1.6: Constraints / obstacles to farmers in rural villages by province, village type and land type,

Province / Type of village / Soil type	No of rural villages	Outstanding issues / problems of rural villages)								
		The soil is not suitable	Lack of plant varieties	Lack of animal breeds	Insufficien t irrigation	Lack of labor	There is no place to wait	No old trailers	There is no vaccine	Yield prices fall
<i>North</i>	<i>2,969</i>	<i>1252</i>	<i>1230</i>	<i>1022</i>	<i>1411</i>	<i>322</i>	<i>1165</i>	<i>585</i>	<i>1291</i>	<i>1778</i>
Phongsaly	460	137	200	165	164	59	181	95	214	258
Luangnamtha	273	103	155	135	159	24	123	51	122	177
Oudomxay	417	237	174	160	223	50	160	98	209	291
Bokeo	204	85	99	57	101	19	108	25	61	122
Luangprabang	627	243	317	275	209	99	267	132	291	445
Huaphanh	673	327	187	164	354	61	226	148	280	261
Xayaboury	315	120	98	66	201	10	100	36	114	224
<i>Central</i>	<i>2,639</i>	<i>1126</i>	<i>1344</i>	<i>974</i>	<i>1311</i>	<i>397</i>	<i>960</i>	<i>397</i>	<i>1024</i>	<i>1301</i>
Vientiane Capital	201	52	73	35	107	25	61	13	35	102
Xiengkhouang	407	208	144	141	186	75	158	90	182	229
Vientiane Province	344	105	169	149	219	38	142	33	134	218
Borikhamxay	233	97	114	70	130	32	100	40	86	135
Khammuane	498	212	292	190	217	63	180	57	194	190
Savannakhet	895	430	518	360	410	159	285	151	365	393

Xaysomboun	61	22	34	29	42	5	34	13	28	34
South	1,336	538	820	524	541	225	480	211	606	692
Saravane	524	201	326	188	214	79	157	94	228	231
Sekong	160	97	88	81	101	22	57	33	87	71
Chapasack	540	174	319	193	191	94	205	49	218	329
Attapeu	112	66	87	62	35	30	61	35	73	61
Urban										
Rural with access to roads	6,372	2687	3128	2327	3021	879	2351	1021	2659	3523
Rural without access to roads	572	229	266	193	242	65	254	172	262	248
Geographical Location	6,944	2,916	3,394	2,520	3,263	944	2,605	1,193	2,921	3,771
Plain	2,530	981	1383	861	1194	387	864	249	943	1248
Mountain	2,768	1257	1317	1125	1144	378	1127	709	1328	1534
Plateau	1,392	548	585	440	780	156	509	191	546	856
Mixed	254	130	109	94	145	23	105	44	104	133
Lao PDR	6,944	2,916	3,394	2,520	3,263	944	2,605	1,193	2,921	3,771

Chapter 13: Sustainable Development Goals

13.1 Background

All United Nations Member States gathered at New York in September, 2015 to adopt Sustainable Development Goals (SDGs), which provides a shared document for peace and prosperity for people and the planet, now and into the future to be achieved through partnership. These Goals are integrated among the three dimensions of sustainable development viz. economic, environmental, and social to realize the human rights and to achieve the gender equality and empowerment for all men and women. These goals are 17 in numbers, integrated with 169 targets and more than 232 indicators (UNSD 2016). SDGs are not alone a government responsibility, they are a national, country-wide responsibility. Strategic partnership among the governments (federal, provincial and local), non-government, private and community sectors would also be required.

SDG goals, targets and indicators are diverse in nature and can't be collected from a single source of data. Most of them come from administrative records (well established management information systems) and few others come from specific census or surveys. Though the scope of the agriculture census is limited to the farm households and population only, it has been tried to abstract the possible SDG indicators related to farm households, access to facilities, disasters as well as other indicators related to food and agriculture. Few indicators from goals 2,5,10 and 15 can be generated from the data collected through LAC. Since standard indicator calculation should have to follow the standard metadata definitions, procedure and concepts as outlined by United Nations Statistics Division (UNSD), it has been tried here to just present the numbers and proxy indicators (proportions) related to different indicators.

13.2 Data related to Food and Nutrition

Goal 2 specifies about the; End hunger, achieve food security and improved nutrition and promote sustainable agriculture with 8 targets as End hunger and ensure access by all people, to safe, nutritious and sufficient food all year round. End all forms of malnutrition, by 2025, the internationally agreed targets on stunting and wasting. Double the agricultural productivity and incomes of small-scale food producers. Ensure sustainable food production systems and implement resilient agricultural practices. By 2020, maintain the genetic diversity of seeds, cultivated plants and animals. Increase investment, in rural infrastructure, agricultural research and extension services and technology development. Correct and prevent trade restrictions and distortions in world agricultural markets. Adopt measures to ensure the proper functioning of food commodity markets and their derivatives.

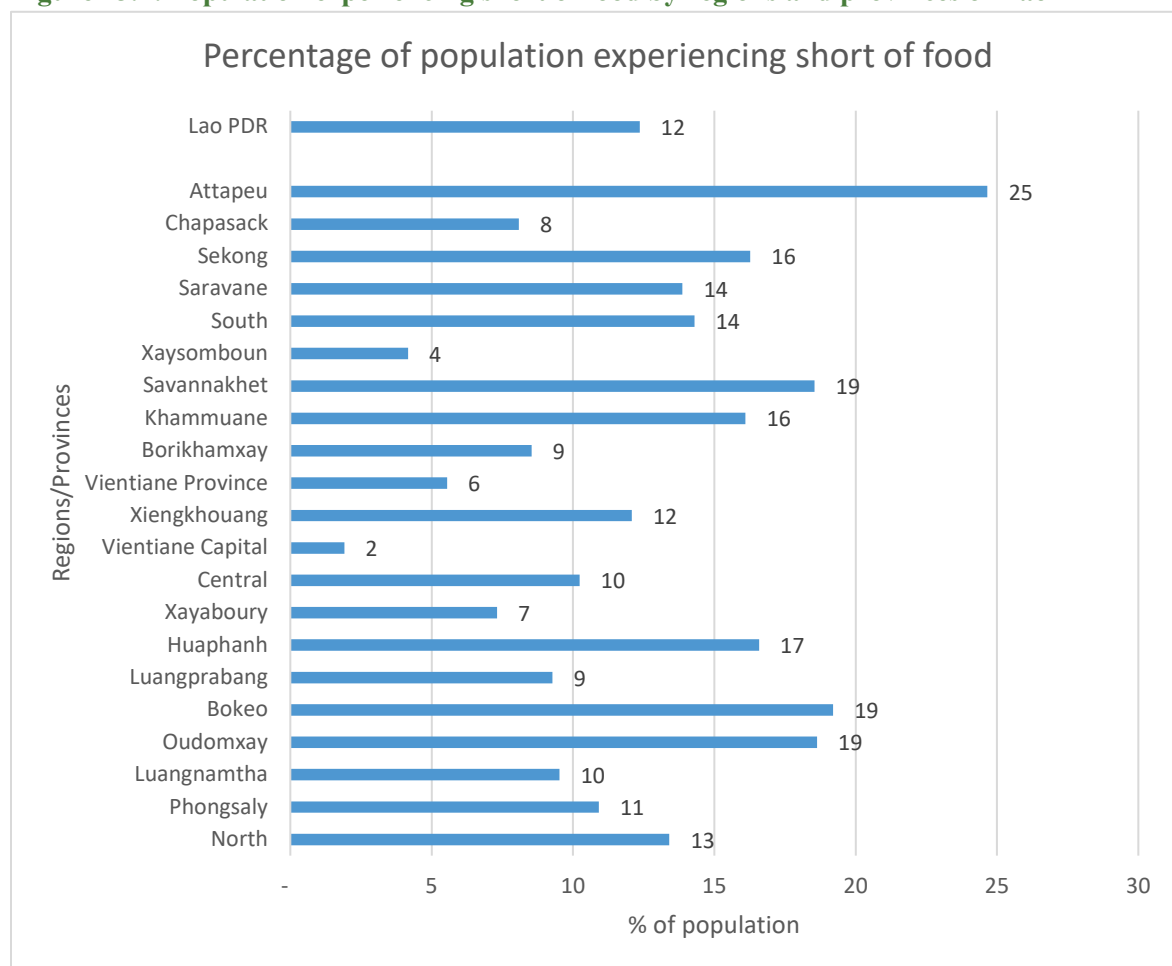
Target 2.1 specifically deals about the food security and nutrition and few proxies have been derived from the Lao Agriculture Census 2019/20 as follows.

Figure 13.1: Proportion of population experiencing short of food by village types and geographical location



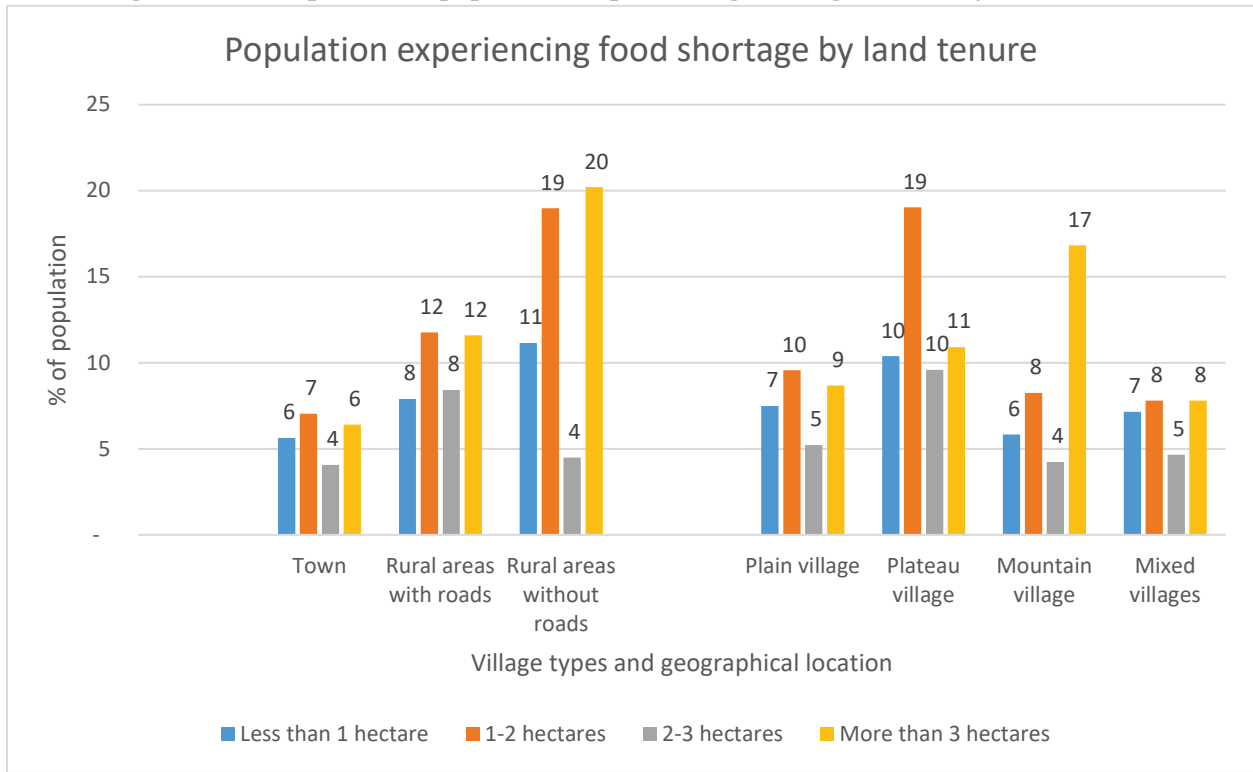
Figure 13.1 presents the proportion of farm population experiencing short of food according to the types of the villages and their geographical location by size of the family. The families with more than five members are more vulnerable to experiencing food shortage compared to those families with less than five people and equal to five people. Family members having equal to five in size seem less vulnerable than other categories in experiencing the food shortage. Rural areas without access to roads are experiencing more food shortage compared to those areas with access to roads as well as urban areas. Plateau villages are experiencing more food shortage followed by mountain and plain villages.

Figure 13.2: Population experiencing short of food by regions and provinces of Lao PDR



About 12% of the population in Lao PDR have reported the short of food during the census reference period. Among the regions South is experiencing the more shortage compared to north and central. Among the provinces highest proportion of Attapeu population are experiencing the food shortage followed by Sabvankhet, Bokeo and Oudomxay. The lowest proportion of population experiencing the food shortage are livising in the provinces of Vientiane capital followed by Xaysomboun and Vientiane province.

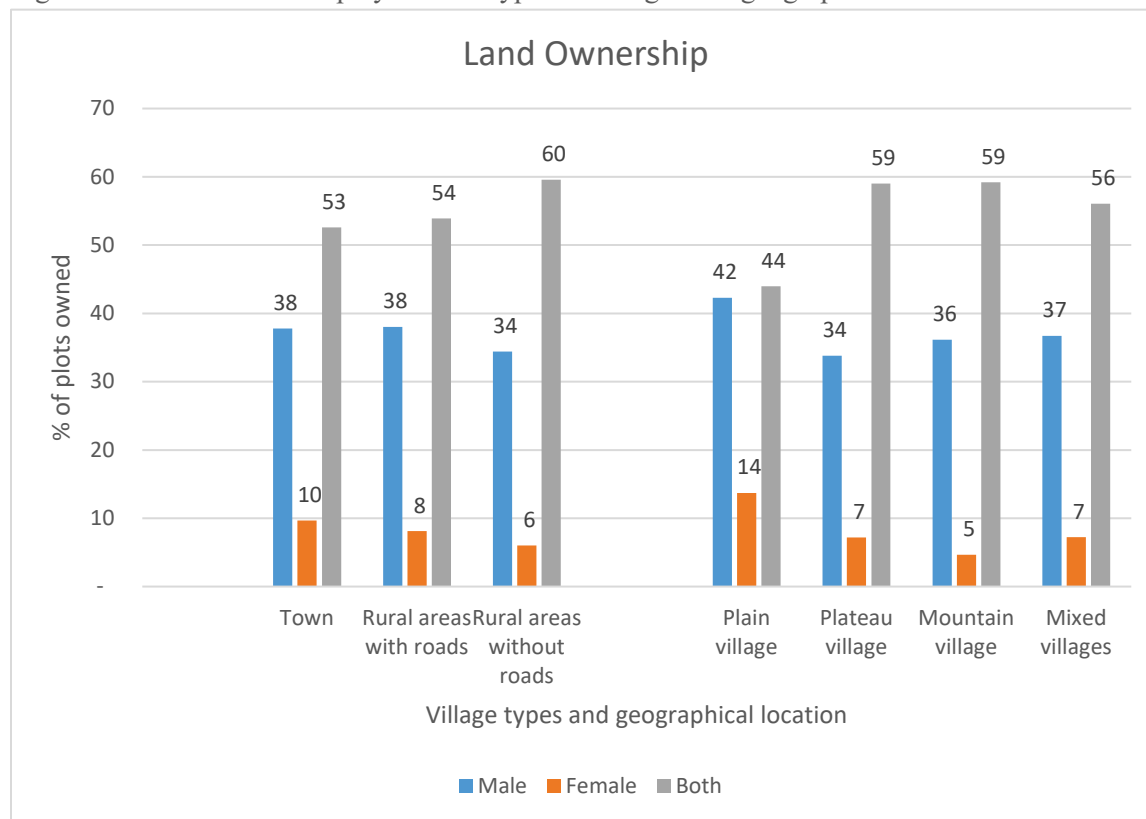
Figure 13.3: Proportion of population experiencing shortage of food by land tenure



Mixed results have been observed according to the size of the land tenure in different villages and geographical locations of Lao PDR in experiencing shortages of food during the census reference period. In rural areas without access to roads, where the highest proportion of the population are experiencing food shortages have more than three hectares of land. Fewer people are experiencing food shortages in towns despite their size of land tenure. Plateau and mountain villages are experiencing more food shortages with land tenure between 1 to 2 hectares. Interestingly, in mountain villages people having more land tenure are experiencing food shortages, this may be due to low fertility and less productivity of these lands.

13.3 Land Tenure

Figure 13.4: Land ownership by sex and types of villages and geographical location



Ownership of plots by sex and village types reveals that, in towns women have more land rights than in rural areas with access to roads and without access to roads. Among the villages in different geographical locations of Lao PDR, plain villages have the highest proportion of land owned by females followed by plateau and mixed villages and lowest proportion is in the mountains.

Land tenure is a major indicator for empowering women in agriculture development. In Lao PDR among about 1.4 million plots, only 8% of them are solely owned by females, 37% are owned by their male counterparts and remaining 55% are owned by both male and females.

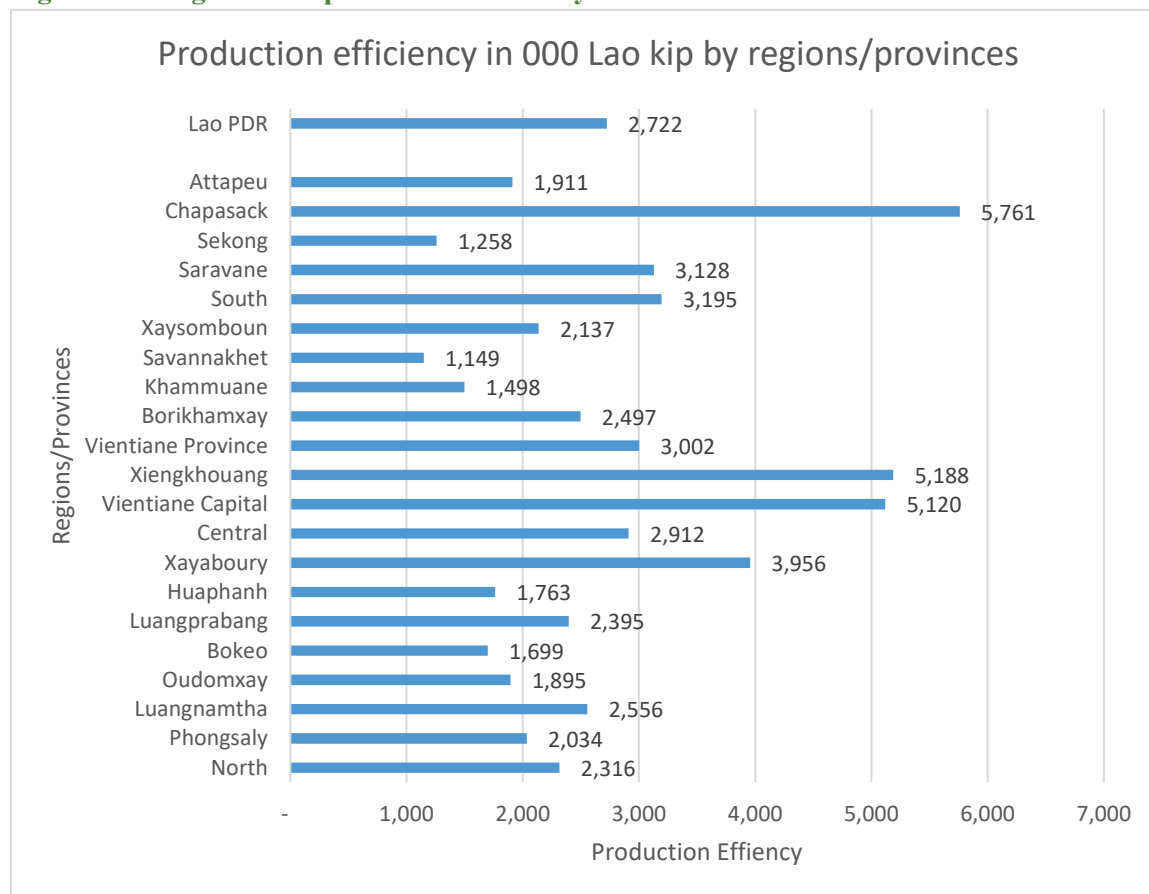
Table13.1: Land Owners Identity by sex

Province	No of agricultural plots	Land Tenure		
		Male	Female	Together
<i>Village type</i>				
Town	248,063	37.8	9.6	52.6
Rural areas with roads	1,079,474	38.0	8.1	53.9
Rural areas without roads	72,278	34.4	6.0	59.6
<i>Geographical location</i>				
Plain village	519,657	42.3	13.7	44.0
Plateau village	398,018	33.8	7.2	59.0
Mountain village	429,011	36.1	4.7	59.2
Mixed villages	53,129	36.7	7.2	56.1
North	616,622	32.6	4.3	63.0
Phongsaly	61,066	12.0	4.7	83.3
Luangnamtha	65,592	38.1	3.1	58.8
Oudomxay	121,870	36.6	5.7	57.7
Bokeo	38,516	41.6	4.5	53.8
Luangprabang	129,895	31.6	4.3	64.1
Huaphanh	64,688	19.9	1.7	78.4
Xayaboury	134,994	42.1	6.9	51.0
Central	514,066	41.3	9.5	49.2
Vientiane Capital	32,526	45.7	16.3	38.0
Xiengkhouang	61,816	45.5	5.7	48.8
Vientiane Province	94,378	40.2	11.0	48.8
Borikhamxay	64,818	21.3	8.2	70.5
Khammuane	60,836	54.3	14.9	30.8
Savannakhet	178,046	58.4	10.7	30.9
Xaysomboun	21,644	24.7	0.9	74.3
South	269,127	38.5	13.7	47.7
Saravane	93,379	50.6	15.9	33.5
Sekong	35,195	22.2	6.8	71.0
Chapasack	105,539	49.3	21.9	28.8
Attapeu	35,014	26.9	6.6	66.5
Lao PDR	1,399,814	37.2	8.2	54.6

13.4 Agriculture Production Efficiency

Production efficiency or labour productivity expressed in terms of 000 Lao kip, calculated by dividing the crop yield value with the number of workers engaged are presented in Figure 13.4.

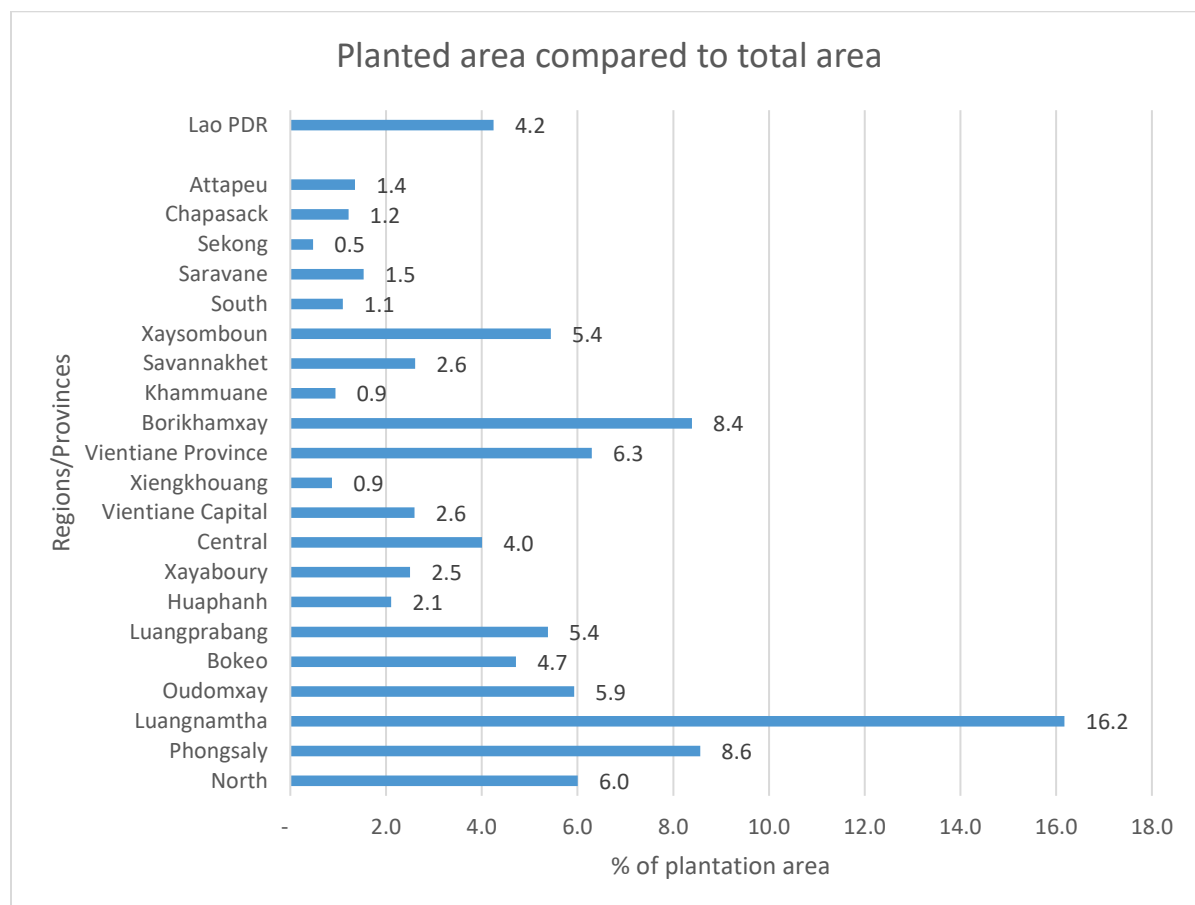
Figure 13.5: Agriculture production efficiency



The average labour productivity in Lao PDR is 2722 thousand Lao kip ranging from as low as 1149 thousand kip in Savankhet to 5761 thousand in Chapasack. South region has more production efficiency compared to central and north. Chapasack, Vientiane province, Vientiane capital and Xayaboury and Savane province are the top performers while Savankhet, Attapeu, Sekong, Khammaune and Bokeo are the lease performers in terms o fproduction efficiency.

13.5 Plantation Area

Figure 13.6: Proportion of planted area compared to total area



Planted area as a proportion of total land area gives an indication of land use, agriculture development and efficiency in agriculture sector. In Lao PDR only about 4% of the land area is planted. Among the regions north has the highest proportion of planted area followed by central and lowest in south. Among the provinces highest proportion of planted area is in the province Luangnamtha followed by Phongsaly and Borikhamxay. The lowest proportion of planted area is in Sekong followed by Khammuane and Chapasack.

13.7 Conclusion

Strategic partnership among the governments (federal, provincial and local), non-government, private and community sectors would also be required to achieving the SDGs. Therefore, carrying out agricultural activities is an opportunity of individual households to contribute in achieving some of the goals of the SDGs. With the information gathered through LAC some SGD indicators and some proxy indicators can be estimated and monitored. Basically, number of farm households, access to facilities, disasters as well as other indicators related to food

and agriculture can be derived using LAC results. Few indicators of the goals 2, 5, 10 and 15 can be generated by using the data collected through LAC. For example, LAC provides the proportion of households experiencing short of food (12%) which is an indicator to monitor SDG2. Therefore, it is reasonable to argue that LAC is one of the major source of information to estimate some important SDG indicators.

It has to be noted here that SDG indicators need to be estimated by using standard methodology as specified in the UNSD metadata portal. The information presented here are only proxies derived from the frequency distribution of the related variables from Lao Agriculture Census 2019/20.

Table 13.1.1: Population experiencing short of food by household size, 2019/20

Province	Number of households that used to be short of food	Number of people who used to be short of food	Household size		
			Less than 5 people	5 people	More than 5 people
<i>Village type</i>					
Town	6,375	33,749	6.4	5.0	11.8
Rural areas with roads	50,755	288,718	8.8	5.8	25.1
Rural areas without roads	4,351	24,875	13.0	9.1	32.7
<i>Geographical location</i>					
Plain village	25,673	146,083	8.1	5.1	17.8
Plateau village	21,704	122,506	12.0	7.8	30.1
Mountain village	12,670	70,832	7.7	5.2	22.2
Mixed villages	1,434	7,920	6.5	6.9	14.0
North	23,774	128,459	11.6	7.5	21.1
Phongsaly	1,855	9,762	11.1	4.8	16.8
Luangnamtha	1,793	9,771	12.0	5.5	11.1
Oudomxay	6,441	35,365	12.0	10.8	33.0
Bokeo	2,599	15,264	16.4	5.6	35.6
Luangprabang	5,266	27,620	8.2	6.2	13.3
Huaphanh	3,637	20,712	12.4	12.3	25.1
Xayaboury	2,182	9,964	8.4	5.3	8.2
Central	23,887	138,355	5.9	5.2	19.6
Vientiane Capital	618	2,973	2.3	1.3	2.1
Xiengkhouang	2,166	12,620	7.7	6.0	22.6
Vientiane Province	2,494	15,157	5.6	4.2	6.8
Borikhamxay	1,294	6,974	3.8	5.9	15.8
Khammuane	4,830	25,132	12.8	6.5	29.0
Savannakhet	12,134	73,708	4.9	6.8	43.9
Xaysomboun	351	1,792	4.7	3.8	4.0
South	13,820	80,528	8.7	5.3	28.8

Saravane	4,681	26,420	7.5	4.3	29.8
Sekong	1,728	11,294	12.9	3.5	32.4
Chapasack	4,578	25,733	4.0	5.7	14.5
Attapeu	2,834	17,081	12.2	10.8	51.0
Lao PDR	61,481	347,342	8.8	6.2	22.1

Table 13.1.2: Population experiencing food and nutrition shortages by agricultural land tenure, 2019/20

Province	Number of households that used to be short of food	Number of people who used to be short of food	Tenure of agricultural land (%)			
			Less than 1 hectare	1-2 hectares	2-3 hectares	More than 3 hectares
<i>Village type</i>						
Town	6,375	33,749	5.6	7.0	4.1	6.4
Rural areas with roads	50,755	288,718	7.9	11.8	8.4	11.6
Rural areas without roads	4,351	24,875	11.1	19.0	4.5	20.2
<i>Geographical location</i>						
Plain village	25,673	146,083	7.5	9.6	5.2	8.7
Plateau village	21,704	122,506	10.4	19.0	9.6	10.9
Mountain village	12,670	70,832	5.8	8.2	4.2	16.8
Mixed villages	1,434	7,920	7.1	7.8	4.7	7.8
North	23,774	128,459	8.7	11.8	6.0	13.8
Phongsaly	1,855	9,762	7.9	7.2	4.4	13.2
Luangnamtha	1,793	9,771	2.2	9.6	9.6	7.2
Oudomxay	6,441	35,365	7.7	8.5	9.7	30.0
Bokeo	2,599	15,264	4.8	25.1	7.0	20.7
Luangprabang	5,266	27,620	5.3	3.2	5.4	13.9
Huaphanh	3,637	20,712	26.7	18.4	2.4	2.3
Xayaboury	2,182	9,964	2.2	6.4	3.6	9.8
Central	23,887	138,355	7.9	10.3	4.6	7.9
Vientiane Capital	618	2,973	2.9	1.3	1.0	0.5
Xiengkhouang	2,166	12,620	8.7	10.1	8.5	8.9
Vientiane Province	2,494	15,157	3.1	2.1	2.7	8.7
Borikhamxay	1,294	6,974	7.5	6.6	1.2	10.3
Khammuane	4,830	25,132	15.3	15.0	11.0	7.1
Savannakhet	12,134	73,708	13.5	26.7	5.9	9.5
Xaysomboun	351	1,792	0.9	4.8	0.7	6.0
South	13,820	80,528	5.6	13.7	9.3	14.2

Saravane	4,681	26,420	5.8	10.6	10.4	14.8
Sekong	1,728	11,294	7.7	21.4	8.6	11.1
Chapasack	4,578	25,733	2.6	6.5	5.4	9.8
Attapeu	2,834	17,081	7.2	18.9	17.7	30.2
Lao PDR	61,481	347,342	7.8	11.6	6.1	11.6

Table13.1.3: Ratio of the population experiencing food and nutrition shortage by class of possession of weed crops, 2019/20

Province	No households that used to be short of food	No of people who used to be short of food	Class possession of weed crops				
			0.01-0.49 Ha	0.50-0.99 Ha	1.00-1.99 Ha	2.00-2.99 Ha	More than 3 Ha
Village type	61,481	347,342	10.5	12.5	11.0	1.4	1.6
Town	6,375	33,749	9.0	6.6	5.2	0.4	1.8
Rural areas with roads	50,755	288,718	10.6	13.7	11.6	2.3	1.5
Rural areas without roads	4,351	24,875	12.6	20.1	19.3	1.2	1.7
Geographical location	61,481	347,342	10.5	12.5	11.0	1.4	1.6
Plain village	25,673	146,083	6.5	12.2	8.7	1.9	1.7
Plateau village	21,704	122,506	16.8	13.8	16.9	1.3	1.1
Mountain village	12,670	70,832	9.1	13.2	9.3	0.9	2.7
Mixed villages	1,434	7,920	8.3	9.5	7.1	2.0	0.6
North	23,774	128,459	13.9	13.9	9.6	0.7	2.1
Phongsaly	1,855	9,762	24.7	4.9	1.8	0.8	0.4
Luangnamtha	1,793	9,771	14.0	7.4	3.4	0.2	3.5
Oudomxay	6,441	35,365	21.3	21.2	10.8	1.7	0.8
Bokeo	2,599	15,264	6.3	21.9	25.5	0.5	3.4
Luangprabang	5,266	27,620	8.2	6.6	8.8	1.0	3.1
Huaphanh	3,637	20,712	21.9	20.4	5.3	0.6	1.6
Xayaboury	2,182	9,964	5.6	8.6	6.6	0.3	0.8
Central	23,887	138,355	6.7	11.2	9.9	2.0	0.9
Vientiane Capital	618	2,973	2.3	1.9	1.3	0.2	0.0
Xiengkhouang	2,166	12,620	9.4	9.3	12.3	4.0	1.2
Vientiane Province	2,494	15,157	5.9	4.6	4.7	0.7	0.7
Borikhamxay	1,294	6,974	10.8	7.8	5.0	0.8	1.2
Khammuane	4,830	25,132	8.1	16.4	16.2	5.8	1.7
Savannakhet	12,134	73,708	3.8	27.0	21.9	1.7	1.1
Xaysomboun	351	1,792	3.5	6.4	2.6	-	-
South	13,820	80,528	10.7	12.3	16.0	1.8	2.1

Saravane	4,681	26,420	10.7	9.9	17.4	0.8	2.6
Sekong	1,728	11,294	17.0	17.7	10.7	2.6	0.8
Chapasack	4,578	25,733	2.2	3.3	15.2	1.2	2.4
Attapeu	2,834	17,081	15.2	25.3	26.7	3.1	3.6
Lao PDR	61,481	347,342	10.5	12.5	11.0	1.4	1.6

Table 13.1.4: Agricultural production efficiency, 2019/20

	Crop yield value (Kip)	Number of crop workers (persons)	Production efficiency (Kip)
<i>Village type</i>			
Town	1,663,467,237	580	2,702,581
Rural areas with roads	7,457,027,148	2,595	2,892,720
Rural areas without roads	351,513,075	157	2,386,119
<i>Geographical location</i>			
Plain village	3,693,356,970	1,508	2,629,111
Plateau village	3,585,942,468	858	3,329,261
Mountain village	1,913,905,315	853	2,201,078
Mixed villages	278,802,707	112	2,696,429
North	2,935,400,626	1,206	2,316,215
Phongsaly	216,158,940	103	2,034,391
Luangnamtha	287,386,711	106	2,555,522
Oudomxay	418,922,756	209	1,895,480
Bokeo	162,334,932	97	1,699,049
Luangprabang	511,230,299	235	2,394,511
Huaphanh	290,101,614	154	1,762,753
Xayaboury	1,049,265,375	302	3,956,002
Central	3,935,977,300	1,397	2,911,606
Vientiane Capital	381,915,179	89	5,119,952
Xiengkhouang	646,539,813	117	5,187,750
Vientiane Province	828,946,771	190	3,001,792
Borikhamxay	441,306,390	154	2,496,722
Khammuane	400,455,992	206	1,498,159
Savannakhet	1,151,186,279	602	1,148,607
Xaysomboun	85,626,876	40	2,137,415
South	2,600,629,535	728	3,194,587
Saravane	824,440,579	247	3,127,807

Sekong	139,167,561	82	1,258,380
Chapasack	1,511,307,536	315	5,760,791
Attapeu	125,713,859	83	1,910,657
Lao PDR	9,472,007,461	3,332	2,722,108

Table 13.1.5: Ratio of the population with lower than median income by activity, by sex, 2019/20

Province	Ratio of the population with below-average income from total income			Ratio of the population with below-average incomes from temporary crops			Ratio of the population with below-average income from permanent crops			Ratio of the population with below-average income from other activities		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
<i>Village type</i>												
Town	32.2	16.2	16.0	80.4	40.0	40.4	91.9	45.8	46.0	34.9	17.6	17.2
Rural areas with roads	44.3	22.2	22.1	74.7	37.8	36.9	94.0	47.6	46.3	50.1	25.2	25.0
Rural areas without roads	57.2	29.6	27.7	75.0	38.7	36.3	97.4	49.8	47.6	64.7	33.1	31.7
<i>Geographical location</i>												
Plain village	38.5	19.2	19.3	75.9	37.9	38.1	97.2	48.4	48.7	41.2	20.5	20.6
Plateau village	38.0	19.6	18.4	71.8	36.4	35.4	90.9	46.2	44.7	49.7	25.5	24.1
Mountain village	51.5	25.7	25.7	82.0	41.2	40.8	94.3	47.6	46.8	53.1	26.5	26.6
Mixed villages	42.9	22.0	20.9	77.9	39.9	37.9	93.6	48.0	45.6	46.4	23.7	22.7
North	41.8	21.4	20.4	80.5	40.7	39.8	96.0	48.4	47.6	44.3	22.5	21.7
Phongsaly	36.4	18.6	17.8	86.7	43.7	43.0	89.4	44.7	44.7	38.0	19.1	19.0
Luangnamtha	24.4	12.3	12.1	86.4	43.2	43.2	96.8	47.9	48.9	23.0	11.3	11.6
Oudomxay	40.5	19.4	21.1	75.9	37.0	38.9	92.5	46.2	46.3	44.4	21.6	22.7
Bokeo	64.1	31.3	32.8	90.8	44.8	46.0	96.9	47.6	49.3	58.8	29.0	29.8
Luangprabang	31.7	16.7	15.0	82.5	41.8	40.7	97.3	49.5	47.8	33.3	17.3	16.0

Huaphanh	56.2	30.5	25.7	94.7	49.7	45.0	97.6	51.2	46.5	52.5	28.4	24.1
Xayaboury	30.5	16.1	14.4	45.4	23.7	21.7	98.2	49.4	48.8	52.7	26.9	25.9
Central	42.1	21.4	20.7	75.5	38.1	37.4	95.7	48.6	47.1	45.6	23.3	22.2
Vientiane Capital	18.7	9.5	9.2	69.3	35.1	34.2	86.9	44.8	42.1	23.2	11.7	11.5
Xiengkhouang	26.3	13.2	13.0	51.2	26.6	24.6	95.7	48.6	47.1	42.6	22.1	20.5
Vientiane Province	33.4	17.1	16.2	77.1	38.9	38.2	93.6	48.2	45.4	37.1	20.1	17.0
Borikhamxay	29.1	14.0	15.1	66.1	32.3	33.8	97.8	48.9	48.9	33.2	16.0	17.2
Khammuane	68.4	35.4	33.0	88.6	45.9	42.8	99.7	51.6	48.2	64.0	33.0	31.1
Savannakhet	77.0	38.7	38.3	94.5	47.5	47.0	96.7	48.5	48.2	74.5	37.5	37.0
Xaysomboun	38.4	20.6	17.7	90.2	45.4	44.7	96.7	48.9	47.8	36.8	19.8	17.0
South	46.0	22.7	23.3	71.4	35.8	35.6	86.4	43.3	43.1	59.7	29.2	30.5
Saravane	54.2	27.2	27.0	63.1	31.9	31.1	95.5	47.8	47.7	69.7	34.6	35.1
Sekong	58.9	29.0	29.9	87.5	44.0	43.5	85.4	42.5	42.9	61.3	30.1	31.2
Chapasack	21.6	10.2	11.4	54.1	26.6	27.4	78.8	39.9	38.9	51.3	24.3	27.1
Attapeu	55.4	27.6	27.7	91.0	45.6	45.4	87.5	43.7	43.9	54.9	27.5	27.4
Lao PDR	42.8	21.6	21.1	76.7	38.7	38.0	94.0	47.5	46.5	47.9	24.2	23.7

Table 13.1.6: Ratio of farm households with incomes below average income by activity by sex of head of household, 2019/20

Province	Ratio of Households with incomes below average from total income			Ratio of Households with incomes below average from subsistence crops			Ratio of Households with incomes below average from perennial crops			Ratio of Households with below-average incomes from other activities		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
<i>Village type</i>												
Town	34.3	30.3	3.9	81.3	73.9	7.4	92.2	84.3	7.9	36.2	32.1	4.1
Rural areas with roads	46.4	41.8	4.6	75.4	69.0	6.3	94.2	87.1	7.1	52.1	47.2	4.9
Rural areas without roads	58.7	55.5	3.2	75.2	70.8	4.4	97.6	92.6	5.0	66.1	62.6	3.5
<i>Geographical location</i>												
Plain village	40.2	35.3	4.9	76.2	68.1	8.1	97.4	87.9	9.5	43.3	38.5	4.8
Plateau village	40.0	36.9	3.1	72.5	67.4	5.1	90.8	85.3	5.5	50.7	47.3	3.5
Mountain village	53.2	49.4	3.7	83.0	77.8	5.2	94.7	89.4	5.3	54.3	50.2	4.1
Mixed villages	45.7	40.6	5.1	78.3	70.8	7.5	94.3	86.1	8.2	48.8	43.3	5.5
North	44.3	41.5	2.8	80.9	76.4	4.6	96.2	91.3	4.9	46.4	43.5	2.8
Phongsaly	39.3	36.4	2.9	88.2	83.3	4.9	89.8	84.5	5.4	39.5	36.5	3.1
Luangnamtha	28.3	25.9	2.5	88.1	83.3	4.8	97.0	92.0	5.0	25.8	23.3	2.5
Oudomxay	41.4	37.4	4.0	76.7	70.2	6.5	93.0	87.0	6.0	44.8	41.3	3.5
Bokeo	66.5	62.3	4.2	90.2	84.2	6.0	96.9	91.1	5.8	61.0	57.3	3.8
Luangprabang	34.6	32.6	2.0	80.8	76.4	4.5	97.3	92.4	4.9	37.2	35.0	2.2
Huaphanh	58.1	56.4	1.8	94.6	92.1	2.4	97.7	95.1	2.6	54.3	52.6	1.8

Xayaboury	33.1	30.7	2.4	47.9	44.5	3.4	98.5	93.4	5.1	54.3	50.9	3.4
Central	43.5	39.1	4.4	76.3	68.9	7.4	96.0	87.8	8.2	46.7	42.4	4.3
Vientiane Capital	21.1	14.8	6.2	71.3	60.1	11.3	88.4	78.5	9.8	24.1	18.8	5.4
Xiengkhouang	27.4	25.7	1.7	52.1	48.8	3.3	95.8	90.9	4.8	43.9	41.4	2.5
Vientiane Province	34.8	32.1	2.7	78.1	70.4	7.8	93.6	85.8	7.8	37.6	34.9	2.8
Borikhamxay	31.2	27.1	4.1	68.0	59.1	9.0	98.5	87.8	10.7	34.6	30.9	3.7
Khammuane	69.3	60.8	8.5	88.4	78.0	10.3	99.7	88.0	11.7	65.7	57.6	8.1
Savannakhet	76.5	70.8	5.7	94.3	86.7	7.7	97.1	88.2	8.9	73.7	68.1	5.6
Xaysomboun	41.7	38.8	2.9	90.3	87.0	3.3	96.7	93.3	3.4	40.6	37.8	2.9
South	48.0	41.9	6.1	72.2	64.4	7.7	86.6	77.8	8.7	61.4	54.0	7.4
Saravane	54.6	49.2	5.4	63.6	57.8	5.7	95.2	86.5	8.8	70.3	63.1	7.2
Sekong	60.6	53.4	7.2	88.0	78.6	9.5	86.6	77.7	8.9	63.1	55.2	7.9
Chapasack	25.4	19.0	6.4	55.5	46.9	8.6	78.7	69.1	9.6	54.4	45.8	8.6
Attapeu	57.3	53.1	4.2	91.2	85.2	6.0	86.8	80.5	6.3	55.6	51.5	4.2
Lao PDR	44.7	40.6	4.1	77.4	71.1	6.3	94.2	87.3	6.9	49.5	45.2	4.3

Table 13.1.7: Plantation area per total area occupied by sex, household head, 2019/20

Province	Total tenure area (000)	Area of plantation (000)	Sex of the household head		
			Total	Male	Female
<i>Village type</i>					
Town	366.2	17.8	6.2	5.9	0.3
Rural areas with roads	1,545.8	33.9	4.1	3.9	0.2
Rural areas without roads	85.4	0.8	1.3	1.2	0.1
<i>Geographical location</i>					
Plain village	853.9	22.7	4.9	4.7	0.2
Plateau village	540.5	13.7	3.0	2.8	0.1
Mountain village	540.1	12.1	4.0	3.8	0.2
Mixed villages	62.9	4.0	5.9	5.4	0.4
North	720.4	28.8	6.0	5.8	0.2
Phongsaly	48.2	3.0	8.6	8.3	0.3
Luangnamtha	84.3	9.0	16.2	15.6	0.6
Oudomxay	123.6	2.6	5.9	5.9	0.1
Bokeo	50.6	2.5	4.7	4.5	0.2
Luangprabang	188.0	6.8	5.4	5.1	0.3
Huaphanh	48.7	0.6	2.1	2.0	0.1
Xayaboury	177.0	4.3	2.5	2.5	0.1
Central	873.0	21.0	4.0	3.7	0.3
Vientiane Capital	49.6	1.3	2.6	2.4	0.2
Xiengkhouang	81.9	0.4	0.9	0.9	0.0
Vientiane Province	153.5	5.4	6.3	5.6	0.7

Borikhamxay	109.1	5.9	8.4	7.4	1.0
Khammuane	93.3	2.0	0.9	0.9	0.0
Savannakhet	323.7	4.2	2.6	2.6	0.0
Xaysomboun	61.9	1.8	5.4	5.4	0.0
South	404.0	2.7	1.1	1.0	0.1
Saravane	139.0	0.6	1.5	1.5	0.1
Sekong	34.9	0.1	0.5	0.4	0.1
Chapasack	179.4	1.2	1.2	1.0	0.2
Attapeu	50.7	0.8	1.4	1.3	0.1
Lao PDR	1,997.3	52.5	4.2	4.0	0.2

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<https://unstats.un.org/sdgs/iaeg-sdgs/tier-classification/>

Annex II: Composition of a **National Agriculture Census Steering Committee** and Technical Committee for Lao Agriculture Census 2020

Agriculture Census Steering Committee

1. Mr. Somdy DUANDY, Former Deputy Prime minister, Minister of MoF, Head of Agriculture Census Steering Committee;
2. Mr. BounChom OUBONPASERT, Minister of MoF, Steering Committee ;
3. Mr. Souphan KEOMIXAY, Former Minister of MPI, Deputy Head of Steering Committee;
4. Mr. Samaychanh BOUPHA, Former of Head LSB, Steering Committee;
5. Mme. Phonesaly SOUKSAVATH. Head of LSB, Deputy Head of Steering Committee (In charge Officer);
6. PhD. Phongparisack PRAVONGVIENGKHAM, Former Vice Minister, Ministry of Agriculture and Forestry, Steering Committee;
7. Prof. PhD Linkham DUANGSAVANH, Former Steering Committee;
8. Mr. Thongphat CONGMANY, Vice Minister, Ministry of Agriculture and Forestry;
9. Mme. Thipphakone CHANTHAVONGSA, Deputy Administrator, Government Office, Former Steering Committee;

Agriculture Office (ACO)

1. Mme. Phetsamone SONE, Deputy Head of LSB, Head of Agriculture Census Officer;
2. Mr. Xaypradeth CHOUNLAMANY, Former Director General, Department of Planning and Finance, Ministry of Agriculture and Forestry, Former Deputy Head of ACO;
3. Mr. Somxay SISANON, Director General, Ministry of Agriculture and Forestry, Former Deputy Head of ACO;
4. Mr. SUSARTH XAYAKOMARN, Director General, Department of Planning and Finance, Ministry of Agriculture and Forestry;
5. Mr. Vixay Santivong Director General, LSB, Deputy Head of ACO;
6. Mr. Bounmy VILAYCHIT, Director General, Department of Administration, LSB;
7. Mme. Soulapnhanh PHIMPHAPHONGSAVATH, Deputy Director General, LSB
8. Mr. Khamphanh CHALERNPHONE, Director General, LSB;
9. Mr. Kinhphet Assanavong, Deputy Director General, LSB;
10. Mr. Savanh HARNPHOM, Former Deputy Director General, Ministry of Agriculture and Forestry;
11. Mr. Phonesy LORPHAYBOUN, Former Agriculture Department, Department, Ministry of Defence;
12. Mr. Keo DUANGMALA, Deputy Director General, Department of Product Management, Department of .., Ministry of Security;
13. Mr. Sypheng PHANARMATH, Deputy Director General, Department of Treasure, Ministry of Finance;

14. Mr. Bounchan KOMBOUNYASITH, Director General, Department of Rural Development, MAF;
15. Mr. Somvang PHANTHAVONG, Director General, Department of Livestock and Fishery, MAF;
16. PhD. Sithong PHIPHAKKHAVONG, Deputy Director General, Department of Livestock and Fishery, MAF;
17. Mr. Bounpone SENGTONG, Deputy Director General, Department of Forestry, MAF;
18. Mr. Somboun LENGSAVATH, Deputy Director General, Department of Rural Development, MAF;
19. PhD. Mr. Thatheva SAPHANGTHONG, Department of Land and Management, MAF;
20. PhD. Mr. Somphone THANASACK, Deputy Director General, Irrigation Department, MAF;
21. Mr. Thongsavanh PHANTHALAVONG, Deputy Director General, Department of Agriculture Manufacturing, MAF;
22. Mr. Sisombath CHANTHAPHIM, Deputy Director General, Department of Map, Ministry of Home Affair;
23. Mr. Vin PHENGDUANG, Deputy Director General, Department of Land Management, MONRE;

Annex III: Concepts and Terms Used

Separately attached

Annex IV: Questionnaires Used

Separately attached

Annex V: Sampling Design and Estimation Procedure

LAC 2019/20 was a survey based on sampling technique. ICAR-Indian Agricultural Statistics Research Institute, New Delhi developed the sampling design for LAC 2019/2020 under the study entitled “Technical assistance on the sampling strategy of the 2019/20 Lao Agriculture Census” supported by the Food and Agriculture Organization of the United Nations (FAO). Based on this study, the sampling design used in LAC 2019/2020 was stratified two stage random sampling design (Figure 1). The following paragraphs of this section briefly describe the sampling design adopted in the Lao Agriculture Census 2019/2020.

Lao PDR administratively consists of 18 provinces followed by 148 districts followed by 8421 villages. Within each district, the total number of villages were grouped into two strata as urban and rural. Further, the rural villages were sub-stratified either as large villages and small villages or villages with road and villages without road based on the criterion responsible for heterogeneity of the villages. However, the urban villages need not be sub-stratified. Similar, but updated, village frame which was used in LAC 2010/11 was used for the selection of villages which contained information on the village name, village code, village type and number of households in the village. Villages and households were selected as follows:

1. Selection of Villages

Villages are considered as first stage units and a sample of farm households are to be selected from each sampled village as the second stage units. Within each district, from each stratum and sub-stratum, a sample of villages were selected by using Simple Random Sampling Without Replacement (SRSWOR) design using proportional allocation (Figure 1). Keeping in view that at least two villages should be selected from each stratum (sub-stratum in case of rural). Rural strata were sampled more frequently than urban strata to capture agricultural activities. Rural includes three sub-strata and all are equally important agriculturally and these sub-strata were sampled equally. Therefore, 25 percent of rural villages were selected within each sub-stratum, whereas only 10 percent of urban villages were selected. Often, the urban stratum in a district contains only a small number of villages. If there is only one village in the urban stratum that was ignored. On the other, if there is only one village in any sub-stratum of rural villages, that village was merged with adjacent sub-stratum before selecting the villages.

2. Selection of Households

Farm households are considered as second stage sampling unit and ultimately the enumeration unit of the LAC 2019/2020. Within each sampled villages, the farm households were identified from the listing information collected by Complete Enumeration of all households in Lao PDR using short questionnaire. In addition to this, two groups (sub-strata) were prepared from the listing information based on farm households related to crops, livestock. The criterion to identify a farm household as related crops/livestock depends on agricultural income. If 50 percent

of agricultural income is coming from crops/livestock, then farm household is related to crops/livestock group. If the information of agricultural income relating to crops/livestock is not available from the short questionnaire, directly 16 farm households were selected from the village and provision for these questions is suggested to be incorporated in the current long questionnaire. From each of these groups, a sample of farm households was selected by using SRSWOR design (Figure 1). A total of 16 sample farm households were selected from these three sub-strata by using SRSWOR design using proportional allocation on the basis of total number of farm household in that sub-stratum.

During the previous two agricultural censuses in Lao PDR, PPS sampling was considered for selection of villages. It is a well-known fact that estimation procedure under PPS without replacement sampling is cumbersome. Thus, SRSWOR technique was adopted for the third LAC. Under this methodology, villages were selected by simple random sampling without replacement using proportion allocation, which will result in simplified estimators of finite population parameter along with sampling errors. Main advantage of this sampling design over previous one is that the proposed methodology has simplified the estimation procedure, statistically under Sample Component of the Agricultural Census methodology. In addition, the change in sampling methodology has improved the reliability and consistency of the sample estimates. Additionally, this methodology has simplified the Sample Component of the Agricultural Census methodology. The other two components, i.e. Village component and Complete Enumeration (CE) component, was implemented as in LAC 2010/11.

Again, during previous two censuses, systematic sampling design was considered for selection of farm households at the second stage of sampling. Once again, it is well-known fact that, although systematic sampling results in better cross section of the population, systematic sampling induces difficulty in estimation of sampling errors of the estimates. This phenomenon has been reported in LAC 2010/11 also. Therefore, under the methodology used in third LAC, SRSWOR sampling was used for selection of farm households from each of the three groups, which has resulted in valid estimate of sampling errors for the estimators of finite population parameters. Regarding anticipated sampling provision for 6 districts affected by flash flooding, LSB has clarified the type of variables and the detailed results of the listing exercise carried out in those regions.

Figure IV.1: Flow chart of sampling strategy applied in the LAC 2019/2020

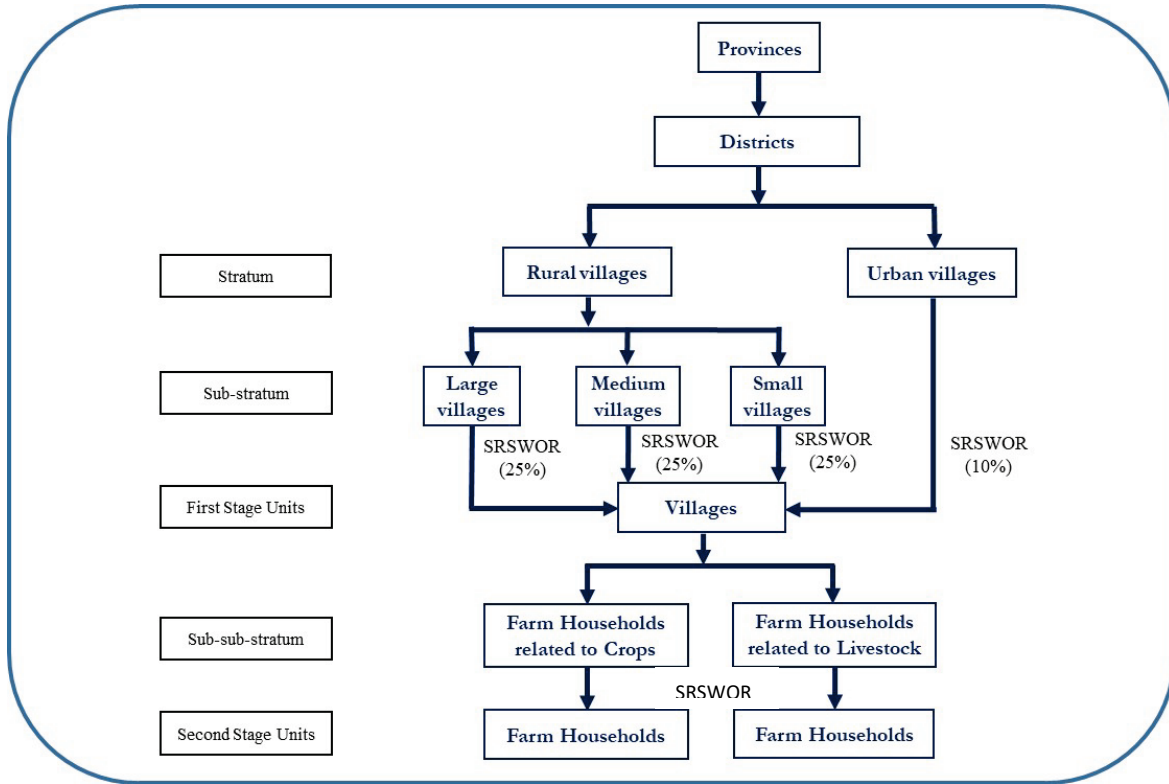


Table IV.1: Distribution of sampled villages by province and type of areas, LAC 2019/20

ຊື່ແຂວງ	ບ້ານຢູ່ເຂດຕົວເມືອງ		ບ້ານຢູ່ເຂດຊົນນະບົດທີ່ມີເນື້ອທີ່ດິນກະສິກໍາຂະໜາດນ້ອຍ		ບ້ານຢູ່ເຂດຊົນນະບົດທີ່ມີເນື້ອທີ່ດິນກະສິກໍາຂະໜາດກາງ		ບ້ານຢູ່ເຂດຊົນນະບົດທີ່ມີເນື້ອທີ່ດິນກະສິກໍາຂະໜາດໃຫຍ່		ລວມ	
	ຈໍານວນ	ສ່ວນຮ້ອຍ	ຈໍານວນ	ສ່ວນຮ້ອຍ	ຈໍານວນ	ສ່ວນຮ້ອຍ	ຈໍານວນ	ສ່ວນຮ້ອຍ	ຈໍານວນ	ສ່ວນຮ້ອຍ
ນະຄອນຫຼວງວຽງຈັນ	15	8%	23	4%	22	3%	30	3%	90	4%
ຜົ້ງສາລີ	8	4%	63	10%	38	6%	20	2%	129	5%
ຫຼວງນໍ້າທາ	6	3%	25	4%	39	6%	47	4%	117	5%
ອຸດົມໄຊ	9	5%	30	5%	37	5%	80	8%	156	6%
ບໍ່ແກ້ວ	5	3%	18	3%	32	5%	29	3%	84	3%
ຫຼວງພະບາງ	17	9%	71	11%	84	12%	56	5%	228	9%
ຫົວພັນ	13	7%	145	23%	40	6%	24	2%	222	9%
ໄຊຍະບູລີ	16	8%	18	3%	28	4%	71	7%	133	5%
ຊຽງຂວາງ	11	6%	37	6%	45	7%	48	5%	141	6%
ວຽງຈັນ	12	6%	19	3%	27	4%	68	6%	126	5%
ບໍລິຄໍາໄຊ	9	5%	9	1%	20	3%	61	6%	99	4%
ຄໍາມວນ	12	6%	36	6%	58	9%	70	7%	176	7%
ສະຫວັນນະເຂດ	22	11%	59	9%	75	11%	187	18%	343	13%
ສາລະວັນ	8	4%	17	3%	45	7%	94	9%	164	6%
ເຊກອງ	5	3%	23	4%	21	3%	18	2%	67	3%
ຈໍາປາສັກ	13	7%	26	4%	49	7%	104	10%	192	8%
ອັດຕະປື	8	4%	8	1%	13	2%	21	2%	50	2%
ໄຊສົມບູນ	3	2%	5	1%	5	1%	22	2%	35	1%
ລວມທັງໝົດ	192	100%	632	100%	678	100%	1,050	100%	2,552	100%

ESTIMATION PROCEDURE

1. Notation

Let:

- h = province ($h = 1, \dots, 17$),
 i = district ($i = 1, \dots, I_h$),
 j = stratum (urban/rural large/ rural medium/ rural small) ($j = 1, \dots, J_{hi}$),
 k = village or primary stage unit (PSU) ($k = 1, \dots, N_{hij}$),
 l = farm household or secondary stage unit (SSU) ($l = 1, \dots, M_{hijk}$),
 N_{hij} = number of villages (PSUs) in j -th stratum of i -th district of h -th province, (according to the village list)
 n_{hij} = number of villages (PSUs) selected in the sample in j -th stratum of i -th district of h -th province
 M_{hijk} = number of farm households (SSUs) in k -th village of j -th stratum of i -th district of h -th province (as enumerated in LAC III)
 m_{hijk} = number of sampled farm households (SSUs) in k -th village of j -th stratum of i -th district of h -th province (as enumerated in LAC III – usually 16)

2. Sample selection

In each stratum, a sample of n_{hij} villages was selected with Simple Random Sampling Without Replacement (SRSWOR). The village list prepared by DoS before the census can be used for frame preparation. The probability of selection of k -th village of j -th stratum of i -th district of h -th province was

$$p_{hijk}^{(V)} = \frac{n_{hij}}{N_{hij}} \quad (1)$$

In each selected village, within each stratum, all households were enumerated as part of the complete enumeration component of the census and all farm households were identified. A sample of farm households was then selected with equal probability i.e. SRSWOR. That is, all farm households in a village have the same probability of selection in the sample. Thus, within k -th selected village k of j -th stratum of i -th district of h -th province, the sample of m_{hijk} farm households was selected from the M_{hijk} farm households in the village with probability of selection:

$$p_{hijkl}^{(H)} = \frac{m_{hijk}}{M_{hijk}} \quad (2)$$

Thus, since SRSWOR is used at both the stages, the overall probability of selection of any farm household in k -th village of j -th stratum of i -th district of h -th province was:

$$p_{hijkl} = p_{hijk}^{(V)} \times p_{hijkl}^{(H)} = \frac{n_{hij}}{N_{hij}} \times \frac{m_{hijk}}{M_{hijk}} \quad (3)$$

3. Estimation of population totals at the district level

Let,

y_{hijkl} = value of study variable y for l -th farm household in k -th village of j -th stratum of i -th district of h -th province

The total value of the variable (Y_{hij}) for j -th stratum of i -th district of h -th province is unknown. Y_{hij} may be estimated from the sample as follows:

$$\hat{Y}_{hij} = \sum_{k=1}^{n_{hij}} \sum_{l=1}^{m_{hijk}} \left(\frac{1}{p_{hijkl}} \times y_{hijkl} \right) \quad (4)$$

The population total (Y_{hij}) for i -th district of h -th province can be estimated by summing the estimate of total for the strata within the district as follows:

$$\hat{Y}_{hi} = \sum_{j=1}^{J_{hi}} \hat{Y}_{hij} = \sum_{j=1}^{J_{hi}} \sum_{k=1}^{n_{hij}} \sum_{l=1}^{m_{hijk}} \left(\frac{1}{p_{hijkl}} \times y_{hijkl} \right) \quad (5)$$

In Equation 5, variable y represents any item from the sample component of the census; for example: number of pigs, number of farm households growing rice, area of maize, number of tractors, number of farm households with less than 1 ha of agricultural land who are growing rice, etc. For estimates of number of farm households with a characteristic, variable y is a Yes/No variable according to whether or not the farm household has the characteristic.

4. Estimation of population totals at province and national level

The estimate of population total of study variable for province h is given by:

$$\hat{Y}_h = \sum_{i=1}^{I_h} \hat{Y}_{hi} \quad (6)$$

The estimate of population total of study variable for Lao PDR is given by:

$$\hat{Y} = \sum_{h=1}^{17} \hat{Y}_h \quad (7)$$

5. Estimation of population means at different levels

It can be noted that M_{hijk} is available for all villages in Lao PDR as a result of the complete enumeration (CE) component of the census. That is, the total number of farm households at the stratum, district, province and national levels are known. This can be used for estimation of population means at different levels. Therefore, the population mean of the study variable per farm household for i^{th} district of h -th province (\bar{Y}_{hi}) can be estimated by dividing the estimate of population total for the district (\hat{Y}_{hi}) by total number of farm households in the district i.e.

$$\hat{\bar{Y}}_{hi} = \frac{\hat{Y}_{hi}}{M_{hi0}} = \frac{1}{M_{hi0}} \sum_{j=1}^{J_{hi}} \sum_{k=1}^{n_{hij}} \sum_{l=1}^{m_{hijk}} \left(\frac{1}{p_{hijkl}} \times y_{hijkl} \right) \quad (8)$$

where

$$M_{hi0} = \sum_{j=1}^{J_{hi}} \sum_{k=1}^{N_{hij}} M_{hijk}$$

Similarly, the population mean for h^{th} province (\bar{Y}_h) can be estimated as follows:

$$\hat{\bar{Y}}_h = \frac{\hat{Y}_h}{M_{h0}} = \frac{1}{M_{h0}} \sum_{i=1}^{I_h} \hat{Y}_{hi} \quad (9)$$

where

$$M_{h0} = \sum_{i=1}^{I_h} \sum_{j=1}^{J_{hi}} \sum_{k=1}^{N_{hij}} M_{hijk}$$

Similarly, the population mean of the study variable per farm household for Lao PDR (\bar{Y}) can be estimated as follows:

$$\hat{\bar{Y}} = \frac{\hat{Y}}{M_0} = \frac{1}{M_0} \sum_{h=1}^{17} \hat{Y}_h \quad (10)$$

where

$$M_0 = \sum_{h=1}^{17} \sum_{i=1}^{I_h} \sum_{j=1}^{J_{hi}} \sum_{k=1}^{N_{hij}} M_{hijk}$$

It has been observed that total number of farm households at different higher levels i.e. M_{hi0} , M_{h0} and M_0 are generally known. If these quantities are not known, sample estimates of these quantities shall be used as following

$$\hat{M}_{hi0} = \sum_{j=1}^{J_{hi}} \frac{N_{hij}}{n_{hij}} \sum_{k=1}^{n_{hij}} M_{hijk}, \quad \hat{M}_{h0} = \sum_{i=1}^{I_h} \sum_{j=1}^{J_{hi}} \frac{N_{hij}}{n_{hij}} \sum_{k=1}^{n_{hij}} M_{hijk} \quad \text{and} \quad \hat{M}_0 = \sum_{h=1}^{17} \sum_{i=1}^{I_h} \sum_{j=1}^{J_{hi}} \frac{N_{hij}}{n_{hij}} \sum_{k=1}^{n_{hij}} M_{hijk}.$$

To estimate population mean with respect to other variables, calculate the estimate of population totals for the numerator and denominator as shown in previous sections and divide the two estimates of totals. For example, to estimate the average number of pigs per pig holding for Lao PDR, first, calculate \hat{Y} (total number of pigs) and \hat{X} (total number of farm households with pigs) using Equation 7. Then, the estimate of average number of pigs per pig holding for Lao PDR is obtained as \hat{Y}/\hat{X} .

6. Calculation of sample weights

The district level estimate of total given in Equation 5, can be expressed as:

$$\hat{Y}_{hi} = \sum_{j=1}^{J_{hi}} \hat{Y}_{hij} = \sum_{j=1}^{J_{hi}} \sum_{k=1}^{n_{hij}} \sum_{l=1}^{m_{hijk}} (w_{hijkl} \times y_{hijkl}) \quad (11)$$

where w_{hijkl} is the sample weight:

$$w_{hijkl} = \frac{1}{p_{hijkl}} = \frac{N_{hij}}{n_{hij}} \times \frac{M_{hijk}}{m_{hijk}} \quad (12)$$

To calculate any estimate at any level, each sampled farm household is weighted by the sample weight w_{hijkl} . The sample weights are calculated at the village level; that is, all sampled farm households in a selected village have the same sample weight. The weight has two components:

- (i) the village sample weight $w_{hijk}^{(V)}$ and
- (ii) the farm household sample weight $w_{hijkl}^{(H)}$.

Thus,

$$w_{hijkl} = w_{hijk}^{(V)} \times w_{hijkl}^{(H)} \quad (13)$$

where

$$w_{hijk}^{(V)} = \frac{1}{p_{hijk}^{(V)}} = \frac{N_{hij}}{n_{hij}} \quad \text{and} \quad w_{hijkl}^{(H)} = \frac{1}{p_{hijkl}^{(H)}} = \frac{M_{hijk}}{m_{hijk}}. \quad (14)$$

The village sample weights $w_{hijk}^{(V)}$ shall be calculated based on the sample selection. The household sample weights $w_{hijkl}^{(H)}$ shall be calculated during the data processing operation.

7. Effect of non-response

The expressions for $w_{hijk}^{(V)}$ and $w_{hijkl}^{(H)}$ in Equations 14 apply regardless of non-response. In general, there are two elements of non-response: villages not enumerated and households missing in enumerated villages. Simple adjustments are to be made at the district level to correct for these two factors as following

$$\begin{aligned}
 w'_{hijkl} &= w_{hijk}^{(V')} \times w_{hijkl}^{(H')} \\
 w_{hijk}^{(V')} &= w_{hijk}^{(V)} \times w_{hijk}^{(CF-V)} = \frac{N_{hij}}{n_{hij}} \times \frac{n_{hij}}{n'_{hij}} \quad \text{and} \\
 w_{hijkl}^{(H')} &= w_{hijkl}^{(H)} \times w_{hijkl}^{(CF-H)} = \frac{M_{hijk}}{m_{hijk}} \times \frac{m_{hijk}}{m'_{hijk}}.
 \end{aligned} \tag{15}$$

where $w_{hijk}^{(CF-V)}$ and $w_{hijkl}^{(CF-H)}$ are correction factors due to non-response for village and farm household weight components respectively and n'_{hij} and m'_{hijk} the actual number of villages enumerated in the stratum and the actual number of farm households enumerated in the selected village.

8. Estimation of sampling errors

An estimate of variance of the district level estimate of total (\hat{Y}_{hi}) given in Equation 5 can be written as

$$\hat{V}(\hat{Y}_{hi}) = \sum_{j=1}^{J_{hi}} N_{hij}^2 \left[\left(\frac{1}{n_{hij}} - \frac{1}{N_{hij}} \right) s_{b,hij}^2 + \frac{1}{n_{hij} \times N_{hij}} \sum_{k=1}^{n_{hij}} M_{hijk}^2 \left(\frac{1}{m_{hijk}} - \frac{1}{M_{hijk}} \right) s_{w,hijk}^2 \right] \tag{16}$$

where

$$\begin{aligned}
 s_{b,hij}^2 &= \frac{1}{n_{hij} - 1} \sum_{k=1}^{n_{hij}} \left(\hat{Y}_{hijk} - \hat{Y}_{hij} \right)^2, \quad s_{w,hijk}^2 = \frac{1}{m_{hijk} - 1} \sum_{l=1}^{m_{hijk}} \left(y_{hijkl} - \bar{y}_{hijk} \right)^2, \\
 \bar{y}_{hijk} &= \frac{1}{m_{hijk}} \sum_{l=1}^{m_{hijk}} y_{hijkl}, \quad \hat{Y}_{hijk} = M_{hijk} \times \bar{y}_{hijk}, \quad \hat{Y}_{hij} = \frac{1}{n_{hij}} \sum_{k=1}^{n_{hij}} \hat{Y}_{hijk}.
 \end{aligned}$$

This form of estimate of variance is motivated by Cochran (1977)[§].

An estimate of standard error of the district level estimate of population total (\hat{Y}_{hi}) is given by

$$SE(\hat{Y}_{hi}) = \sqrt{\hat{V}(\hat{Y}_{hi})}$$

An estimate of percentage coefficient of variation (%CV) of the district level estimate of population total (\hat{Y}_{hi}) is given by

$$\%CV(\hat{Y}_{hi}) = \frac{SE(\hat{Y}_{hi})}{\hat{Y}_{hi}} \times 100 = \frac{\sqrt{\hat{V}(\hat{Y}_{hi})}}{\hat{Y}_{hi}} \times 100 \quad (17)$$

Estimates of variance of the province and national (i.e. Lao PDR) level estimates of population totals given in Equation 6 and 7 can be written as

$$\hat{V}(\hat{Y}_h) = \sum_{i=1}^{I_h} \hat{V}(\hat{Y}_{hi}) \quad \text{and} \quad \hat{V}(\hat{Y}) = \sum_{h=1}^{17} \hat{V}(\hat{Y}_h) = \sum_{h=1}^{17} \sum_{i=1}^{I_h} \hat{V}(\hat{Y}_{hi}) \quad (18)$$

Estimate of %CV of the province and national level estimates of population totals are given by

$$\%CV(\hat{Y}_h) = \frac{\hat{V}(\hat{Y}_h)}{\hat{Y}_h} \times 100 \quad \text{and} \quad \%CV(\hat{Y}) = \frac{\hat{V}(\hat{Y})}{\hat{Y}} \times 100 \quad (19)$$

Estimates of variance of the estimates of population means of the study variable per farm household at district, province and national (i.e. Lao PDR) level given in Equation 8, 9 and 10 can be written as

$$\begin{aligned} \hat{V}(\hat{\hat{Y}}_{hi}) &= \frac{1}{M_{hi0}^2} \hat{V}(\hat{Y}_{hi}), \\ \hat{V}(\hat{\hat{Y}}_h) &= \frac{1}{M_{h0}^2} \hat{V}(\hat{Y}_h), \\ \hat{V}(\hat{\hat{Y}}) &= \frac{1}{M_0^2} \hat{V}(\hat{Y}), \end{aligned} \quad (20)$$

where

$\hat{V}(\hat{Y}_{hi})$, $\hat{V}(\hat{Y}_h)$ and $\hat{V}(\hat{Y})$ are defined in Equation 16 and 18; M_{hi0} , M_{h0} and M_0 are defined in Equation 8, 9 and 10.

Estimate of %CV of the province and national level estimates of population means are given by

$$\%CV(\hat{\hat{Y}}_{hi}) = \frac{\hat{V}(\hat{\hat{Y}}_{hi})}{\hat{\hat{Y}}_{hi}} \times 100, \quad \%CV(\hat{\hat{Y}}_h) = \frac{\hat{V}(\hat{\hat{Y}}_h)}{\hat{\hat{Y}}_h} \times 100 \quad \text{and} \quad \%CV(\hat{\hat{Y}}) = \frac{\hat{V}(\hat{\hat{Y}})}{\hat{\hat{Y}}} \times 100 \quad (21)$$



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