



Food and Agriculture
Organization of the
United Nations



European Union



FOOD SYSTEMS PROFILE - **THE LAO PEOPLE'S DEMOCRATIC REPUBLIC**

Catalysing the sustainable and inclusive
transformation of food systems



The Lao
People's
Democratic
Republic



FOOD SYSTEM PROFILE - THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

Catalysing the sustainable and inclusive
transformation of food systems

Published by
the Food and Agriculture Organization of the United Nations
and
the French Agricultural Research Centre for International Development
and
the European Union
Rome, Montpellier and Brussels, 2022

Required citation:

FAO, European Union and CIRAD. 2022. *Food Systems Profile – The Lao People's Democratic Republic. Catalysing the sustainable and inclusive transformation of food systems*. Rome, Brussels and Montpellier, France. <https://doi.org/10.4060/cc0302en>

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO), the French Agricultural Research Centre for International Development (CIRAD) or the European Union (EU) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by CIRAD, FAO or EU in preference to others of a similar nature that are not mentioned. The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of CIRAD, FAO or EU.

ISBN 978-92-5-136303-4

© FAO, 2022



Some rights reserved. This work is made available under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; <https://creativecommons.org/licenses/by-nc-sa/3.0/igo/legalcode>).

Under the terms of this licence, this work may be copied, redistributed and adapted for non-commercial purposes, provided that the work is appropriately cited. In any use of this work, there should be no suggestion that FAO endorses any specific organization, products or services. The use of the FAO logo is not permitted. If the work is adapted, then it must be licensed under the same or equivalent Creative Commons licence. If a translation of this work is created, it must include the following disclaimer along with the required citation: "This translation was not created by the Food and Agriculture Organization of the United Nations (FAO). FAO is not responsible for the content or accuracy of this translation. The original [English] edition shall be the authoritative edition."

Disputes arising under the licence that cannot be settled amicably will be resolved by mediation and arbitration as described in Article 8 of the licence except as otherwise provided herein. The applicable mediation rules will be the mediation rules of the World Intellectual Property Organization <http://www.wipo.int/amc/en/mediation/rules> and any arbitration will be conducted in accordance with the Arbitration Rules of the United Nations Commission on International Trade Law (UNCITRAL).

Third-party materials. Users wishing to reuse material from this work that is attributed to a third party, such as tables, figures or images, are responsible for determining whether permission is needed for that reuse and for obtaining permission from the copyright holder. The risk of claims resulting from infringement of any third-party-owned component in the work rests solely with the user.

Sales, rights and licensing. FAO information products are available on the FAO website (www.fao.org/publications) and can be purchased through publications-sales@fao.org. Requests for commercial use should be submitted via: www.fao.org/contact-us/licence-request. Queries regarding rights and licensing should be submitted to: copyright@fao.org.



FOOD SYSTEMS PROFILE

THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

Key messages

The Lao People's Democratic Republic is a small landlocked country rich in natural resources, such as minerals, water, and forests. These resources have been instrumental in sustaining its high economic growth in recent years. The country has a tropical climate, with a pronounced rainy season from May to October, and a dry season from November to February. The land is largely mountainous with the Annamite Range towering over the northeastern and eastern parts of the country. Although The Lao People's Democratic Republic has a low population density (32 inhabitants per km²), the mountainous topography limits the arable land per capita. Agricultural land is scattered, with only a few areas along the Mekong River and its tributaries having extensive contiguous cultivated land. Despite a recent increase in the rate of urbanization, more than 60 percent of the population lives in rural areas, where most of the households (80 percent) are still subsistence farmers. The country has 50 officially recognized ethnic groups, making it the most ethnically diverse country in South-East Asia.

The Lao People's Democratic Republic has made significant progress towards achieving food security and reducing rural poverty, and has strong potential to move towards sustainable food systems:

- stunting and underweight in children below five years have decreased in recent years;
- self-sufficiency has been achieved in rice production at the national level;
- very high-quality food products are recognized and appreciated by domestic and global consumers, such as Khao kai noi rice, Boloven coffee, and Phongsaly tea;
- food production is still largely based on small-scale subsistence rice farming systems;
- rich natural resources (forests, waterways, biodiversity, minerals, and natural landscapes) underpin the country's green and clean potential;
- opening up to markets has led to increased exports to neighbouring countries, such as China, Thailand, and Viet Nam, contributing to national growth. The recently developed Laos-China railway will increase linkages with the Chinese market; and
- one of the youngest populations in South-East Asia, with a promising future for the agricultural sector and rural development, and a large labour force.



Despite swift economic progress, the Lao People's Democratic Republic still faces a number of challenges:

- malnutrition indicators remain a serious concern, such as anaemia among children under five years and women of reproductive age, while overweight and micronutrient deficiencies reflect a low diet diversity. The extent of malnutrition also varies based on geographical location and socioeconomic status;
- forests continue to provide a large share of the food and income of rural populations, despite being continuously depleted;
- a gradual shift from subsistence to commercial agriculture leads to several social and environmental impacts;
- transition to sustainable commercial production still presents the following challenges: limited infrastructure; limited technical knowledge; and lack of sufficient extension support;
- low productivity and unsustainable agriculture do not offer adequate opportunities for young rural workers, leading to a shrinking agricultural labour force and youth migration to cities for work. These migrants often become the urban poor;
- the informal structure of the domestic food processing sector, limited food import controls, and poor sanitary conditions lead to a high prevalence of unsafe food;
- poverty and vulnerability among smallholder farmers can intensify with the threats from climate change events, such as storms, floods and droughts, as their ability to cope is low; and
- gender inequities and traditional/social norms also adversely affect the health and nutrition of women of reproductive age and their children.

To enhance the sustainability of the country's food systems, the following should be considered when formulating policies:

- improve the national diet quality by supporting diversified farming systems, while limiting the spread of unsafe processed foods.
- encourage good practices and strengthen inspections and controls in processing and along the supply chain, while improving public awareness to reduce consumption of unsafe food;
- support innovations and skills to build clean agricultural systems and sustainable food chains, while ending the promotion of unsustainable cash crops (monocultures); and
- improve the capability of vulnerable farmers to be more resilient to climate events and economic shocks through diversified farming systems and market outlets.



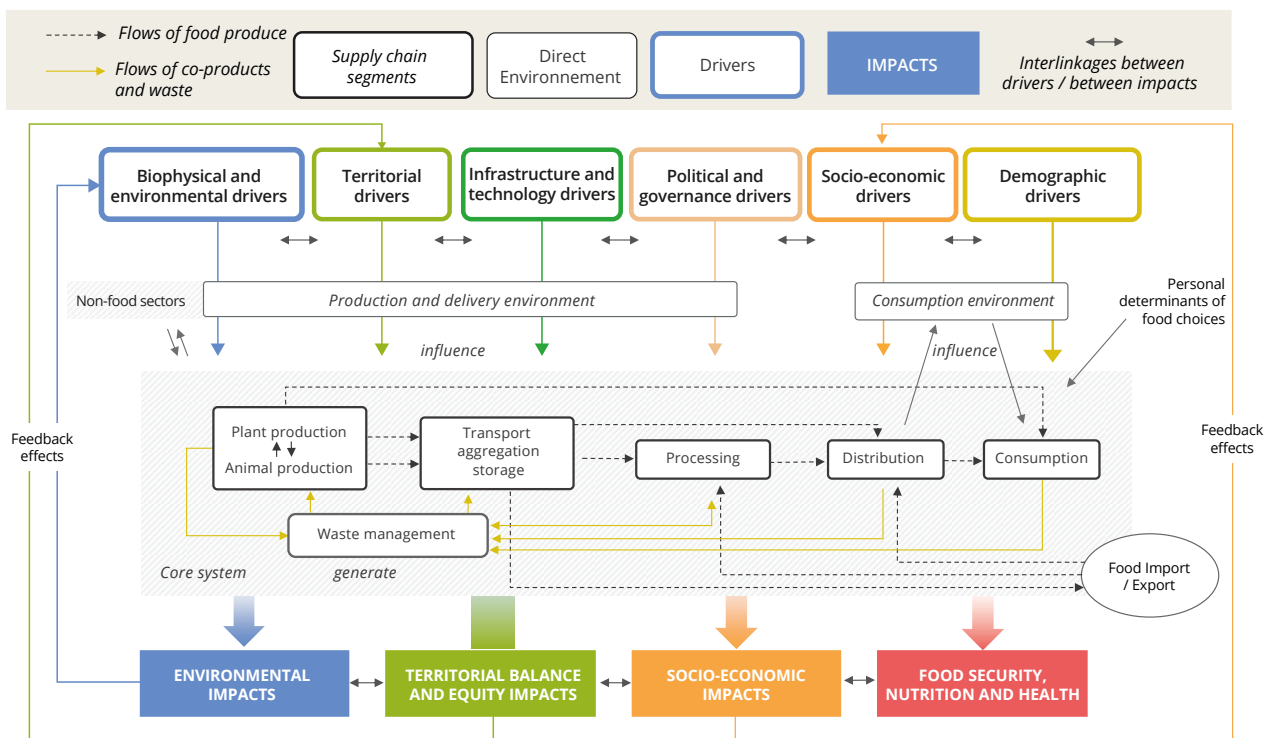
Methodology and process

This brief is the result of a collaboration between the Ministry of Agriculture and Forestry, the Lao People's Democratic Republic, the Food and Agriculture Organization of the United Nations (FAO), CIRAD, and the European Union, in close consultation with national and international experts. It was implemented in the Lao People's Democratic Republic from June to September 2021. The methodology used for preparing this brief is the result of a global initiative of the European Union, FAO, and CIRAD to **support the sustainable and inclusive transformation of food systems**. This assessment methodology is described in detail in the joint publication entitled, *Catalysing the sustainable and inclusive transformation of food systems: conceptual framework and method for national and territorial assessment* (David-Benz et al., 2022).

The assessment integrates qualitative and

quantitative data analysis with participatory processes by mobilizing public, private and civil society stakeholders. The approach includes interviews with key stakeholders and a consultation workshop to refine the systemic understanding of food systems and discuss potential levers to improve its sustainability. The assessment process thus initiates participatory analysis and stakeholder discussion on the strategic opportunities and constraints to the sustainable transformation of food systems. The approach assesses the actors and their activities at the core of the system, together with their interactions along the food chain as well as the environments directly influencing their behaviour. Conditioned by long-term drivers, these actors generate impacts in different dimensions that in turn influence drivers through several feedback loops (see Figure 1).

Figure 1. Analytical representation of the food system



Source: David-Benz, H., Sirdey, N., Deshons, A., Orbell, C. & Herlant, P. 2022. *Catalysing the sustainable and inclusive transformation of food systems: conceptual framework and method for national and territorial assessment*. Rome, Brussels and Montpellier, France. FAO, European Union and CIRAD.



The approach involves a detailed understanding of the key challenges along the four dimensions of sustainable and inclusive food systems: (i) food security, nutrition, and health; (ii) inclusive economic growth, jobs, and livelihoods; (iii) sustainable natural resource use and environment; and (iv) territorial balance and equity. Aimed at identifying critical issues affecting the sustainability and inclusivity of food systems, the assessment is both qualitative and quantitative. Critical challenges and key food systems dynamics are specified in the form of Key Sustainability Questions (KSQs), whose answers (see schematic representations for all KSQs) help identify systemic levers and areas of action that are essential to bringing about desired transformations in food systems.

This approach is designed as a preliminary rapid assessment for food systems and can be



implemented over 8–12 weeks. The methodology has been applied in more than 50 countries as a first step to support the transition towards sustainable food systems.





National context: key figures

The gross domestic product (GDP) per capita of the Lao People's Democratic Republic increased over the past two decades (see Table 1). Over the period 2016–2020, the national economy grew steadily, at an estimated average rate of 5.8 percent per year. However, the overall economic growth rate fell short of the national target of 7.2 percent for the period (Government of the Lao People's Democratic Republic, 2018). The poverty rate decreased by more than half between 2000 and 2020, falling from 46 percent to 18 percent (World Bank, 2020). Although the agriculture

sector's share of GDP growth decreased to 16.5 percent in 2020 from 51 percent in 2000, this sector continues to play a major role in the country's economy. Subsistence agriculture is still the primary economic activity of approximately 61 percent of the national labour force (World Bank, 2021a). However, unemployment among young people, especially the rural young population, has led to increasing urban migration, resulting in approximately 36 percent of the country's total population living in urban areas (World Bank, 2021b).

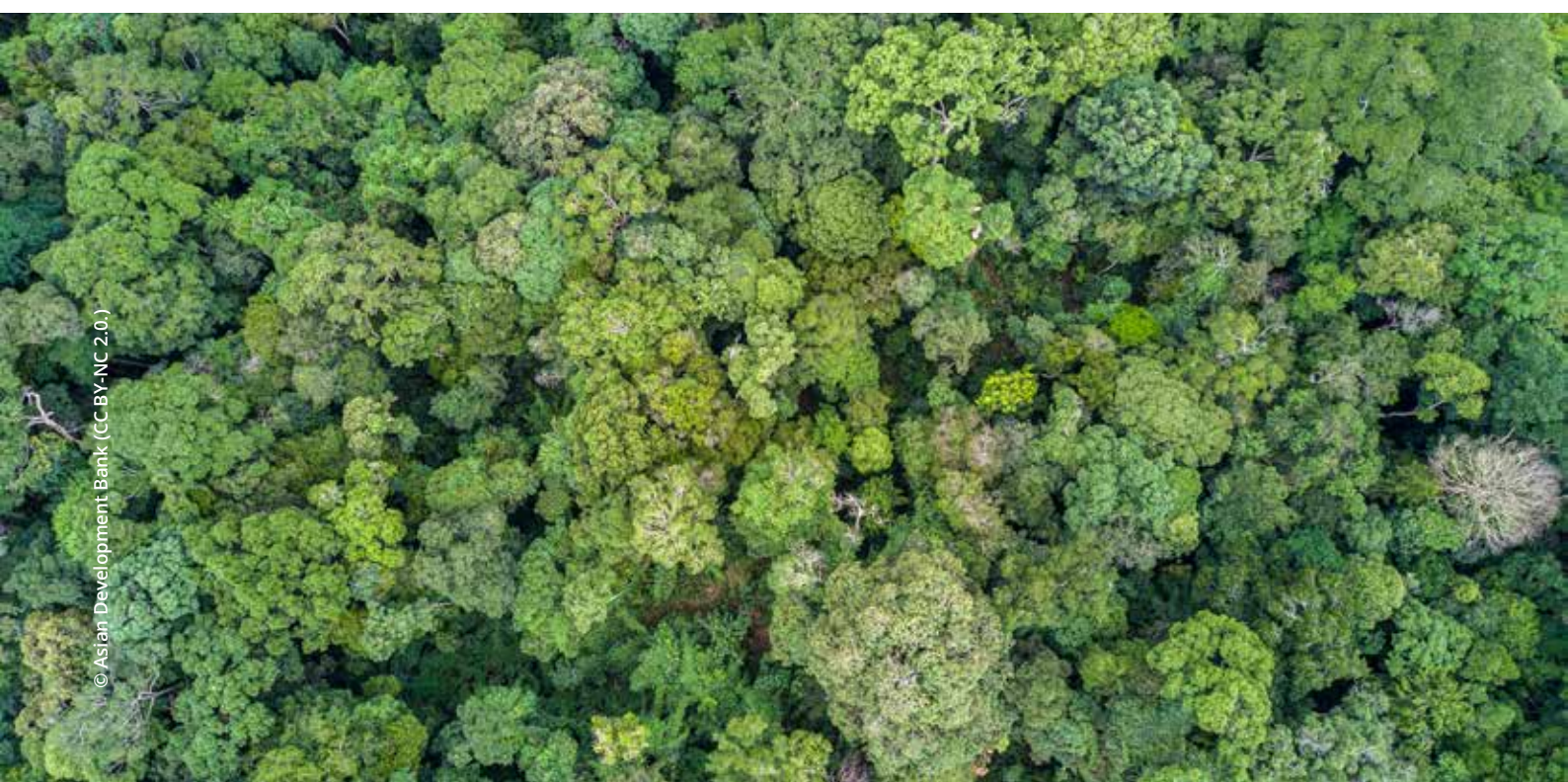
Table 1. Selected indicators for the Lao People's Democratic Republic

Indicators	2000	2010	2020	Comments
Population	5 324 000	6 385 000	7 231 000	Steady increases
Population growth rate (%)	1.7	1.6	1.5	Slightly declining trend
GDP (USD)	1.7 billion	7.1 billion	19.1 billion	Before the COVID-19 pandemic, which strongly affected the economy
GDP per capita (USD)	325	1 140	2 630	More than double in a decade
GDP growth rate (%)	5.8	8.5	3.3	The rate for 2020 dropped sharply as a result of the COVID-19 pandemic
Percent rural population (%)	78.0	69.9	64.4	Still large, but trending lower
Urban population	1 169 990	1 878 750	2 640 299	Growing steadily
Urban population growth (%)	6.3	3.6	3.3 (2019)	Driven mainly by the migration of young people to cities for employment



Agriculture sector's share of GDP (%)	51.0	22.6	16.5	Government focuses on the agriculture and environment sectors
Inflation rate (%)	25.1	5.9	5.0	Inflation does not seem to be a problem
Access to electricity (%)	42.5	70.1	98 (2019)	Good access
Access to safe drinking water Urban (%) Rural (%)	21.4 0.2	24.3 9.2	27.0 12.4	The general population faces challenges with access to safe drinking water; rural areas are the worst affected
Share of population using at least basic sanitation services Urban (%) Rural (%)	76.7 37.6	86.9 59.7	97.1 78.5	Average use is good, but there is a large gap between rural and urban populations
School enrolment primary (gross %)	75	94.5	91 (2018)	A good education scenario in terms of gender
Forest coverage (%)	74	71	71	Approximately a 2 percentage point decrease per decade

Source: World Bank. 2021. Data. In: Lao PDR [online] Washington, DC. Cited 12 March, 2022. <https://data.worldbank.org/country/lao-pdr>





Key figures and trends in food production, consumption, and trade

Rice dominant crop production influences rice-based diets

Food production in the Lao People's Democratic Republic is historically dominated by paddy rice (see Figure 3). Rice production combined with other crops, such as maize, cassava, yams, taro, sweet potatoes, chillies, and leafy vegetables forms the traditional subsistence production system in the country. According to the USDA (2019), rice covers more than 60 percent of the country's arable land.

Since the 1990s, rice production has increased steadily (mainly in terms of the area from 460 000 Ha in 1995 to 964 000 Ha in 2017), making the country nationally self-sufficient (Manivong and Cramb, 2020). However, extreme weather events and soil depletion have affected cereal production – for example, rice production decreased from 4.14 million tonnes in 2016 to 3.5 million tonnes in 2020 (Lao People's Democratic Republic, 2021).

The country's food balance in terms of calories reflects the subsistence nature of production. According to FAO, 97 percent of the calories consumed by the population continue to come from the food produced in the country, while five percent comes from food stocks (FAO, 2021a). Trade plays a minimal role in the supply of food; imports account for only 8 percent of the total food energy (kcal) supply. However, this situation is changing as imports are increasing, particularly of cheap processed foods rich in fat, sugar, and sodium, which could have significant adverse consequences on the local population's diet (Comrie-Thomson, *et al.*, 2020).

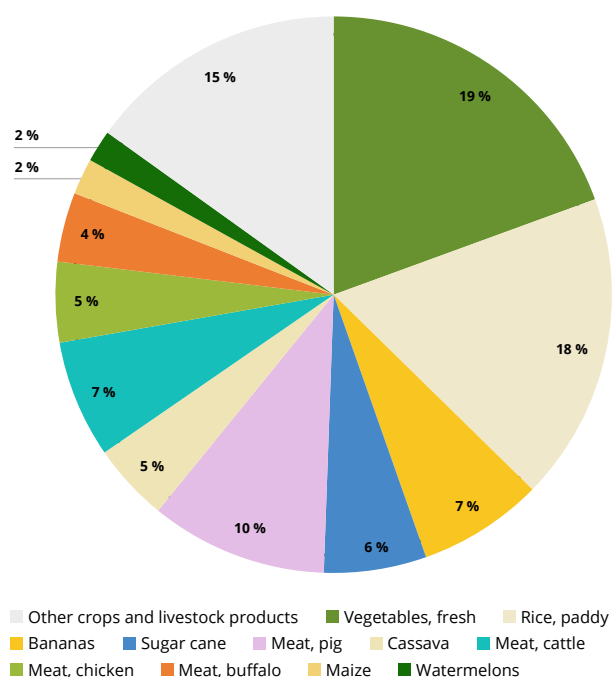
Food supply in terms of daily calories per capita reflects a diversity of available foods in the country for a balanced diet. Cereals, mainly glutinous rice, are the primary staple of the Laotian diet (60 percent). Supply of fruits and vegetables account for 13 percent and beef and poultry production accounts for 6 percent of

the daily food supply per capita (see Figure 2). Wild foods from forests and rivers, such as mushrooms, bamboo shoots and wild fish, also are an essential part of the local diet, with regional and ethnic group variations.

Recent trends in food trade impact food and nutrition security

Government policies promoting exports and foreign direct investment (FDI) have contributed to the introduction of new crops. Maize was the first commercial crop to be extensively introduced in the country in the mid-2000s. After 2016, the maize-planted area declined by approximately 30 percent and was replaced by cash crops. Planted areas of: coffee increased by 67 percent; banana by 80 percent; sugar cane by 138 percent and cassava

Figure 2. Structure of production (% of value, 2019)



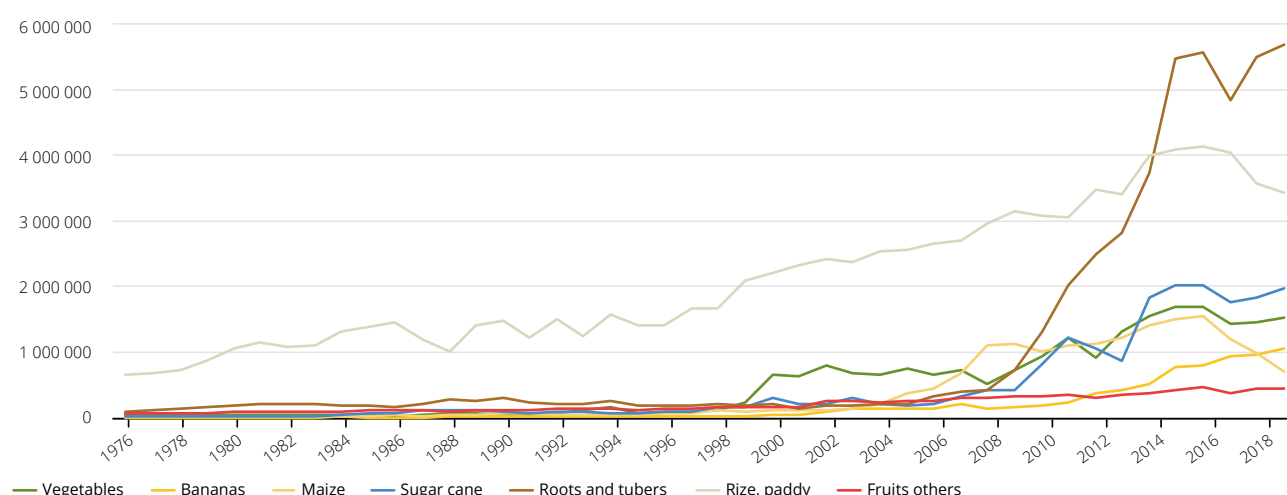
Source: FAO. 2021. FAOSTAT. Selected Indicators. In: *Lao People's Democratic Republic* [online] Rome. Cited 20 March 2022. <https://www.fao.org/faostat/en/#country/120>



by more than 500 percent between 2009 and 2019 (FAO, 2021b). The expansion of commercial production is largely driven by external markets, particularly in the northern provinces, which supply the markets of neighbouring countries (China, Thailand, and Viet Nam). As a consequence, exports of cash crops such as roots and tubers (mainly cassava), sugar cane, fruits, and vegetables, have increased significantly since 2010 (see Figure 4).

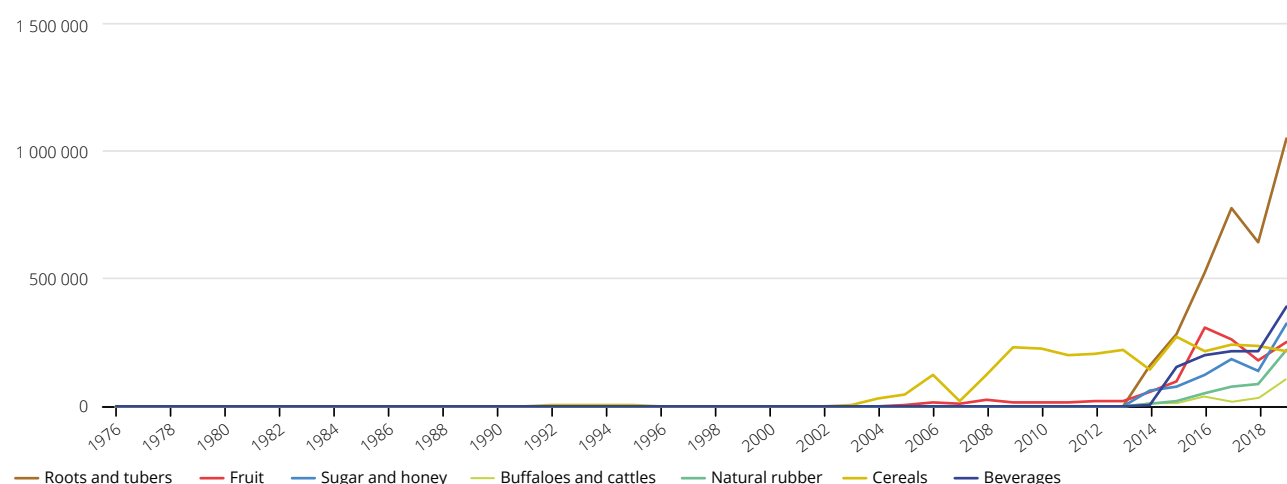
This strategy focuses on the production of low-value agricultural commodities (maize, cassava, rubber, and sugar cane), which are processed elsewhere. Apart from a few products, such as coffee or tea, the Lao People's Democratic Republic exports are comprised of a limited number of higher value-added products for niche markets in neighbouring countries and more distant markets.

Figure 3. Trends in production of agricultural commodities (volume in tonnes)



Source: FAO. 2021a. FAOSTAT Production Database. In: *Lao People's Democratic Republic* [online] Rome. Cited 23 March 2022. <https://www.fao.org/faostat/en/#data>

Figure 4. Trends in exports of key commodities (volume in tonnes, except livestock)



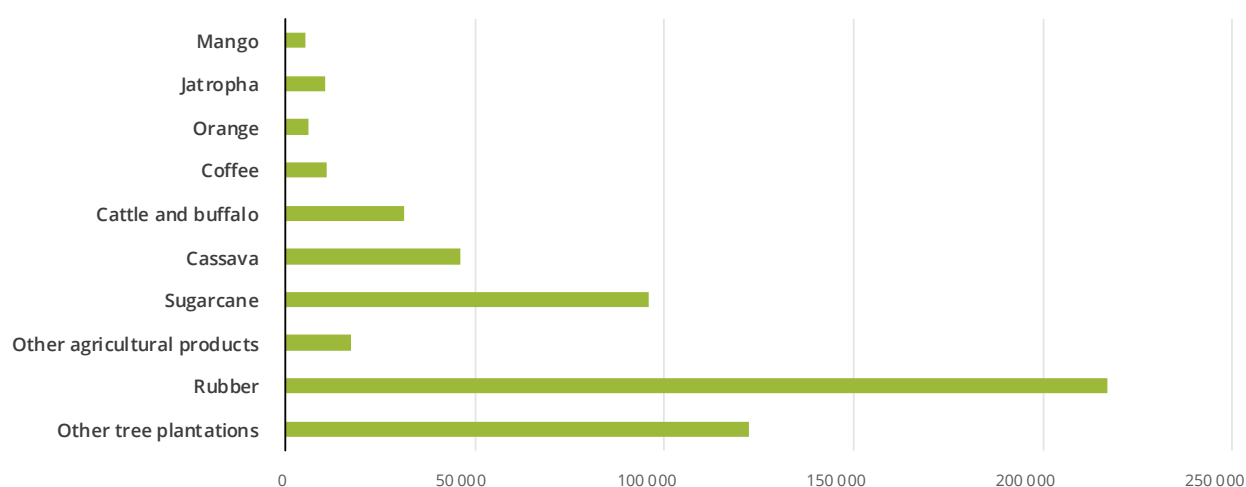
Source: FAO. 2021a. FAOSTAT Trade Database. In: *Lao People's Democratic Republic* [online] Rome. Cited 23 March 2022. <https://www.fao.org/faostat/en/#data>



In 2016-17, the Government's support to commercial agricultural production resulted in the granting of 224 000 Ha for agricultural use through 360 land deals (Hett, et al., 2020). Moreover, investments in the agricultural and forestry sectors have focused mainly on the

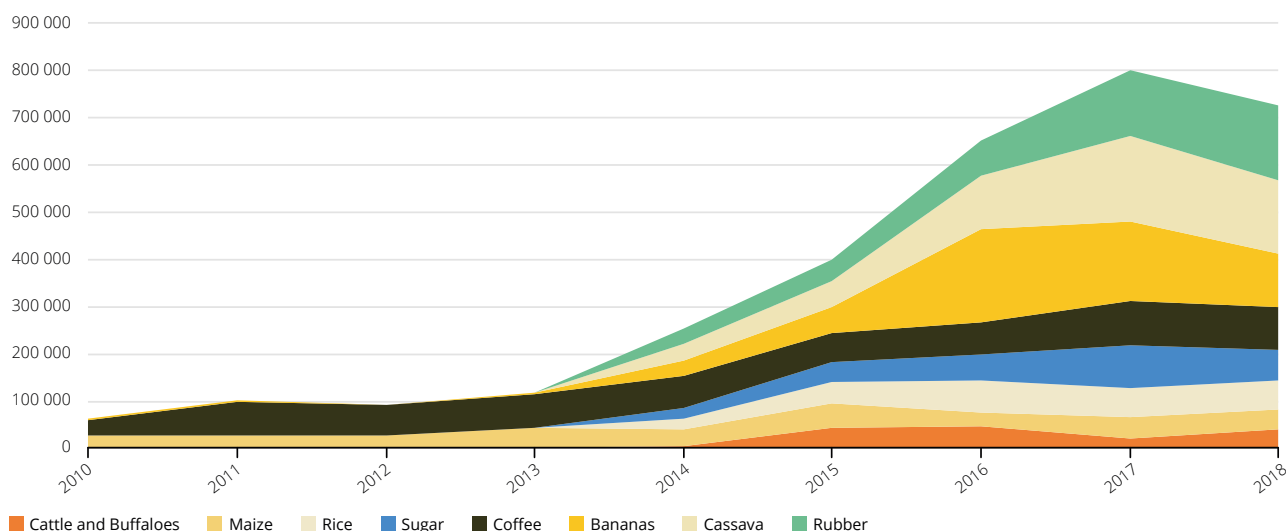
production of rubber, sugar, and cassava (see Figure 5). Figure 6 shows how that this strategy has boosted agricultural exports. Export-oriented production at the expense of domestic production poses risks to food security and food accessibility. Livestock production is another important sector

Figure 5. Main agricultural and forestry crops targeted by investments in concessions (Ha)



Source: Hett, C., Nanthavong, V., Hanephom, S., Phommachanh, A, Sidavong, V., Phouangphet, K, Lu, et al. 2020. *Land Leases and Concessions in the Lao PDR: A Characterization of Investments in Land and Their Impacts*. [online]. Bern. Bern Open Publishing. Cited 23 March 2022. https://boris.unibe.ch/133115/1/Land_deals_in_the_Lao_PDR_Eng_4SEP2020_LQ.pdf

Figure 6. Main agricultural and livestock export products (USD 1 000)



Source: FAO. 2021a. FAOSTAT Food Balances Database. In: Lao People's Democratic Republic [online] Rome. Cited 23 March 2022. <https://www.fao.org/faostat/en/#data>



of the economy. Cattle breeding has progressed considerably over the past ten years. In 2019, the country had 2 092 344 heads of cattle and 1 209 712 buffaloes. The increase in large ruminants' production is driven by an emergent commercial agriculture promotion policy as stated in the Sixth National Socio-Economic Development Plan (NSED) 2006–2010. Poultry and pigs are important livestock for rural families.

Very few food products are processed using modern food technologies in the country. The vast majority of food processing industries are small-scale units, employing less than ten employees. Primary processed foods include milled rice and dried coffee beans. In addition, food is generally home-processed for better preservation, as most protein-rich and perishable foods are not stored in a cold storage system. Examples of the most commonly traded, traditional processed foods are rice noodles,

pickled vegetables, deep fried onions and garlic, dried fish and pork, and local sausages.

It should be noted that the main imported food products, in terms of value, are non-alcoholic, sugary beverages (sodas) and processed food, particularly cereals and sugar-based foods, such as cakes, pastries, crackers, instant noodles, confectionery and, sweets, resulting in an increasing trend of overweight and obesity. Imports of such food products have grown exponentially since the 2000s, confirming the greater dependence of households on purchased, processed foods. Urban supermarkets and informal/traditional marketplaces and retail shops in rural areas increasingly supply these imported foods, such as sodas (imports increased from less than 6 000 tonnes in 1998 to almost 250 000 tonnes in 2018) (FAO, 2021b) and processed foods (imports increased from less than 3 000 tonnes in 1998 to more than 122 000 tonnes in 2018 (FAO, 2021b).





Characterization of the dominant actors of food system of the Lao People's Democratic Republic

Key Sustainability Question 1: Why is there a high incidence of stunting, wasting and micronutrient deficiencies among children under five years and women of reproductive age, particularly those from rural and remote areas, and an increasing trend of overweight and obesity?

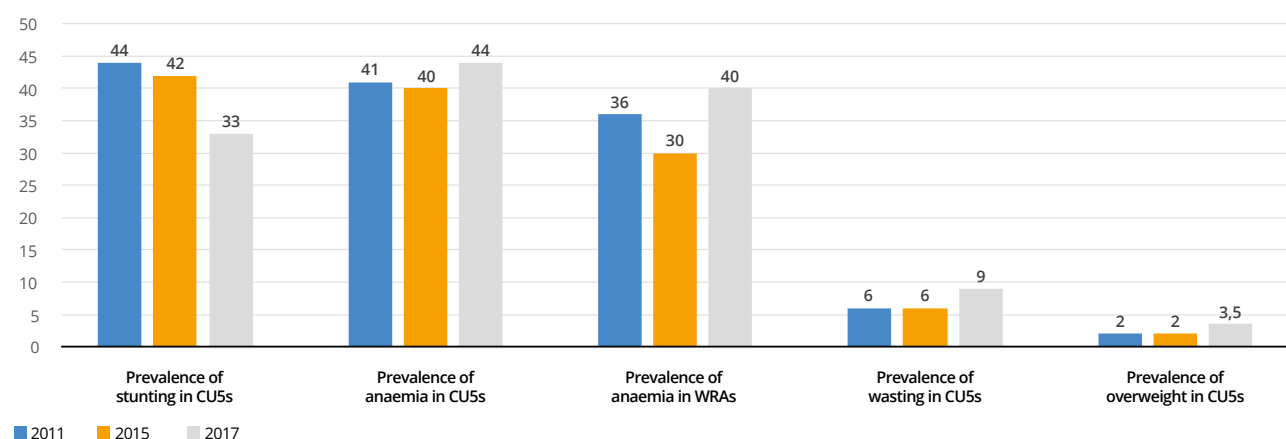
Although the Lao People's Democratic Republic has made some progress in mitigating malnutrition, the country faces a triple burden of malnutrition (undernutrition, emergent overnutrition, and micronutrient deficiencies). The stunting rate for children under five years has decreased significantly in recent years, but it remains a threat to achieving the Sustainable Development Goals (SDGs) and the country's Ninth National Socio-Economic Development Plan (NSED) 2021–2025 targets.

The extent of malnutrition varies based on geographical location and socioeconomic status. Those most affected are in rural and remote areas. Stunting rates are higher in the northern provinces, while wasting occurs at high to very high levels in the southern provinces (see Figure 8). Malnutrition has affected ethnic minorities more than others. The stunting rate among children under five years in the Hmong-Mien and Sino-Tibetan ethnic communities averages

50 percent, compared to 33 percent on average in the Lao-Tai households. Children from the Mon-Khmer ethnic group (eight percent of the population) are afflicted with the highest level of wasting (10 percent underweight) (UNICEF, 2019).

There is also a significant variation across income levels; stunting rates range from 20 percent in the richest quintile to 60 percent in the poorest. Stunting and underweight rates among children from the poorest quintile (48 percent stunted) are close to three times that for children from the richest quintile (14 percent stunted). Surprisingly, the prevalence of overweight is growing not only in urban areas, including in the capital city, (Vientiane), but also in the rural, northern provinces; the rates, for example, are as high as 10 percent in Phongsaly province (see Figure 8). As discussed earlier, a key cause of obesity could be attributed to the overconsumption of sugary foods because of high sugar imports.

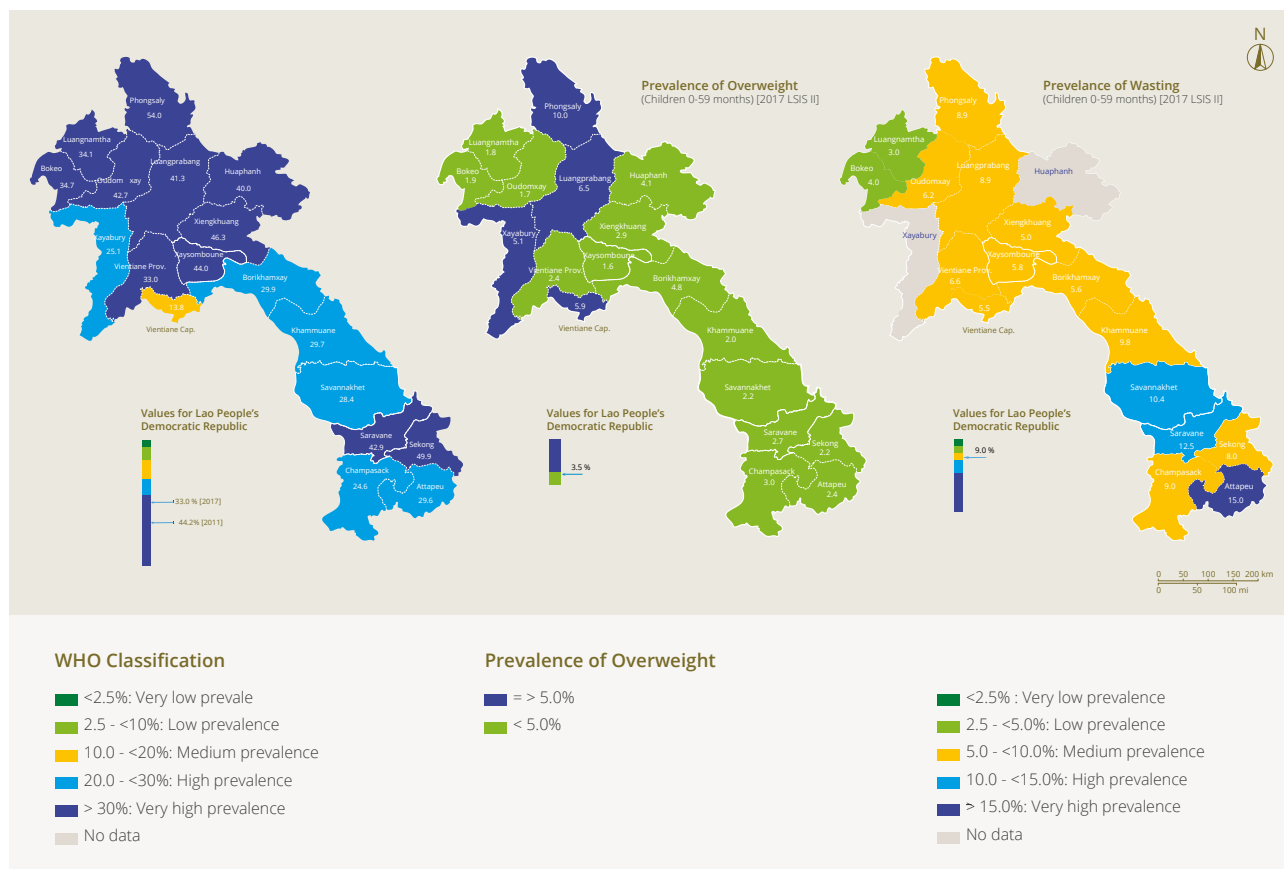
Figure 7. Trends of key indicators of malnutrition in children under five and women of reproductive age



Source: National Information Platform for Nutrition. 2020. *National Nutrition Profile: Lao People's Democratic Republic*. [online] Vientiane. Cited on 25 March 2022. <https://www.nipn-nutrition-platforms.org/Lao-PDR>



Figure 8. Stunting, wasting and overweight rates by province, 2017



Source: National Information Platform for Nutrition (NIPN). 2020. *National Nutrition Profile: Lao People's Democratic Republic*. [online] Vientiane. Cited on 25 March 2022. https://www.nipnnutrition-platforms.org/IMG/pdf/unicef_nipn_nutrition_profile_final_041219.pdf . Map conforms to UN. 2004. Map of the Lao People's Democratic Republic. <https://www.un.org/geospatial/content/lao-peoples-democratic-republic>

The persistence of malnutrition in the Lao People's Democratic Republic is driven mainly by production, poverty, and consumption factors (see Figure 9). Subsistence agriculture is still the primary economic activity of most of the country's labour force with rice being the staple crop, as discussed earlier. Upgrading to more sophisticated agricultural production techniques is limited by poor knowledge among the poorest and most isolated communities, along with a lack

of technical assistance, especially for the most remote villages, which are inaccessible during the wet season.¹ Agricultural innovations are poorly disseminated, leading to reduced yields, lack of diversified crops, and poor handling of post-harvest processes. As a result, smallholder farmers working on unsuitable lands (slopes and poor soil fertility) suffer from food insecurity, even though the country is self-sufficient in rice production.

¹ In general, more than 60 percent of the national roads are classified as being in poor or bad condition. Most of the provincial and district roads are inaccessible during the rainy season. It is estimated that more than 40 percent of villages are 6 km or more from a main road and nearly half of them are not accessible during the rainy seasons (Logistics Capacity Assessment, 2021). Approximately 15 percent of the villages in the country are still classified as "rural without road access". These types of villages are more common in Huaphanh and Sekong provinces.



Furthermore, extreme climatic-related events (floods, droughts, animal diseases, rodents, and pest outbreaks) are factors that have contributed to lower food security, especially for vulnerable households who have experienced significant losses of harvest (FAO, 2019).

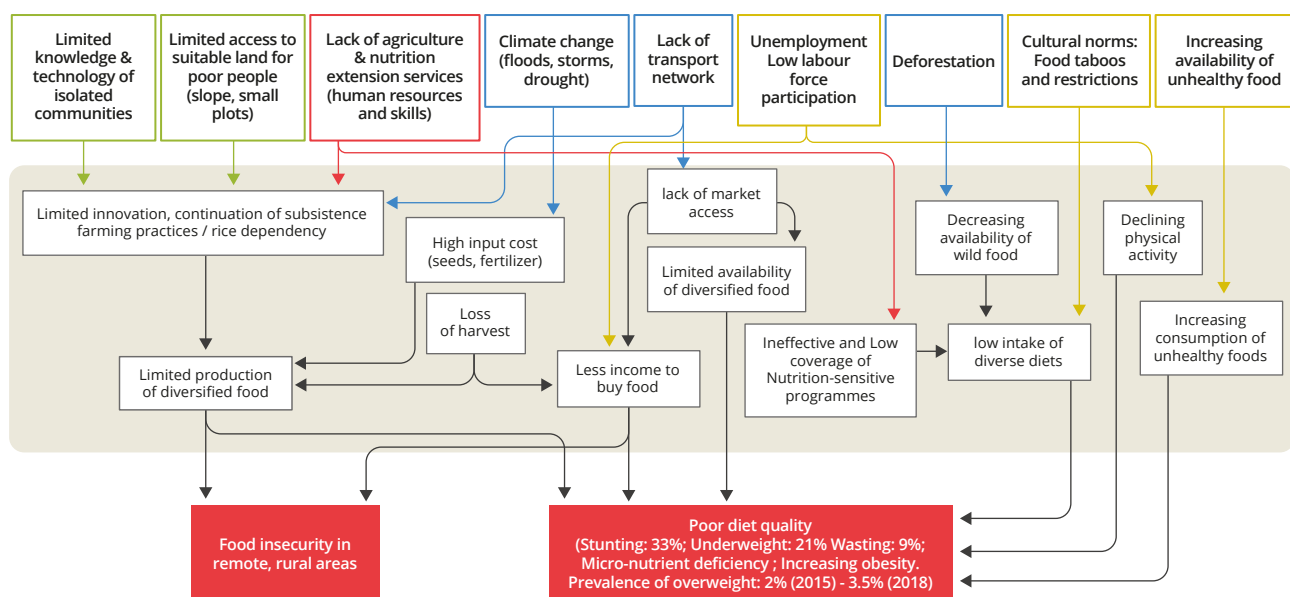
The dominant production of rice paddy translates into rice-based diets at the household level. Approximately 60 percent of household diets consist of rice, mostly glutinous and consume limited sources of other nutrients to fulfil normal requirements (FAO, 2021b) (see Figure 10). As shown by the 2012–2013 Laos Expenditure and Consumption Survey (LECS, V), this trend is more acute in rural areas where most households consume only three of the seven recommended food groups (Lao Statistics Bureau, 2013); in some areas, rice accounts for up to 88 percent of the calorie intake (Siliphouthone and Yasunobu, 2015).

Most households, especially those in rural areas, cannot afford a diversified diet because of a lack of income. Many households are under the

national poverty line and all provinces in the country still have households classified as poor.

Because of limited production levels and lack of purchasing power, a large section of the rural population's daily diets depends mainly on foraged foods, such as mushrooms, bamboo shoots, wild plants, insects, wild meat, and wild fish. For instance, wild fish is an important source of protein, totalling more than half of the total fish consumption in 2019 (Lao Statistics Bureau, 2021). However, access to such natural foods has been hampered by deforestation, mainly due to commercial agricultural expansion and encroachment, and infrastructure development. According to FAO, the decrease in forest cover has been continuous, declining by more than 12 000 km² since 1990 (FAO, 2020). Deforestation has had serious consequences on the quality of the diets of the rural poor. This is because even when farmers receive increased incomes from cash crop production, they rarely buy protein-rich foods and vegetables – partly because market access is not easy in remote rural areas and partly because cash incomes are primarily spent

Figure 9. Pathways leading to a high incidence of various forms of malnutrition among children under five years and women of reproductive age



Source: Authors, 2021.



Figure 10. Prevalence of rice in the daily diet



Source: FAO/WHO GIFT. 2017. *Global Individual Food Consumption Data Tool. National Food Consumption Survey Lao PDR 2016—2017*. Lao People's Democratic Republic. Cited on 27 March 2022. <https://www.fao.org/gift-individual-food-consumption/data-and-indicator/en/>

on household goods, such as motorbikes and telephones, and invested in children's education (Broegaard et al., 2017). Moreover, when rural populations migrate to cities, they no longer have access to wild food resources and can only rely on their income to improve their diets. Often, the income that these migrants obtain in the cities is from informal activities, which are too low to improve their diets.

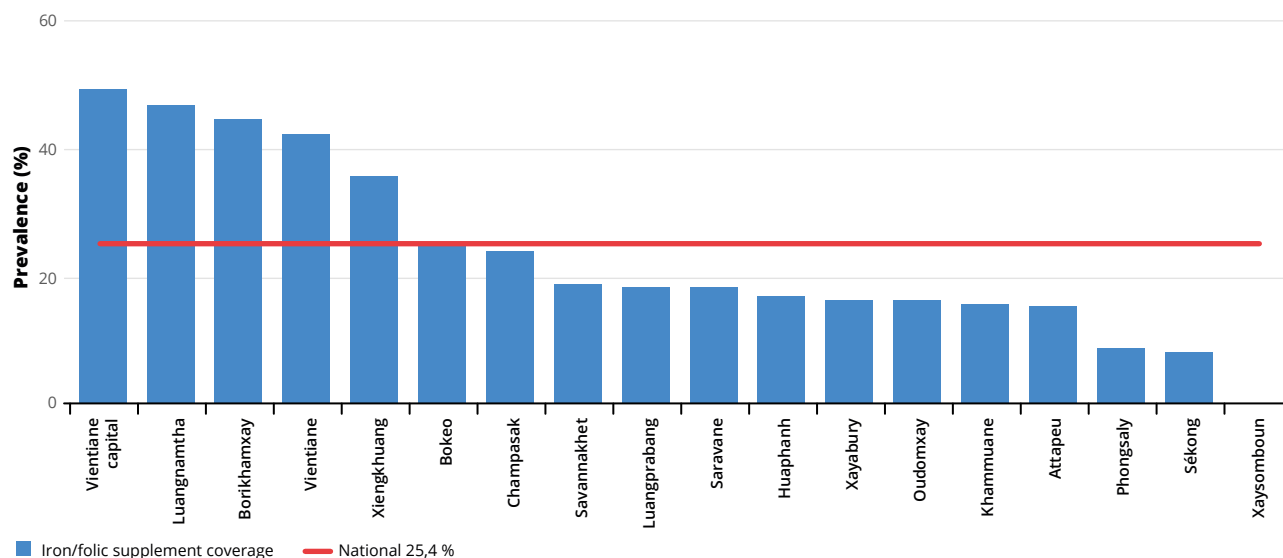
Low food diversity is also a result of the population's lack of awareness about nutritious diets stemming from a lack of health and educational services. In rural areas, exposure to nutritional knowledge is limited. Efforts to deliver health services on food nutrition, moreover, are hindered by the inability to access road networks. Results from the Lao Social Indicator Survey 2017 indicate that only 52 percent of pregnant women from the poorest wealth quintile had received antenatal care from a trained health professional and more than 36 percent of pregnant women living in rural areas lacking roads had received no antenatal care services. For the rural poor, many from remote areas, distance to health facilities is a major issue.

Unsurprisingly, limited access to maternal health care also translates into inadequate health care for children — approximately 90 percent of rural women do not choose postnatal care and less than 50 percent of rural children are fully vaccinated across the country; this figure is even less for rural children living in the northern provinces (UNICEF, 2017). In addition, the lack of knowledge about good nutrition and the growing availability of cheap, unhealthy foods has led to overconsumption of fats and sugars. Iron and folic acid supplementation play a major role in the prevention and treatment of iron deficiency anaemia, improving birth outcomes, and developing healthy foetuses. However, coverage of iron and folic acid supplementation remains low (see Figure 11); only 38.5 percent of children (6–59 months) have received vitamin A supplements (National Information Platform for Nutrition, 2020).

Consumption behaviours also contribute to malnutrition in the Lao People's Democratic Republic. Social and cultural norms are closely correlated with stunting. Early marriage remains widely practiced, particularly in rural areas. Approximately 94 out of 1 000 births are from



Figure 11. Coverage of iron/folic acid supplementation among women of reproductive age



Source: Lao Statistics Bureau. 2018. *Lao Social Indicator Survey II 2017, Survey Findings Report*. [online] Vientiane. Cited on 26 March 2022. <https://www.unicef.org/laos/media/306/file/LSIS2017ENG.pdf>

girls aged 15–19 years (Lao Statistics Bureau, 2015). Unfortunately, this contributes to stunting in children, as children born to mothers 18 years old and younger are more likely to be stunted by ten percentage points than children born to mothers older than 18 years (Kamiya et al., 2018). Additionally, social norms upheld by influential family members, including grandmothers and husbands, affect the daily diets of women of reproductive age, as they encourage restricted food intake, for example, during pregnancy and lactation, leading to malnutrition.

Women's low level of empowerment has also been found to be determinant of stunting (Kamiya et al., 2018). Kamiya et al. (2018) found that three dimensions of women's autonomy – confidence to exert control over their own health care, self-esteem, and control over their spending or money – are associated with stunting in the Lao People's Democratic Republic. A mother's level of education is significantly correlated with stunting. Studies have found that approximately 45 percent of stunted children's mothers received no education or only early childhood education (UNICEF, 2017).

In addition, poor access to water supply, sanitation, and hygiene can lead to incidences of infectious diseases causing malnutrition. While approximately 78 percent of households have access to "basic" drinking water, more than 83 percent of households have E. coli contamination in their source of water. Only 65 percent of rural households have access to basic sanitation and as many as 32 percent of households still practice open defecation. Regarding the latter, there are large regional variations, with 47 percent of households in Phongsaly province practicing open defecation (UNICEF, 2017).

The persistence of high levels of childhood undernutrition presents a staggering, yet avoidable loss of human and economic potential for the country. At the current levels of maternal and childhood malnutrition, the burden on the national economy has been estimated to be at least USD 200 million annually, representing about 2.4 percent of the country's GDP (World Bank, 2019). At the individual level, stunting has long-term adverse developmental impacts that far surpass childhood and has been linked to slower learning outcomes, poor academic performances, and lower productivity and wages in adulthood.



Proposed systemic levers:

1. **promotion of nutrition education, awareness, and information to improve food consumption behaviours; and**
2. **promotion of locally available, indigenous, and nutritious foods.**

In line with the opportunities identified by the National Dialogue for the Food Systems Summit 2021, promoting nutrition education for the general public, including nutritious diets, nutrition labelling, and using social media to promote nutritious recipes, can be carried out by making nutrition information accessible and easy to understand. Strategies could include audio-visual communication campaigns tailored for local dialects and levels of literacy, particularly in rural and remote areas.

Moreover, there is a need to strengthen nutrition knowledge and services for mothers and children. On the one hand, capacity development of health professionals in critical fields, such as quality counselling and support for feeding young children could be achieved by investing in the recruitment, training, and supervision of community-based counsellors and workers. On the other hand, it is important to encourage the dissemination of nutrition knowledge and to

promote nutrition-related services to ensure that mothers and caregivers are informed about the availability and user-friendliness of such services.

Improving the dietary habits of adolescents through interventions in the education system could be an opportunity for changing the eating habits of young people on a national scale, and to move towards a generation that is nutrition informed and more likely to make healthy consumption choices (United Nations, 2021). Supporting nutrition-smart agricultural production could help boost the availability of local, nutritious foods and avoid reliance on food imports. Such production techniques need technical support from the government to integrate nutrition into the capacity development of agricultural extension workers.

Increasing the availability and affordability of nutritious foods can also be achieved by promoting more diverse production of fruits, vegetables, eggs, fish, meat, and fortified foods. The Government may consider policies to incentivize their production, distribution, and retailing based on the local food value chain system. Furthermore, the government can also improve regulation frameworks that support implementation of national standards and legislation on consumer protection, particularly to protect children from unhealthy food and beverages.





Key Sustainability Question 2: What are the reasons for the lack of equitable and sustainable development of commercial farming systems in the Lao People's Democratic Republic?

Agriculture in the Lao People's Democratic Republic has been undergoing a transition from rice-based subsistence cultivation toward commercial production. This transition is largely driven by the opening up of the country to a market economy, as it integrates into the regional economies of South-East Asia (Hepp et al., 2019). It is also supported by public policies aimed at reducing shifting cultivation practices and promoting cash crop production for poverty alleviation (Lienhard et al., 2019).² The Government of the Lao People's Democratic Republic, moreover, considers the reduction of shifting cultivation and promotion of permanent agriculture as ways to reduce deforestation (Vongvisouk et al., 2014).

As part of the Government's "Turning Land into Capital" policy, the thrust towards commercialization has led to an increase in land concessions and land leases to develop cash crops at a large scale (Kenney-Lazar, Dwyer, and Hett, 2018). The number of land concessions and leases was negligible in 2000, but in less than a decade, it increased by more than 50-fold to 1 758 land deal projects, claiming more than one million Ha, split between mining exploitation (41 percent), tree plantations (35 percent), agriculture (23 percent) and hydropower (1 percent) (Hett et al., 2020). The process of identifying land and granting concessions to companies is non-transparent and consultation for this purpose with communities has been extremely poor. Most of the land concessions are in the upland borderland areas, where ethnic minorities are most concentrated, and compete for fallow lands for grazing cattle and harvesting non-timber forest products.³

As farming has become more widely commercialized, contract farming has also emerged as a key agricultural production model in the country. Contract farming schemes are common for bulk export commodities, such as cassava, tea, coffee, sugar, banana, maize, and rubber, which are in high demand in China, Thailand, and Viet Nam (Ingalls et al., 2018). The risk burden to smallholder farmers in contract farming remains high due to the informal, often verbal, nature of agreements (National Institute for Economic Research, 2020). As inputs are often provided on credit, production risks are disproportionately borne by the smallholder producers.

The evidence for commercialization is mixed. Several research studies indicate that commercialized agricultural development generally had positive implications for social development, income generation, employment, and poverty reduction among rural households (Thanichanon et al., 2018). Other research studies suggest that the transformation from subsistence to commercial farming has led to substantial social and environmental challenges.⁴

First, land degradation, soil erosion, sedimentation, and disturbance of watercourses are often associated with the development of cash crops in the country, particularly in the northern region (Fujisao et al., 2020). The shift to permanent agriculture has also led to an increase in the use of chemical fertilizers and pesticides, tractors, hybrid seeds, and other agricultural technologies to increase productivity.

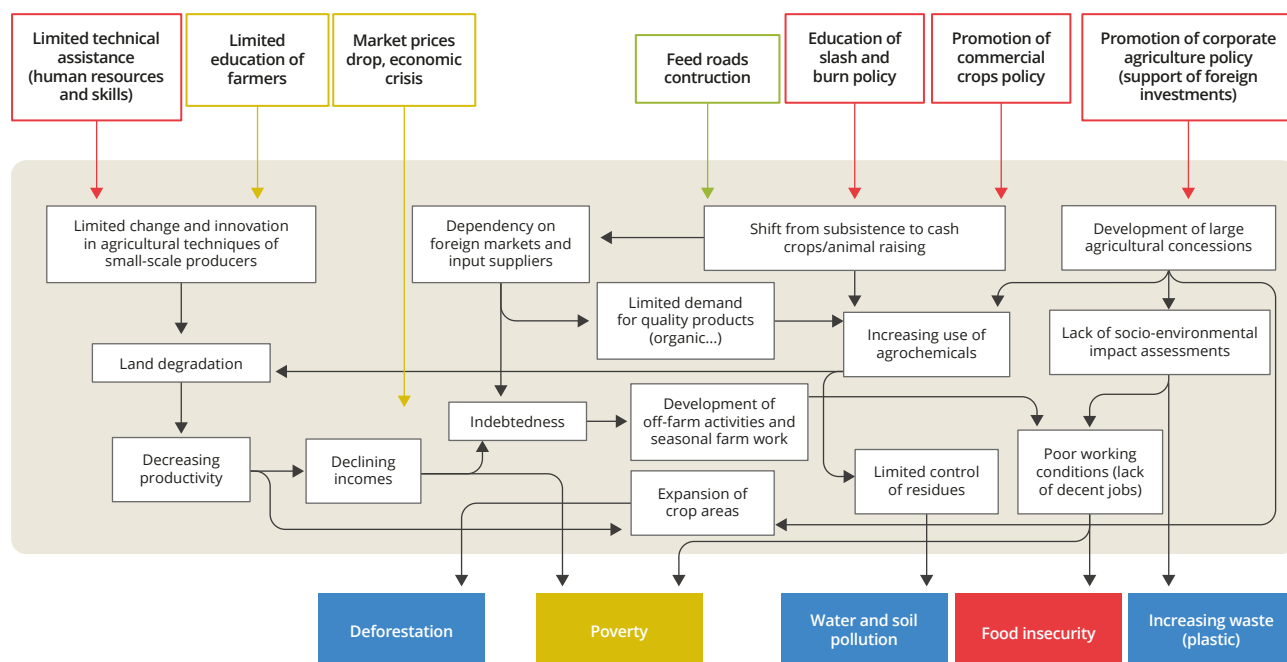
² The Agriculture Strategy 2025 and Vision 2030 (ADS) of the Ministry of Agriculture and Forestry emphasize support for strengthening the capacity for commercialized agriculture.

³ The political response to problems with land concessions includes a moratorium on concessions, mostly on plantations.

⁴ Evidence from northern Laos suggests that agrochemicals have been disposed of in streams and rivers, affecting livestock and fisheries downstream. Plastic and other impacts have also been reported from the cultivation of bananas and other cash crops in northern Laos (Fullbrook, 2014).



Figure 12. Reasons behind the lack of equitable and sustainable development of commercial farming systems in the Lao People's Democratic Republic



Source: Authors, 2021.

Figure 13. Yields of maize crop (t/ha)



Source: Lao Statistics Bureau. 2021. *Lao Statistical Information Service (LAOSIS)*. [online] Vientiane. Cited on 28 March 2022. <https://laosis.lsb.gov.la/tblInfo/TblInfoList.do?rootId=2101000&menuId=2101101>

The practice of spraying chemicals and pesticides on land concessions for banana production and in contract farming has been reported in many places (Lapeyre, Tixier and Risède, 2017; Shattuck, 2021; Wentworth et al., 2021; World Bank, 2021d). Poor farmers, especially young people, often work at big plantations under poor working conditions involving exposure to unsafe levels of pesticides (Baird, 2011).

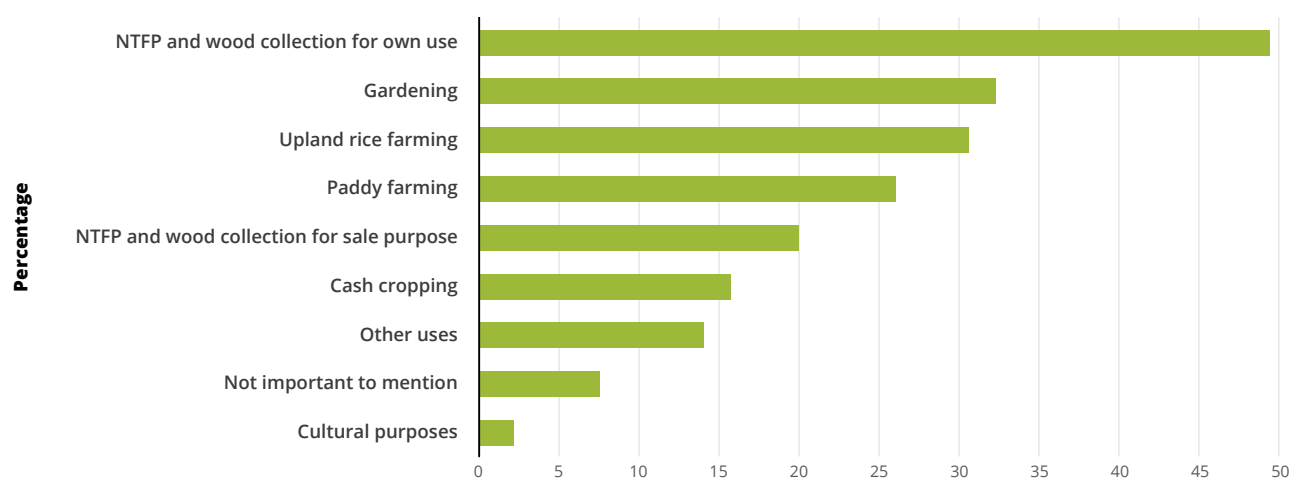
After a period of high productivity, intensive farming techniques have typically led to declining soil fertility and significant yield reductions, despite a significant increase in chemical inputs (see Figure 13). Moreover, as per discussions with stakeholders, cash crops use fewer indigenous seeds, which are more adapted to climate change, resulting in declining agrobiodiversity and increasing vulnerability to climate disasters, such as droughts and heavy rainfalls. Capacity constraints and lack of technical assistance limit adoption of agricultural practices that are ecologically and socioeconomically sound.



To maintain production levels, farmers also compensate for lower yields by expanding the area under cultivation or by abandoning cultivation on depleted soils and moving further afield, often along the slopes, which further aggravates landscape degradation. Cash crops have gradually increased, following the construction of feeder roads that are often dug at the expense of forest cover (Castella and Phaipasith, 2021). Accordingly, agriculture intensification through conversion from slash-and-burn subsistence farming to commercial agriculture does not guarantee that forests will not be affected, as farmers clear land along new roads to expand their production of cash crops (Vongvisouk et al., 2016). Expansion

of cash crops is one of the main causes of deforestation in the Lao People's Democratic Republic (Costenbader et al., 2015). In addition, commercial agriculture and large concessions may indirectly result in additional forest clearance when lands under existing subsistence uses are allocated to commercial investors, leading to subsistence agriculture relocating to new forested lands. Forest conversion into cash crops affects food security, as the main uses of the land before being allocated for concessions were the collection of non-timber forest products for food, such as mushrooms, honey, and wild plants, and other domestic uses as well as for sale (Ingalls et al., 2018) (see Figure 14).

Figure 14. Main use of the land before being allocated to land deals/concessions



Note: NTFP: non-timber forest product.

Source: Hett, C., Nanhthavong, V., Hanephom, S., Phommachanh, A, Sidavong, V., Phouangphet, K, Lu, et al. 2020. *Land Leases and Concessions in the Lao PDR: A Characterization of Investments in Land and Their Impacts*. [online]. Bern. Bern Open Publishing. Cited 23 March 2022. https://boris.unibe.ch/133115/1/Land_deals_in_the_Lao_PDR_Eng_4SEP2020_LQ.pdf

Second, the shift to commercial agriculture has also led to social inequalities. Although incomes have increased on average, some farmers have not benefited, while others have become richer (Vongvisouk et al., 2014). Contract farming can put farmers at a disadvantage, particularly when the relationship between investors and farmers is not formalized (Kallio et al., 2019). Moreover, the development of monocultures and the

concentration on a single cash crop becomes a risky activity for farmers. The shift from subsistence farming to export-oriented production exposes households to the volatility of international commodity prices and yield variations, which can be caused by climatic hazards (Junquera and Grêt-Regamey, 2020). In the case of crop failure, farmers cannot rely on income from other agricultural activities, such as rearing livestock,



growing rice, and foraging for non-timber forest products, to feed themselves (Polthanee et al., 2021). Farmers who cannot pay the debts incurred for the construction of roads to fields and the purchase of inputs (seeds and agrochemicals) are the most affected by this transition to commercial agriculture. Investors may take ownership of their land, often in an informal manner, without any involvement of government authorities, and lease it back to them as described by Friis and Nilsen (2016) in the case of the banana sector in northern Laos. As a result, many households abandon farming activities to escape a vicious cycle of indebtedness.

Strategies to diversify agriculture by combining several crops or agricultural activities – through integrated crops, aquaculture, and livestock approaches – can help to avoid farmer dependence on investors, traders, and middlemen. Through the adoption of agroecological techniques (organic farming, conservation agriculture, agroforestry, integrated pest management, and other techniques), farmers can increase the sustainability of production (Lienhard et al., 2019). However, agroecological techniques are only slowly being implemented, despite the existence of the Green and Sustainable Agriculture 2030 framework for the Lao People's Democratic Republic. One of the reasons for this is that farmers have limited skills to apply agroecological techniques. Support to farmers has not been adequate due to the lack of national and provincial extension services for innovative agricultural techniques. Two of the challenges hindering this are limited

budgets and limited research and development dedicated to sustainable agriculture, including the promotion of sustainable value chains (Kousonsavath et al., 2018).

In addition, the declining productivity of cash crops has prompted farmers to seek alternative options mainly through off-farm activities. The better-off farmers reinvest their profits in businesses, such as small retail shops, while the less wealthy and indebted farmers, who have lost their farms, find employment with the former or migrate to cities or other villages in search of work, especially at large agroindustrial plantations. However, while job creation is often cited as a key benefit of land investments, there is evidence suggesting that large concessions provide limited opportunities for wage labour for those displaced from their land by large enterprises, and often involve poor working conditions (Baird, 2011). In many cases, investors have preferred to import labour from cities or even neighbouring countries to work in plantations. This was observed in the northern part of the country involving land leased out to Chinese companies for banana production (Friis and Nielsen, 2016). Meanwhile, secure employment opportunities outside agriculture remain limited, leading to dire consequences for the displaced families (Kenney-Lazar, 2015). Most of the jobs offered by large-scale plantations require only low technical skills, such as planting and weeding. Hence, 85 percent of them are only seasonal, with no fixed term, and sometimes with low wages (see Table 2), which could have dramatic consequences in terms of food affordability.

Table 2. Daily wages offered in agriculture and tree plantation concessions

Subsector	Daily Wage (kip)			
	Mean	Min	Max	National min wage/day 2015
Agriculture	53 335	10 000 z	200 000	45 000
Tree plantation	49 337	10 000	150 000	45 000

Source: Hett, C., Nanthavong, V., Hanephom, S., Phommachanh, A., Sidavong, V., Phouangphet, K, Lu, et al. 2020. *Land Leases and Concessions in the Lao PDR: A Characterization of Investments in Land and Their Impacts*. [online]. Bern. Bern Open Publishing. Cited 23 March 2022. https://boris.unibe.ch/133115/1/Land_deals_in_the_Lao_PDR_Eng_4SEP2020_LQ.pdf

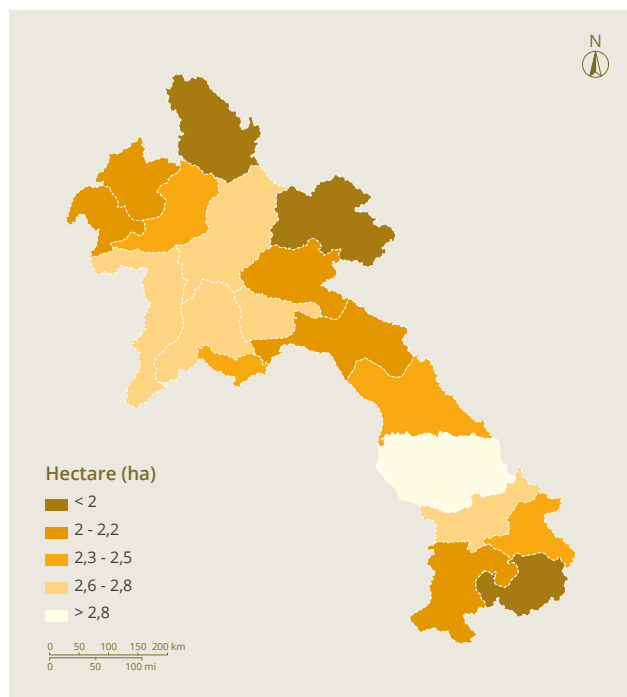


Due to the rapid expansion of commercial agriculture, the policy response to regulate and manage commercial farming to ensure fair outcomes for farmers and to avoid negative social or environmental consequences is lagging. There is an urgent need to improve transparency in land governance and institutional arrangements for monitoring and evaluating concessions and contract farming programmes.

Proposed systemic levers:

1. **support the transition towards more diversified, sustainable, and inclusive agriculture; and**

Figure 15. The average size of land holdings in the Lao People's Democratic Republic, 2011



Source: Adaptation of Agriculture Census Office. 2012. *Lao Census of Agriculture 2010/11*. [online] Vientiane. Cited on 28 March 2022. <https://catalog.ihsn.org/index.php/catalog/4686>. Map conforms to UN. 2020. Map of the Lao People's Democratic Republic <https://www.un.org/geospatial/content/lao-peoples-democratic-republic>.

2. **promote corporate sustainable responsibilities of large-scale, commercial agriculture companies.**

The Lao People's Democratic Republic needs a more sustainable and inclusive growth path that promotes climate-smart and sustainable agricultural production systems, including organic farming and other agroecological practices. Supporting sustainable agriculture also requires the promotion of value chains based on the enhancement of sustainable, inclusive, and equitable attributes of sustainable production systems, through specific instruments, such as organic agriculture and fair-trade certifications and geographical indications, and improved market distribution systems. This is consistent with opportunities identified by the National Food Systems Dialogue 2021, which indicated that diverse smallholder production and a balance between smallholder farming and specialized cash crop production for markets are essential for food and nutrition security. This is particularly relevant to the disruption of the international market during the COVID-19 pandemic.

Related to this view is the opportunity to protect wild foods, and possibly domesticate and manage them in their natural environment, which would help to secure safe and diverse food options for vulnerable households. Taking into account corporate social responsibility (CSR), the sustainability of large agriculture and tree plantation concessions could be improved through guiding principles (Lette et al., 2017) and the implementation of voluntary sustainability standards set up by global multi-stakeholder initiatives. Other global multi-stakeholder initiatives have developed sustainability principles that could support corporate, environmental, and social responsibility strategies of investors and large companies in the Lao People's Democratic Republic, such as the Global Partnership for Sustainable Rubber.



Key Sustainability Question 3: What are the reasons behind the increasing vulnerability of smallholder farmers and rural communities?

As stated earlier, most of the country's population works in the agricultural sector. The most vulnerable are the poorest rural populations that have low levels of education and are subsistence farmers working on small plots. Many of these types of farmers are in ethnic communities in remote highlands.

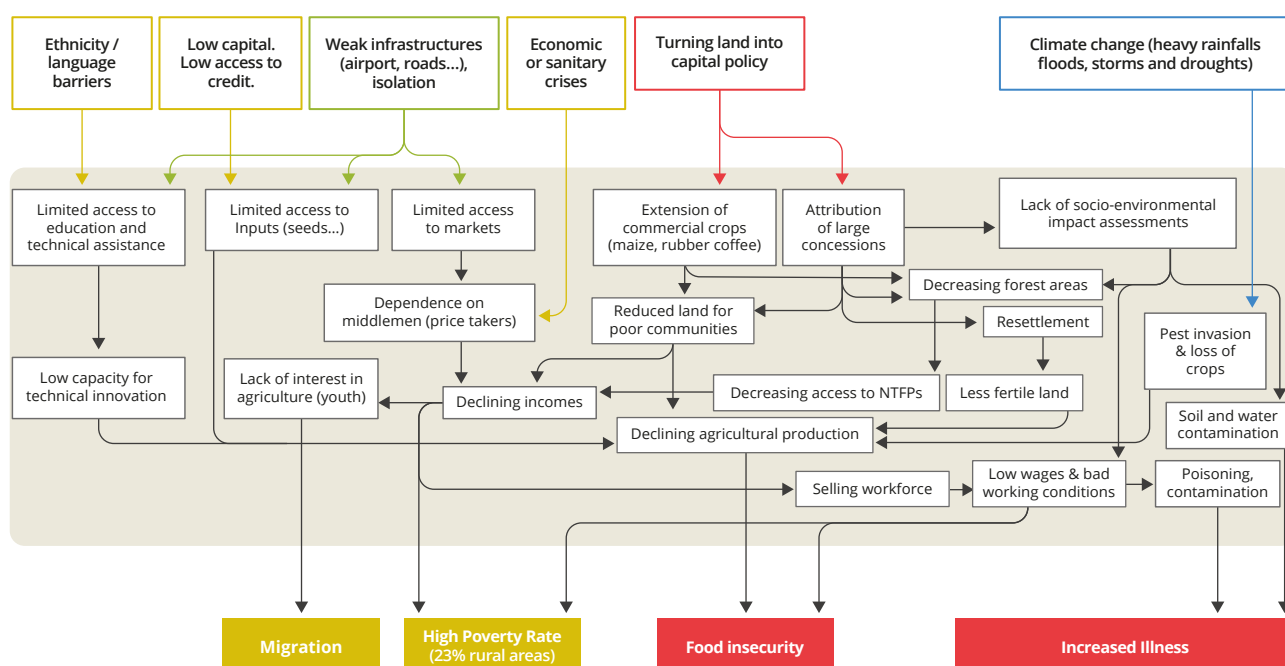
The livelihoods of these populations are vulnerable to high risks and their adaptive capacity to cope with these risks is low (Voladet et al., 2015). The very low average farm size of 2.4 ha per household (Lao People's Democratic Republic, Ministry of Agriculture and Forestry, 2014) (see Figure 15) makes them vulnerable to economic, environmental, and health crises and to the structural socioeconomic changes, which have marked the country since the 1980s.

There are several reasons behind the vulnerability of these populations (see Figure 16).

The Lao People's Democratic Republic is the most ethnically diverse country in South-East Asia. Forty-nine official ethnic groups classified into four major ethnolinguistic segments, of which two-thirds of the population is from the Lao-Tai ethnolinguistic family, are scattered throughout this landlocked country (Schlemmer, 2017). Some rural populations from ethnic minority groups do not speak the Lao language, particularly in isolated rural areas. Approximately eight percent of the population in 2015 lived in remote and isolated villages without access to roads (Lao Statistics Bureau. 2015).

Rural populations face significant challenges in terms of communication, transport, and access to essential services. A large proportion of smallholders in remote rural areas have low formal education and limited vocational training. Gender inequalities in terms of access to education are also very marked, exacerbated by low secondary

Figure 16: Reasons behind the increasing vulnerability of smallholder farmers and rural communities



Source: Authors, 2021.



school completion rates, early marriages, and a high birth rate among adolescent girls. In 2017, only 15 percent of the working population in rural areas had completed secondary education. The level of formal education among farmers is even lower in remote areas where infrastructure is less developed and access to educational services is difficult (UNCTAD, 2021). The difficulty for agriculture extension services to access remote areas plus existing language barriers and the low education have led to low innovation capacity among rural smallholder farmers. Finally, access to credit and finance is another constraint. Few financial institutions provide credit to smallholder farmers due to their relatively high level of risk. The inability of many farmers to use agricultural land as collateral due to the lack of secure land titles is an important contributory factor. Even when credit is available, it is limited, interest rates are high, and repayment periods are short (National Agriculture and Forestry Research Institute, 2020). Facilitating access to flexible credit mechanisms for smallholder farmers is critical.

In addition, poor infrastructure and low connectivity in rural areas also limit farmers' access to credit, agricultural inputs, and markets. For example, in Houaphan province, Vietnamese

cross-border traders have introduced commercial hybrid maize crops through the provision of inputs (seeds and agrochemicals) and enabled by feeder road construction. Prices are set by these foreign traders or middlemen in contracts that do not always benefit local farmers. Profits have become erratic over time as soil health has been depleted and productivity is declining. For many smallholders, their future options remain limited by their dependence on traders (Cole, 2021).

While incomes from cash crops have transformed the livelihoods of most poor households, the apparent success of commercial agriculture hides great disparities between farmers, as discussed in KSQs 1 and 2. The Lao People's Democratic Republic is particularly exposed to market instability as trade remains concentrated mainly with China, Thailand and Viet Nam. For example, the price of rubber dropped drastically from USD 2.82/kg in 2011 to USD 0.48/kg in 2017, and has remained low during the period under study (Baird, 2020). Rubber producers could no longer sell their products and suffered severe income losses, resulting in food shortages (Polthanee et al., 2021).

In a period of falling prices and without the safety net provided by subsistence farming, the





socioeconomic situation of the most vulnerable communities has become dire. Despite the sharp decrease in the country's poverty in recent years, poverty remains high in rural areas (23.8 percent in 2019) (World Bank, 2020), especially among ethnic minorities and households with low education. The poverty rate is more than two and a half times higher for the Mon-Khmer ethnic group than for the Lao-Tai (Lao People's Democratic Republic, Ministry of Agriculture and Forestry, 2016); and in 2019, the poverty rate for households with no formal education was of 34.6 percent, which was ten times higher than those headed by people who had completed their secondary education (World Bank, 2020).

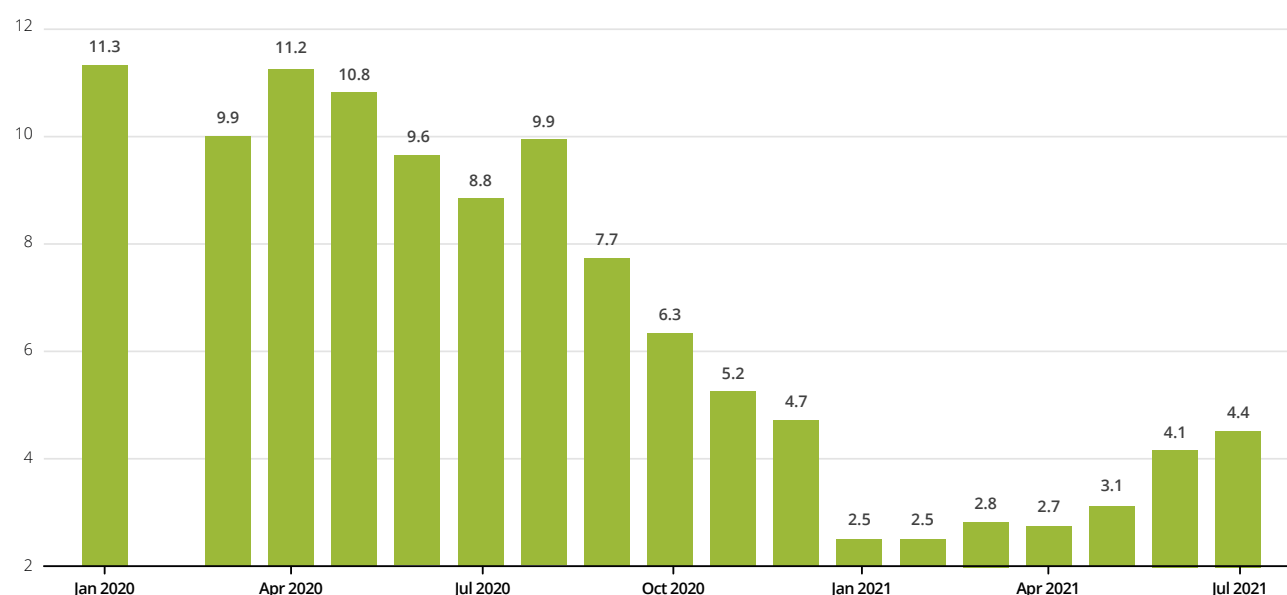
Declining prices of cash crops typically prompt poor farmers to increase their debts or sell their land when they are food insecure. The landless become day labourers and are increasingly dependent on remittance income. Agricultural workers face a precarious employment scenario, dependent on demand for seasonal labour in a very informal labour market. A survey of more than 360 households in Huaphan conducted in 2009 and 2016 showed that the percentage of

households working for others increased from 30 percent to 60 percent during the survey period; while the percentage of households who were rice sufficient for more than six months fell from 70 percent to 20 percent (Castella and Phaipasith, 2021). Remittances from 1.3 million Laotians living abroad, including the 923 000 living in Thailand, is the main source of income for the country's vulnerable poor (Shattuck, Manivong, and Vongthilard, 2019). Yet, rampant food inflation is increasing poverty and food insecurity among the most vulnerable populations (see Figure 17).

This dire situation is amplified during periods of economic crisis, such as the COVID-19 pandemic. In a recent survey of more than 1 000 people, for instance, shows that a large section of the population is affected by an increase in food prices, particularly high in some provinces, which could lead to dramatic food insecurity consequences (WFP, 2020).

As discussed in KSQ 2, while the expansion of commercial agriculture has improved the wealth of some farmers, it has also contributed to increased vulnerability for many, especially smallholder

Figure 17. Food inflation in the Lao People's Democratic Republic



Source: Lao Statistics Bureau. 2021. *Lao food inflation*. [online] Vientiane. Cited 28 March 2022. <https://tradingeconomics.com/laos/food-inflation>



farmers. In areas where concessions have been established, there is decreased availability of non-timber forest products, important nutritional inputs for the diets of vulnerable rural communities, and a significant source of their income. The expansion of big concessions has made small-scale farmers more dependent on off-farm wages from concessions. Although resettlement projects often provide new land to expropriated farmers, the fertility of the land is often insufficient to achieve food security for the resettled communities (Kusakabe et al., 2015).

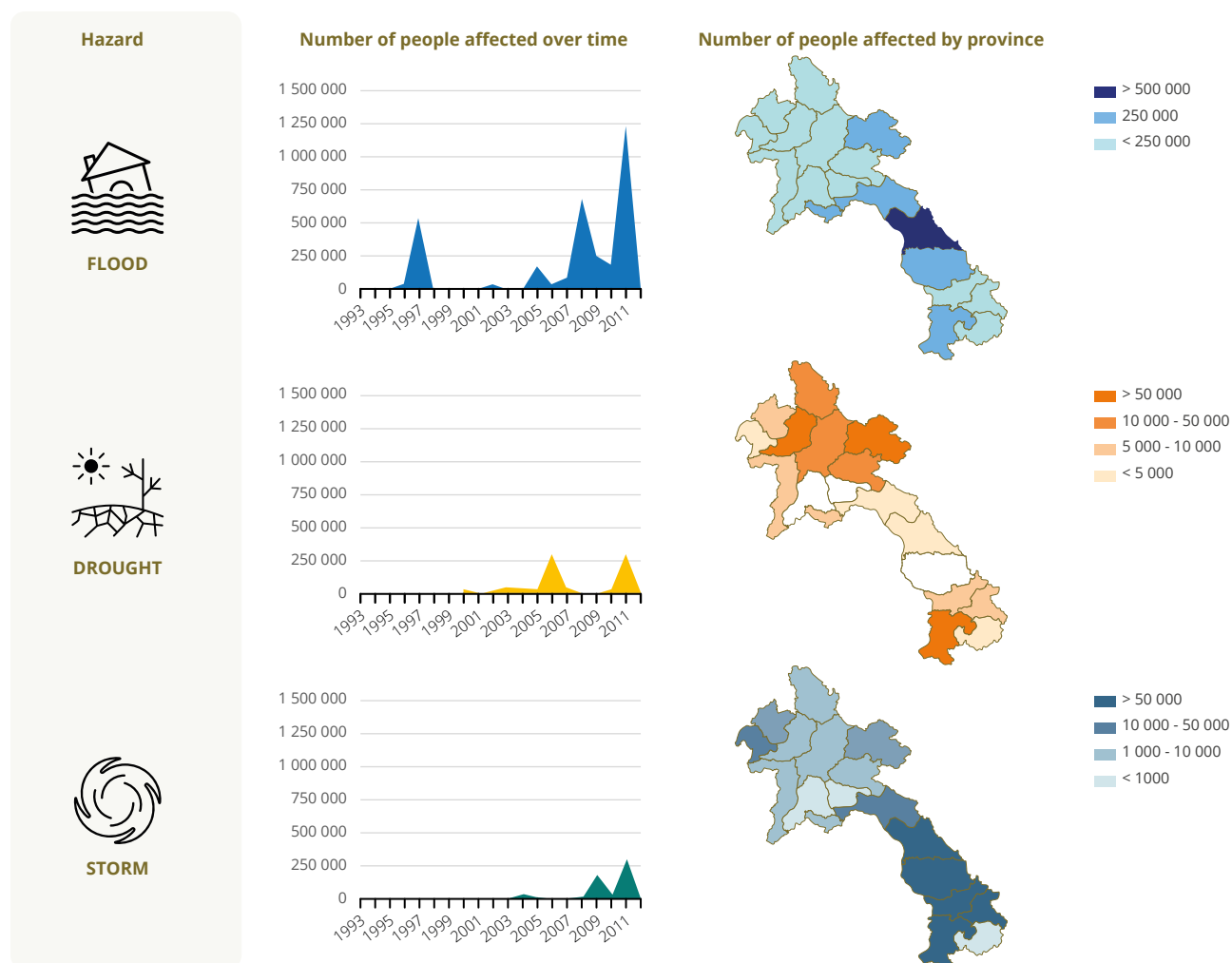
Although large concessions and cash crop development create opportunities for wage labour, there are not enough jobs available and the wages are not high enough to replace food production and income generation from lost agricultural and forest lands. As rural areas do not offer adequate employment opportunities for young workers, they migrate in search of work, most often to Thailand. In 2016, it was estimated that approximately 300 000 Laotians were working in Thailand and that 71 percent of them were from rural areas (IOM, 2016).

The Lao People's Democratic Republic is also highly vulnerable to climatic hazards, such as storms, floods, landslides, droughts, strong winds, and small earthquakes (CFE-DM, 2021). The frequency of droughts, floods and tropical storms has increased over the past three decades, affecting an increasing number of villagers (see Figure 18). A large proportion of the population lives along the Mekong River, in the central and southern parts of the country where the risk of flooding is highest. Most southern rice farmers have been affected at least once by a disaster over the past five years. In northern the Lao People's Democratic Republic and the highlands of central and southern the Lao People's Democratic Republic, the potential risks associated with climate change are crop and livestock pests. Repeated episodes of drought (see Figure 18) also have had a considerable impact on crops, reducing rice productivity by 20 to 30 percent (Voladet et al., 2015). Prospective studies on climate change show that the situation is only going to get worse, as sharp increases in the areas affected by heavy rains or long periods of drought are expected (World Bank and Asian Development Bank, 2021).





Figure 18. Floods, droughts, and storms – Number of people affected over time and by province in the Lao People's Democratic Republic



Source: WFP. 2016. *Lao People's Democratic Republic, consolidated livelihood exercise for analyzing resilience (CLEAR) report.* [online] Vientiane. Cited 28 March 2022. <https://www.wfp.org/publications/lao-pdr-report>. Maps conform to UN. 2004. Map of the Lao People's Democratic Republic. <http://www.un.org/geospatial/content/lao-peoples-democratic-republic>

In 2013, 6.9 percent of the country's rice fields were damaged by floods (Voladet et al., 2015). Climatic hazards have affected about 100 000 Ha of rice fields. In 2018, rice production declined to 3.6 million tonnes from more than four million tonnes in the previous year (UNCTAD, 2021). Livestock losses were significant in 2017 (17 000 large animals and 79 000 poultry) (UNCTAD, 2021). Flood damage to irrigation infrastructure in 2018 and 2019 caused drops in harvests. Rice production in 2019 was 12

percent below the previous five-year average, leading to higher prices in December 2019 – 30 percent higher year-on-year – and food shortage for an estimated 67 800 people in early 2020, especially hard hit were poor households dependent on upland rice cultivation (FAO, 2019). Ethnic minorities from remote mountain areas without any socioeconomic safety nets and low coping mechanisms are particularly vulnerable to climatic hazards (Siliphouthone and Yasunobu, 2015).



Proposed systemic levers:

1. **improve connectivity with essential agricultural, health and other services (roads, electricity, health facility, market, credit access and inputs) for rural and remote communities;**
2. **offer support services (techniques and innovative technology) to rural smallholder farmers to help them build resilience to socioeconomic and climate changes; and**
3. **improve regulations related to contract farming and land concessions to protect the communities and workers as well as the environment.**

Better infrastructure and transportation networks could link rural communities with markets. Strengthening farmer groups and agricultural cooperatives could empower farmers to sell agricultural products, bargain and gain access to credit and markets. Increasing connectivity could generate opportunities for decent jobs, income, and social safety nets for the rural population, including people living in remote areas. Access to credit and technological and innovative practices would help farmers increase the productivity and quality of their products, which, in turn, would increase food availability and add to the supply used for meeting national and international demand for agricultural products both crops and livestock.

There is a need to strengthen extension workers with knowledge, capacity and practical

skills for the engagements with local farmers. Technical and financial support for rural smallholder farmers would help them cope with rapid environmental and economic changes. Developing production plans and management strategies would create agricultural resilience to climate change. Innovative and advisory services from provincial and district extension workers would help farmers to transform from subsistent practices to agroecological food production systems, which is a more sustainable way for food production and commercialization. Deploying crop resilient varieties, such as rice paddy and vegetables, resistant to disease, drought, and floods would help farmers adapt to severe climate change.

Commercialization of the agriculture sector needs to be accompanied by enabling policies, and an institutional and legal framework. Responsible investment has to be implemented and monitored by the authorities so that fair compensation is paid to the villagers for their losses. It is also important to empower village development committees to monitor, report and negotiate with local authorities and companies on the fairness of compensation and working conditions in concession projects. Workers' rights and health and safety standards should be set and enforced, especially for banana and rubber plantations and other crops associated with documented health risks. A more comprehensive legal framework that underpins the rights of farmers and investors, while also setting measures to manage and avoid potentially negative social and environmental impacts of commodity crops is critical.





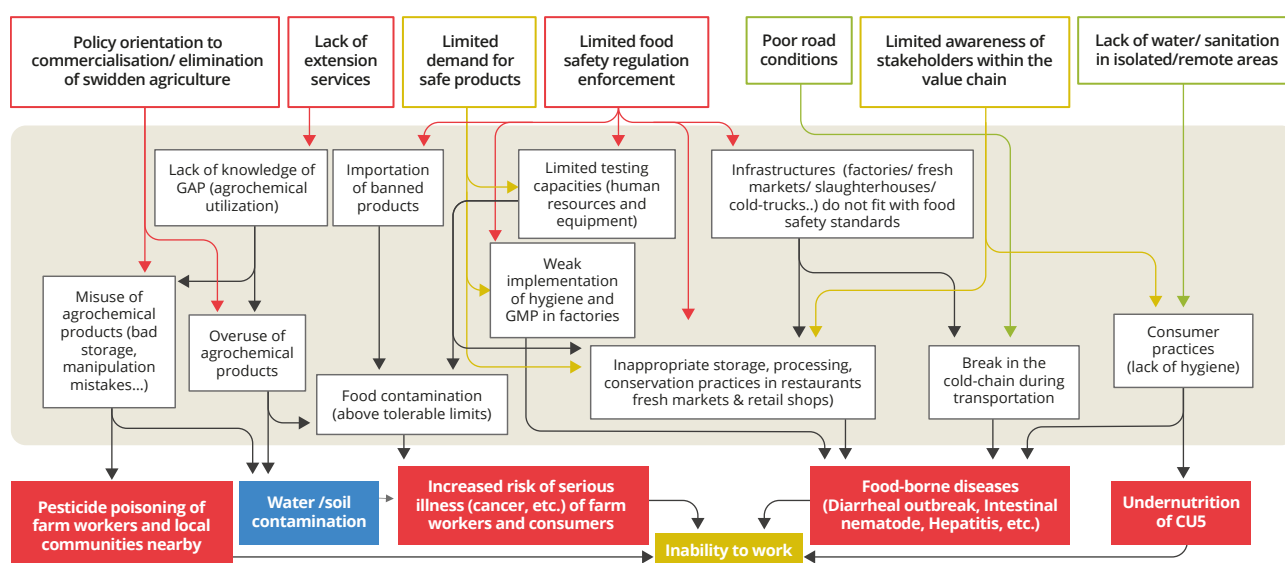
Key Sustainability Question 4: What are the reasons behind the increasing safety concerns in domestic and imported food value chains, for both fresh and processed food?

Unsafe food is a major concern in the Lao People's Democratic Republic. Although food contamination surveillance, research, and documented reports on food-borne diseases are limited in the country, food-borne hazards are increasingly recognized by the government, consumers, and other value chain actors. For example, the blood tests taken from nearly 1 000 school children, farmers, and consumers in Xieng Khouang province showed that only 4 percent of them had no signs of contamination (Rassapong et al., 2018). In addition, diarrheal diseases and intestinal nematode infections are highly prevalent in the country (Houatthongkham, 2020). Diarrhoea is not only the main cause of child mortality, but it also contributes to malnutrition among children. Unhygienic practices and food-borne illnesses often result in poor nutrient absorption, leading to the malnutrition of children under five years, as discussed in KSQ 1.

Since the 2000s, the Government of the People's Democratic Republic has gradually developed

a plan of action for food safety to protect the health of consumers and promote international trade by strengthening food safety regulations. The Food Safety Policy was introduced in 2009. In 2015, the Government endorsed the principles of "developing clean, safe, and sustainable agriculture", in addition to adhering to the Lao Organic Agriculture Standard applied since 2005 and the Lao Good Agriculture Practices Standard and Certification System, adapted from the ASEAN Good Agricultural practices in 2014. These policies focus more on the export sector, however, when combined with development projects, they support the creation of organic markets in Vientiane and some cities in the north of the country. Various sanitary measures, such as the Good Manufacturing Practice and the Hazard Analysis Critical Control Point-based systems have also been introduced. Despite the regulatory framework, however, food safety challenges continue to persist (see Figure 19).

Figure 19. Reasons behind the increasing safety concerns for both fresh and processed food in domestic and imported food value chains



Source: Authors, 2021.

Notes: GAP, Good Agricultural Practices; GMP, Good Manufacturing Practice.



One of the reasons behind this persistent food safety challenge is the policy shift from subsistence to commercial agriculture, which has increased in agrochemical use across the country. Overuse of agrochemicals is a direct consequence of this profound change toward commercial agriculture in the Lao People's Democratic Republic, as discussed in KSQ 2. A recent study shows that 59 percent of vegetable farmers in the country overuse pesticides (Schreinemachers, et al., 2020).

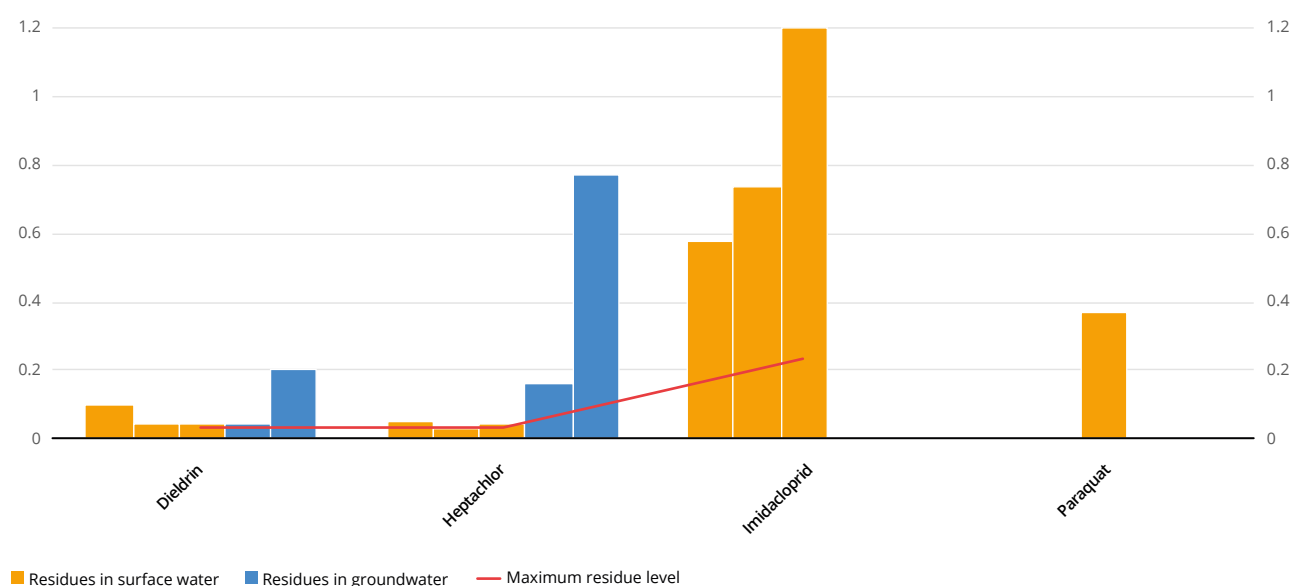
A study conducted on banana plantations in northern Laos People's Democratic Republic shows that the potential environmental risk of pesticides is significant, as several pesticide residues were found in surface and groundwater samples that exceeded WHO standards for environmental water quality (Wentworth et al., 2021). In addition, residues of some organochlorine pesticides that are prohibited in the Lao People's Democratic Republic, including dichlorodiphenyltrichloroethane (DDT), were detected (Wentworth et al., 2021). These pesticides are very prevalent in the environment and tend to

bioaccumulate, posing a risk to those exposed to contamination (see Figure 20).

Small-scale farmers are increasingly applying chemicals to produce traditional upland rice and vegetables, which were previously considered "organic by default" (Shattuck, 2021). The few studies to screen pesticide residues in local market produce and on-farm food products in the Lao People's Democratic Republic show contamination levels of great concern. A high concentration of pesticide residues was also detected in imported food products, as shown by the studies carried out in Xieng Khouang province (see Table 3) (Rassapong, 2018).

Throughout the country, awareness of proper pesticide handling practices is poor among the farmers. Mixing agrochemical products without environmental precautions and spraying pesticides without adequate protective clothing are common practices. Although there is no formal monitoring system and no official record of accidents from

Figure 20. Pesticide residue levels in surface water and groundwater observed in banana farms in northern the Lao People's Democratic Republic ($\mu\text{g/l}$)



Source: Adapted from Wentworth et al. 2021. *Environmental risks from pesticide use: the case of commercial banana farming in northern the Lao People's Democratic Republic*. WMI research report 177. [online] Colombo. Cited on 28 March 2022. https://www.iwmi.cgiar.org/Publications/IWMI_Research_Reports/PDF/pub177/rr177.pdf



pesticide misuse, stories of acute poisonings are numerous (Schreinemachers, et al., 2020; Shattuck, 2021). In addition, increasing livestock production to meet the high demand from domestic and international markets push farmers to use high doses of antibiotics and growth hormones.

Misuse of such products is also related to an important gap in meat production (Ramachandran et al., 2017). Accordingly, increasing residues of hormones and antibiotics found in meat products are also a growing public health concern (Archawakulathep et al., 2014).

Table 3. Estimation of pesticide residues in food products from Xieng Khouang province

Pesticide residue tests Xieng Khouang by source						
Districts	Provincial markets - domestic produce		Provincial markets - imported produce		Direct from farmers	
	Tot. samples	% of unsafe	Tot. samples	% of unsafe	Tot. samples	% of unsafe
Nonghet	18	5.6	8	12.5	21	4.8
Kham	56	12.5	24	16.7	19	10.5
Mork	51	13.7	18	27.8	31	0
Khoun	33	18.2	15	33.3	37	0
Phaxay	46	8.7	15	13.3	13	15.4
Phoukout	55	7.3	22	31.8	22	22.7
Paek	60	23.3	29	62.1	17	29.4
Total	319	13.5	13.1	32.1	160	9.4

Source: Rassapong, S., Syfongxay, C., Phanthanivong, I., Syhalad, B., Phimmahthut, S., Manyvong, T., Keothangkham, B., et al. 2018. *Pesticide Use in Lao PDR: Health and Environmental Impacts. Luras briefing note, January*. [online] Vientiane. Cited on 29 March 2022. <https://www.laofab.org/document/download/3477>

Some of the impacts of the overuse and misuse of agrochemicals, hormones, and antibiotics are water and soil contamination, an increase in cases of farmer poisoning, and food and drinking water contamination leading to a risk of serious illnesses, such as cancer (Shattuck, 2021; Hughes et al., 2021). Rassapong et al. (2018) reported that 41 percent of the blood tests taken from school children, farmers, and consumers in Xieng Khouang province and Vientiane in 2016–2017, had residue levels for organophosphates and carbamates above recommended levels.

The excessive use of pesticides and other substances is also caused by the lack of equipment and human resources (GIZ and Consumers International., 2013a). Tests that are carried out to measure pesticide residues in the

country's agricultural products are generally not very sophisticated because of cost issues and limited of local laboratories to run accurate tests.

Government services also face challenges related to reach, capacity and enforcement of regulations, as many farms are located in remote areas. Most provincial and district extension officers have limited skills and budgets for providing technical support on clean agriculture practices. Moreover, these pesticides are mainly imported from neighbouring countries (Elsing, 2019). Tracking imported agrochemicals and maintaining control of food imports are especially difficult for the local government because of porous borders with neighbouring countries. Data from the Ministry of Agriculture show that between 2006 and 2016, pesticide imports increased 3 696 percent as



commercial agriculture took off (Shattuck, 2021). Some of these imports are illegal and some of the chemical products imported are prohibited, such as Paraquat.

The combination of a low perception of risks among the local farming community and the limited market demand for safe foods is why incentives to ensure food safety along the value chain are low (FAO, 2021b). As organic agriculture and Good Agricultural Practices certifications are expensive, only a very few entrepreneurs implement voluntary standards. Good Agricultural Practices certification is still in the early stages of development and consumers in the Lao People's Democratic Republic are not aware of it. According to Ku and Dumbrell (2020), only 12 farmer groups covering 720 households and 40 types of vegetables were awarded the national Good Agricultural Practices certification in 2016.

Lack of control is also prevalent in the intermediate and downstream stages of the food value chains. Owing to limited testing capacities in the country, imported food is often contaminated, including seafood, which tends to have high levels of formalin, a solution used as a preservative (Keovongsuk et al., 2020). The few tests that have been conducted in markets, food factories, restaurants, and schools show high levels of food contamination. For instance, a recent report on food surveillance and monitoring along the food distribution chain indicated that out of a test case of 1 450 samples, 442 of them were contaminated. Some food contaminations can be particularly dangerous, such as borax in meat and processed foods, formaldehyde in meat and seafood, and coliform in drinking water and ice (FDD, 2020). Local factory managers have limited knowledge about food safety regulations while Good Manufacturing Practice certification is voluntary, so not many entities have attained it (Duangtavanh, 2019).

Food chains are largely informal, which also presents challenges for the enforcement of food safety regulations. Food processing industries and slaughterhouses are under-equipped and lack the

capacity to comply with food safety standards. Challenges related to reaching and accessibility in rural areas often lead to a distribution of chilled and frozen products in insulated and cooled transport boxes without appropriate refrigerated containers (Onphanhdala, 2019). This type of food transport system can lead to an increasing risk of fresh and frozen products carrying various food-borne pathogens (Pruvot et al., 2019). For example, foods contaminated by banned chemicals (formaline) and pathogenic bacteria have been reported in local wet markets (Chanthakoun et al. 2018). Inappropriate storage practices in small shops, particularly in rural areas, are also commonly reported, such as food and pesticides, which are reportedly often stored on the same shelves (Vazquez et al., 2013). Poor hygienic practices have been observed in informal wet markets where safe water and toilets are lacking (WHO, 2011). Buying food from wayside stalls, where hygiene and safety standards are seldom enforced, is a common practice in the country.

Food safety education is limited in the Lao People's Democratic Republic. Consumers have little access to food safety information. Food packages, particularly from rural shops, do not mention expiry dates, while food safety warnings are not written in the Lao language. As discussed in KSQ 1, another challenge is the lack of personal hygiene and sanitation, which increases the risks of food-borne diseases, such as coliform (Kounnavong et al., 2011).

Only 54 percent of the population has access to a handwashing facility with soap and water, while only 48 percent of primary schools and 25 percent of health facilities have access to safe drinking water and sanitation (World Bank, 2019). Only 24 percent of the population in remote rural areas without proper roads have access to safe water (GIZ and Consumers International, 2013b). As a result, the prevalence of hepatitis and intestinal infection is high in the Lao People's Democratic Republic (Coker et al., 2011). Kounvisith et al. (2020) reported that about 64 percent of 400 children and adults from Xieng Khouang province and the Vientiane Capital had tested positive for hepatitis A.



Proposed systemic levers:

1. **strengthen capacity development of institutions and individual involvement in enforcing food safety standards and improving food quality controls and inspections; and**
2. **increase food safety awareness and education among consumers and all actors involved in the food value chain.**

In keeping with the National Food Systems Dialogue 2021, there is a need to better disseminate Good Agricultural Practices, Good Manufacturing Practices, Hazard Analysis Critical Control Point, and organic agriculture standards among farmers and food companies. Implementation of such standards and good practices requires accurate technical assistance and skilled extension services. Specific curriculums can help to train farmers, food industry managers, and employees.

Increasing the number of researchers and food technologists responsible for the monitoring and

control of pathogens in food and site inspection staff would improve food quality control capacity (physical, chemical and microbiological analysis). Strengthening border control points is important to tackle illegal imports of prohibited pesticides and food products that do not comply with safety standards. Training and curriculum development can help to build the capacity of food safety staff working in public administration. Equipping food laboratories with modern technologies is another key issue for monitoring public health, and for issuing alerts in case of serious health problems.

Running communication campaigns, training support staff for establishing consumer groups and offering incentives for creating consumer associations for greater consumer participation in decisions affecting the food chain can address the lack of general awareness on food safety. Consumers should be able to disseminate information in case of food poisoning. A data collection system on the main food-borne pests, parasites and diseases and food poisoning related to the misuse of pesticides can address the lack of information on food safety and allow the Government to set up policy measures.





Transition to sustainable food systems

as action points for transformation encompass many dimensions – agriculture and forestry, health, education, and the environment – across rural and urban areas, requiring strong engagement from public, private and civil society as well as consumers at large. Business as usual is unsustainable, but the transformation requires strong political will, collaboration across stakeholders, and an accountability framework, including upward and downward accountability. An effective coordination mechanism that involves government stakeholders from various ministries and line departments, central and local levels, private sector players, civil society organizations, and non-governmental organizations is needed to ensure coherence in policies across different dimensions for an impactful outcome.

The findings of the rapid assessment serve as the first step for planning programmes and projects for sustainable food systems transformation. The assessment identified specific actions with different entry points to trigger system-transformative changes.

Build a dynamic and resilient production base:

- strengthen the resilience of smallholder farmers as climate change extremes will entail increased exposure to floods, droughts, and pest invasion;
 - strengthen producer organizations to improve the capacity of rural producers, improve extension efficiency and adoption of sustainable agriculture practices, and encourage joint procurement and marketing of sustainable farm produce, to reduce their vulnerability to economic shocks and dependence on middlemen and traders;
 - promote agroecological practices to improve soil management, limit the use of chemicals, enhance food safety, and target niche markets; and
 - find innovative ways to encourage young people to participate in efforts to make more productive and efficient food systems by promoting sustainable agricultural practices and increasing agriculture competitiveness.
- Improve the efficiency of the value chains to contribute to sustainable and resilient food systems:
- promote good manufacturing practices and Hazard Analysis Critical Control Point during post-harvest and processing to enhance product quality;
 - upgrade logistics and value chain infrastructure, namely wholesale markets, wet markets, collection and aggregation centres, transport, and roads, to enhance value addition, improve hygiene and food safety, reduce agricultural wastes and food losses, and facilitate market access;
 - establish and implement traceability procedures for agricultural products; and
 - provide agricultural financing to leverage private sector investments in processing and market distribution.
- Address the socioeconomic challenges facing the food systems:
- provide nutrition education to the general public, with particular attention paid to vulnerable groups, children, women of reproductive age, and ethnic groups;
 - reduce poverty and hunger, increase food access and promote consumption of a diverse quantity of nutritious and safe foods, with the objective to tackle undernourishment, and overweight and obesity.
 - reduce inequalities among the most vulnerable and ethno-linguistic groups, and



- increase job opportunities with decent incomes, social safety nets, social support, and well-being.

Build an enabling policy environment for food systems transformation:

- improve food safety standards and regulations for all actors in agricultural value chains to be consistent with regional and international markets;
- enforce national regulations on environmental and social impacts of large-scale investments,
- clean agriculture production and food safety;
- strengthen the coherence between export-oriented agricultural development policies and the country's green and sustainable agriculture framework for 2030;
- strengthen extension services related to agriculture and nutrition; and
- upgrade national and regional laboratories and research centres in risk analysis in such areas as climate, disease, food safety and market risks, risk management and risk communication.



References

- Archawakulathep, A., Kim, C., Meusene, D., Handijatno, D., Hassim, H., Rovira, H., Myint, K., et al.** 2014. Perspectives on antimicrobial resistance in livestock and livestock products in ASEAN countries. *The Thai Journal of Veterinary Medicine*, 44(1): 5–13.
- Baird, I.** 2011. "Turning land into capital, turning people into labor: primitive accumulation and the arrival of large-scale economic land concessions in the Lao People's Democratic Republic". *New Proposals: Journal of Marxism and Interdisciplinary Inquiry*, 5(1): 10–26.
- Baird, I.** 2020. Problems for the plantations: Challenges for large-scale land concessions in Laos and Cambodia. *Journal of Agrarian Change*, 20(3): 387–407.
- Broegaard, R. B., Rasmussen, L. V., Dawson, N., Mertz, O., Vongvisouk, T., & Grogan, K.** 2017. Wild food collection and nutrition under commercial agriculture expansion in agriculture-forest landscapes. *Forest Policy and Economics*, 84, 92–101.
- CFE-DM.** 2021. *Lao PDR Disaster management reference handbook*. <https://reliefweb.int/report/lao-peoples-democratic-republic/disaster-management-reference-handbook-lao-pdr-february-2021>
- Castella, J.-C., and Phaipasith, S.** 2021. Rural Roads Are Paving the Way for Land-Use Intensification in the Uplands of Laos. *Land*, 10(3), 330.
- Chanthakoun, V., Manysoat, S., Briatia, X., & Bandavong, V.** 2018. Study on Food Safety by Detection of Contamination in Food of the Market at Luang Prabang. Department of Food Science and Technology, Faculty of Agriculture and Forest Resource, Souphanouvong University, Laos. *Souphanouvong Journal*. 3: 144–155. [ISSN: 2521-0653].
- Coker, R., Hunter, B., Rudge, J., Liverani, M., & Hanvoravongchai, P.** 2011. Emerging infectious diseases in Southeast Asia: regional challenges to control. *Lancet*, 377 (9765): 599–609.
- Cole, R.** 2021. Cashing in or driving development? Cross-border traders and maize contract farming in northeast Laos. *Journal of Agrarian Change*, 22(1) 39–61.
- Comrie-Thomson, L., Phongluxa, P., Walker, S., Huang, S., Willenberg, L., Tartaggia, J., & Coghlan, B.** 2020. Understanding eating and feeding practices affecting maternal-child nutrition in ethnic minority groups in southern Lao People's Democratic Republic. Vientiane, World Vision.
- Costenbader, J., Varns, T., Vidal, A., Stanley, L., & Broadhead, J.** 2015. *Drivers of forest change in the greater Mekong Subregion*. Lao PDR Country Report. USAID LEAF.
- Duangtavanh, S.** 2019. Food safety development in Lao PDR. Presentation made in Vientiane on 19 October. <https://www.laofab.org/document/download/4078>.
- Elsing, S.** 2019. Navigating small-scale trade across Thai-Lao border checkpoints: legitimacy, social relations and money. *Journal of Contemporary Asia*, 49(2): 216–232.
- FAO.** 2019. *Special Report – 2019 FAO/WFP Crop and Food Security Assessment Mission to the Lao People's Democratic Republic*. Rome. <https://doi.org/10.4060/ca8392en>.
- FAO.** 2020. *Global Forest Resources Assessment 2020*. Rome. <https://www.fao.org/documents/card/en/c/ca8753en/>
- FAO.** 2021b. National Agricultural Innovation System Assessment in Lao PDR, consolidated report. www.fao.org/nr/research-extension-systems/informres/en/

FDD. 2020. *Report of food surveillance and monitoring tests in markets, food factory, restaurants and schools*. Food and Drug Department & Bureau of Food and Drug Inspection, Ministry of Health, Laos

Friis, C., and Østergaard N. 2016. Small-scale land acquisitions, large-scale implications: exploring the case of Chinese banana investments in northern Laos, *Land Use Policy*, 57, 117–129.

Fujisao, K., Khanthavong, P., Oudthachit, S., Matsumoto, N., Homma, K., Asai, H., & Shiraiwa, T. 2020. Impacts of the continuous maize cultivation on soil properties in Sainyabuli province, Laos, *Scientific reports*, 10(1): 1-9.

Fullbrook, D. 2014. Contract farming: what works and what might work better. Prepared for the contract farming workshop of the Government Development Partners Sub-Sector Working Group on Farmers and Agribusiness (SWGAB), Agence Française de Développement, the Swiss Agency for Development and Cooperation and the International NGO Network Laos, May. www.researchgate.net/publication/265824253_Contract_Farming_What_works_what_might_work_better

Fullbrook, D. 2011. Smallholder production agreements in the Lao PDR: qualifying success. Study produced by the Laos Extension for Agriculture Project (LEAP) for the Government Donor Sub-working Group on Farmers and Agribusiness. www.researchgate.net/publication/265822951_Smallholder_production_agreements_in_the_Lao_PDR_Qualifying_Success

German Agency for International Cooperation (GIZ) & Consumers international. 2013a. Food safety control measures: country report for Lao PDR” www.asean-agrifood.org/download/appendix-ii-country-report-laos/

German Agency for International Cooperation (GIZ), & Consumers International. 2013b. Food Safety Control Measures in Developing Asian Countries: Bangladesh, Cambodia, Lao PDR and Myanmar. www.asean-agrifood.org/download/food-safety-control-measures-in-developing-asian-countries-bangladesh-cambodia-lao-pdr-and-myanmar/?wpdmdl=9596&refresh=626be50d9833c1651238157

Lao People’s Democratic Republic. 2018. Post-disaster needs assessment: 2018 Floods. December. Government of the Lao People’s Democratic Republic. www.gfdrr.org/en/publication/post-disaster-needs-assessment-2018-floods-lao-pdr

Lao People’s Democratic Republic. 2021. 9th National Social Economic Development Plan (2021–2025). Vientiane.

Hepp, C., Bech Bruun, T., & de Neergaard, A. 2019. Transitioning towards commercial upland agriculture: a comparative study in Northern Lao PDR. *NJAS: Wageningen Journal of Life Sciences*, 88(1): 57–65.

Houatthongkham, S. 2020. Etiologic agents of diarrhea in Vientiane Capital, Lao People's Democratic Republic. *International Journal of Infectious Diseases*, 101: 344.

Hughes, D., Thonkum, W., Tidpor, K., Turnbull, N., Yukalang, N., Sycharuen, V., Vo, T. et al. 2021. Pesticides use and health impacts on farmers in Thailand, Vietnam, and Lao PDR: Protocol for a survey of knowledge, behaviours and blood acetyl cholinesterase concentrations. *PLoS ONE*, 16(9).

International Organization for Migration (IOM). 2016. *Assessing Potential Changes in the Migration Patterns of Laotian Migrants and Their Impacts on Thailand and Lao People’s Democratic Republic*. Vientiane, IOM.

Ingalls, M., Diepart, J.-C., Truong, N., Hayward, D., Niel, T., Phomphakady, C., Bernhard, R et al. 2018. *State of Land in the Mekong Region*. Bern, Bern Open Publishing.

Ingalls M., Thannasack P., Hett C., Heinimann, A., & Phyoyavong K. 2020. *Non-Timber Forest Products in the Green Economy of Lao PDR*. TABI.

Junquera, V., and Grêt-Regamey, A. 2020. Assessing livelihood vulnerability using a Bayesian network: a case study in northern Laos. *Ecology and Society*, 25(4): 38.

Kallio, M., Hogarth, N., Moeliono, M., Brockhaus, M., Cole, R., Bong, I., & Wong, G. et al. 2019. The colour of maize: Visions of green growth and farmers perceptions in northern Laos, *Land Use Policy*, 80, 185–194.

Kamiya, Y., Nomura, M., Ogino, H., Yoshikawa, K., Siengsounthone, L., & Xangsayarath, P. 2018. Mothers' autonomy and childhood stunting: evidence from semi-urban communities in Lao PDR. *BMC women's health*, 18(1): 1-9.

Kenney-Lazar, M. 2015. *Authoritarian resource governance and emerging peasant resistance in the context of Sino-Vietnamese tree plantations, Southeastern Laos: land grabbing, conflict and agrarian-environmental transformations: perspectives from East and Southeast Asia*. BRICS Initiatives for Critical Agrarian Studies (BICAS), MOSAIC Research Project, Land Deal Politics Initiative (LDPI), RCSD Chiang Mai University, Transnational Institute, i-iv, 1–21.

Kenney-Lazar, M., Dwyer, M., and Hett, C. 2018. *Turning land into capital: assessing a decade of policy in practice. A report commissioned by the Land Issues Working Group (LIWG)*. Vientiane.

Keovongsuk, V., Sulyya, S., & Vongkhampeang, C. 2020. *Detection of formalin in seafoods at markets and wholesaler-retailer stores (Case study: Xaythany District and Xaysetha District, Vientiane capital)*. <http://research-forum.nuol.edu.la/2020/11/03/detection-of-formalin-in-seafoods-at-markets-and-wholesaler-retailer-stores-case-study-xaythany-district-and-xaysetha-district-vientiane-capital/>.

Khounvisith, V., Xaiyaphet, X., Chanthavilay, P., Nouanthong, P., Vongphachanh, B., Reinharz, D., Muller, et. al. 2020. Hepatitis A virus in Lao People's Democratic Republic: seroprevalence and risk factors, *The American Journal of Tropical Medicine and Hygiene*, 103(1), 164–168.

Kounnavong, S., Vonglokham, M., Houamboun, K., Odermatt, P., & Bouppha, B. 2011. Soil-transmitted helminth infections and risk factors in preschool children in southern rural Lao People's Democratic Republic, *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 105(3): 160–166.

Kousonsavath, C., Marie-Vivien, D., Vagneron, I., and Xiong, M. 2018. *Boosting the demand for organic products: The role of consumer trust and product availability*. Policy brief. Available at www.semanticscholar.org/paper/Boosting-the-demand-for-organic-products%3A-The-role-Kousonsavath-Marie-Vivien/2616ef4ade6da9d2a2a6ee04fb94e9bab39f5f79

Ku, V., & Dumbrell, N. 2020. *Safe vegetable production in ASEAN countries: status and opportunities for improvement*. ASEM/2013/018. Available at <https://tarisp.group/wp-content/uploads/2020/02/ASEM-2012-081-Appendix-19-Review-Safe-Vegetables-Production-in-ASEAN-countries.pdf>

Kusakabe, K., Lund, R., Panda, S., Wang, Y., and Vongphakdy, S. 2015. Resettlement in Lao PDR: mobility, resistance and gendered impacts. *Gender, Place & Culture*, 22(8).

Lao People's Democratic Republic, Ministry of Agriculture and Forestry. 2014. *Lao census of agriculture 2010/11: Analysis of selected themes*. Vientiane. www.fao.org/3/at767e/at767e.pdf

Lao People's Democratic Republic, Ministry of Agriculture and Forestry. 2016. *Indigenous Peoples Planning Framework. Lao PDR: Northern Rural Infrastructure Development Sector Project. Ethnic Groups Development Framework*. Vientiane. www.adb.org/sites/default/files/linked-documents/42203-025-ippfab.pdf

Lao Statistics Bureau. 2013. Laos Expenditure and Consumption Survey (LECS, V)

Lao Statistics Bureau. 2015. Provisional Report of the Fourth Lao Population and Housing Census 2015. <https://lao.unfpa.org/sites/default/files/pub-pdf/Final%20report-editing-English1.pdf>

Lapeyre, L., Tixier, P., & Risède, J-M. 2017. *Mission report of the CIRAD (UR GECCO) team to Lao PDR from 17/10/17 to 24/10/17*. Available at <https://agritrop.cirad.fr/588351/>.

- Lette, J., Sylvester, J., Khouangvichit, V.** 2017. *Guiding principles towards responsible agricultural investment in Lao PDR. MRLG and Village Focus International discussion note.* January. www.mrlg.org/publications/guiding-principles-towards-responsible-agricultural-investment-in-lao-pdr/
- Lienhard, P., Castella, J-C., Ferrand, P., Cournarie, M., d'Aquino, P., Scopel, É., & Bougnoux, N.** 2019. Accompanying the actors of the agroecological transition in Laos. In: F-X Côte, E. Poirier-Magona, P. Perret, B. Rapidel, P. Roudier, Philippe, & M-C Thirion, et al., eds. *The agroecological transition of agricultural systems in the Global South.* Versailles, France, QUAE.
- Logistics Capacity Assessment.** 2021. *Lao People's Democratic Republic: Road Assessment, Laos Logistics Infrastructure.* Assessed by WFP Laos Supply Chain Team. <https://dlca.logcluster.org/display/public/DLCA/2.3+Laos+Road+Assessment>
- Manivong, V., and Cramb, R.** 2020. *From subsistence to commercial rice production in Laos. In: R. Cramb, ed. White Gold: The Commercialisation of Rice Farming in the Lower Mekong Basin.* Palgrave Macmillan, Singapore.
- National Agriculture and Forestry Research Institute.** 2020. Leveraging geo-economic proximity and agricultural commercialisation. Research brief no. 001/2020. <https://ali-sea.org/aliseaonlineibrary-dashboard/get/file/NAFRI-Research-Brief-Leveraging-Geo-Economic-Proximity-and-Agricultural-Commercialisation.pdf>
- National Institute for Economic Research.** 2020. Contract farming in Lao PDR. Presentation by NIER, MPI. Vientiane, 22 May 2020.
- Onphanhdala, P.** 2019. Inter-state and transit trade by using the cold chain in the Lao People's Democratic Republic. In, Kusano, E., ed. *The Cold Chain for Agri-food Products in ASEAN.* ERIA Research Project Report FY2018 no.11, Jakarta, ERIA.
- Polthane, A., Promkhambut, A., Aditto, S., & Phasouysaingam, A.** 2021. Impact of changing swidden-based farming to rubber-based farming on food security in Luang Namtha province, Lao PDR. *Sustainability* 2021, 13(14): 7617.
- Pruvot, M., Kammavong, K., Milavong, P., Philavong, C., Reinharz, D., Mayxah, M., Rattanvong, S. et al.** 2019. "Toward a quantification of risks at the nexus of conservation and health: The case of bushmeat markets in Lao PDR". *Science of the Total Environment*, 676: 732–745.
- Ramachandran, P., Weaver, T., Medialdia, T., & Adriano, L. et al.** 2017. *Harmonizing Food Safety Systems and Increasing Market Access in the Greater Mekong Subregion.* Discussion Paper No. 1, Greater Mekong Subregion's Core Agriculture Support Program Phase 2 (CASP2), ADB. www.gmswga.org/sites/default/files/documents/Discussion%201%20Harmonizing.pdf
- Schlemmer, G.** 2017. Ethnic belonging in Laos: a politico-historical perspective. In V. Bouté & V. Pholsena, eds., *Changing Lives: New Perspectives on Society, Politics, and Culture in Laos.* Singapore, NUS Press.
- Schreinemachers, P., Grovermann, C., Praneetvatakul, S., Heng, P., Nguyen, T., Buntong, B., Li, N. et al.** 2020. "How much is too much? Quantifying pesticide overuse in vegetable production in Southeast Asia". *Journal of Cleaner Production*, 244:118738.
- Shattuck, A.** 2021. "Toxic uncertainties and epistemic emergence: understanding pesticides and health in Lao PDR". *Annals of the American Association of Geographers*, 111(1): 216–230.
- Shattuck, A., Manivong, V., & Vongthilard, S.** 2019. Towards 'People Centered Agriculture': Rethinking rural labour, youth employment and the agrarian transition in Laos". www.laofab.org/document/view/4069
- Siliphouthone, I., & Yasunobu, K.** 2015. The Effects of Flood on Household Economies and Food Security in Lowland Rice Farming Households in Laos, *Journal of the Japanese Society of Agricultural Technology Management*. 22(3): 69–79.
- Thanichanon, P., Schmidt-Vogt, D., Epprecht, M., Heinemann, A., & Wiesmann, U.** 2018. "Balancing cash and food: The impacts of agrarian change on rural land use and wellbeing in Northern Laos", *PLoS ONE*, 13(12): e0209166.
- Troeger, C., Forouzanfar, M., Rao, P., Khalil, I., Brown, A., Renner Jr., & Fullman, N. et al.** 2017. Estimates of global, regional,

and national morbidity, mortality, and aetiologies of diarrheal diseases: a systematic analysis for the Global Burden of Disease Study 2015. *The Lancet Infectious Diseases*, 17(9): 909–948.

United Nations. 2021. *Pathways to sustainable food systems. Food Systems Summit 2021: Member State dialogues in Lao PDR*. <https://laopdr.un.org/en/137391-synthesis-report-pathways-sustainable-food-systems-food-systems-summit-2021-member-state>

United Nations Children's Fund (UNICEF). 2017. Lao Social Indicator Survey (LSIS) 2017. Vientiane.

United Nations Children's Fund (UNICEF). 2019. The Situation of Children and Women of Lao People's Democratic Republic. Vientiane. www.unicef.org/laos/reports/situation-children-and-women-laopdr

United Nations Conference on Trade and Development (UNCTD). 2021. Vulnerability profile of Lao PDR (UNCTAD/ALDC/2021/2).

United States Department of Agriculture (USDA). 2019. Laos Rice Report MY2018-2019. Global agriculture information network (GAIN). GAIN Report Number: TH9016. www.fas.usda.gov/data/laos-laos-rice-annual

Vazquez, C., Tasaka, K., Makarady, K., Monorum, C., & Sopha, Y. 2013. Illegal pesticide trade in the Mekong countries: case studies from Cambodia and Lao PDR. CEDAC, SAEDA and PANAP.

Voladet, S., Bounsiphom, L., Xayyalath, V., & Chanphathong, C. 2015. Study report on Social Protection for Small-Scale Farmers in Lao PDR: Risk and Vulnerability Assessment. Mekong economic research network. <https://idl-bnc-idrc.dspacedirect.org/handle/10625/54702>

Vongvisouk, T., Mertz, O., Thongmanivong, S., Heinemann, A., & Phanvilay, K. 2014. Shifting cultivation stability and change: Contrasting pathways of land use and livelihood change in Laos, *Applied Geography*, 46: 1–10.

Vongvisouk, T., Broegaard, R., Mertz, O., & Thongmanivong, S. 2016. Rush for cash crops and forest protection: Neither land sparing nor land sharing. *Land Use Policy*, 55: 182–192.

World Bank. 2019. *Water supply, sanitation, and hygiene for improved nutrition*. www.worldbank.org/en/news/feature/2019/04/03/water-supply-sanitation-and-hygiene-for-improved-nutrition.

World Bank. 2020. *Lao People's Democratic Republic Poverty Assessment 2020: Catching Up and Falling Behind*. Washington DC., World Bank.

World Bank. 2021a. *Employment in agriculture Lao PDR*. <https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=LA>

World Bank. 2021b. *Urban population (% of total population) - Lao PDR*. <https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS?locations=LA>

World Bank. 2021c. Lao PDR. <https://data.worldbank.org/country/lao-pdr>

World Bank. 2021d. *Managing pesticides for greener growth in Lao PDR: Policy note*. Washington, DC.

World Bank and Asian Development Bank (ADB). 2021. *Climate Risk Country Profile: Lao PDR*. Washington, DC, and Manila, World Bank Group and ADB.

World Food Programme (WFP). 2020. *Rapid Assessment of Food Security and Agriculture in Lao PDR*. <https://reliefweb.int/report/lao-peoples-democratic-republic/rapid-assessment-food-security-and-agriculture-lao-pdr-may>

World Health Organization (WHO). 2011. *Regional consultation on safe street foods*. New Delhi, WHO.

Acknowledgments

The following people have contributed to this assessment and the writing of this note: *Sayvisene Boulom, Thongdeuane Nanthanavone (National Consultants); Stéphane Guéneau (CIRAD), Meeta Punjabi Mehta (CFID, FAO), Pooja Khosla (CFIB, FAO), Maria Antonia Tuazon (FAO), Isabelle Vagneron (CIRAD) Leyla Werleigh (FAO, Lao PDR), James Tefft (CFID, FAO).*

Editing and formatting: *Alan Cooper, Saon Bhattacharya, Chiara Virdis.*

The support of the Ministry of Agriculture and Forestry of the Lao People's Democratic Republic is gratefully acknowledged, as are the comments received by the peer review group, and the participants in all the Food Systems' stakeholders' consultation workshops.



