Local food plants for nutrition

# IMPROVING DIETS AND REDUCING FOOD SCARCITY WITH THE HELP OF LOCAL FOOD PLANTS IN SAYABOURY PROVINCE OF LAOS


SD=HS Sowing Diversity = Harvesting Security

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# Acronyms

| | |
|---|---|
| ASOCUCH | Asociación de Organizaciones de los Cuchumatanes |
| CTDT | Community Technology Development Trust |
| CSI | Cognitive Salience Index |
| DSR | Dietary Species Richness |
| ESAFF | Eastern and Southern Africa Small Scale Farmers' Forum |
| FFS | Farmer Field School |
| FOVIDA | Fomento de la Vida |
| FVS | Food Variety Score |
| HDDS | Household Dietary Diversity Score |
| HFIAS | Household Food Insecurity Access Scale |
| HHS | Household Hunger Scale |
| Li Bird | Local Initiatives for Biodiversity, Research and Development |
| MAHFP | Months of Adequate Household Food Provisioning |
| MsHDDS | Micronutrient Sensitive Household Dietary Diversity Score |
| NAFRI | National Agricultural and Forestry Research Institute |
| NUS | Neglected and Underutilized Species |
| PELUM | Participatory Ecological Land Use Management |
| SD=HS | Sowing Diversity = Harvesting Security |
| ZAAB | Zambia Alliance for Agroecology and Biodiversity |

# Foreword

This document presents the main household-level findings of the baseline survey conducted between 2019-2021, during the second phase of the *Sowing Diversity = Harvesting Security (SD=HS)* programme (2019-2023). The survey is part of SD=HS' work on Local Food Plants for Nutrition. SD=HS is a global program, and our work on local food plants is currently implemented by Oxfam Country Offices and partner organizations in seven countries. These partners are the *National Agricultural and Forestry Research Institute (NAFRI)* and the *Agricultural Research Center (ARC)* in Laos, the *Local Initiatives for Biodiversity, Research and Development* (Li Bird) in Nepal, the *Asociación de Organizaciones de los Cuchumatanes (ASOCUCH)* in Guatemala, the *Participatory Ecological Land Use Management (PELUM)* and the *Eastern and Southern Africa Small Scale Farmers' Forum (ESAFF)* in Uganda, the *Zambia Alliance for Agroecology and Biodiversity (ZAAB)* in Zambia, the *Community Technology Development Trust (CTDT)* in Zambia and Zimbabwe, and the *Fomento de la Vida (FOVIDA)* in Peru. SD=HS is coordinated by Oxfam Novib.

The use of the baseline data allowed us to establish the local and regional nutritional and agroecological conditions in the communities where the Farmer Field Schools (FFS) on Nutrition and Local Food Plants were implemented. The baseline data served to advise and guide the development of a country-specific FFS curriculum and the implementation of FFS activities, by informing FFS participants, collaborators, and other stakeholders about the potential role of local food plants in improving local diets and reducing the food scarcity period.

We are grateful for the funding support from the Swedish International Development Cooperation Agency (Sida). We hope this document, which provides new and detailed data, contributes to increased attention on the role of local food plants for healthy and affordable diets, and improved nutrition of indigenous peoples and smallholder farmers.

# 1 Introduction

## 1.1 Malnutrition

Malnutrition remains one of the greatest global health challenges, and women and children are its most visible and vulnerable victims. People are malnourished when: (a) their diet does not provide adequate calories or nutrients for their body growth and normal function, (b) they are unable to fully utilize the food they eat due to illness, or (c) they take in too much energy, saturated or trans-fat, salt, and sugar (overnutrition). In all cases, malnutrition is closely linked to disease as it affects the function and recovery of every organ system. Poverty exacerbates the likelihood and effects of malnutrition. Furthermore, malnutrition contributes to higher healthcare expenses, decreased productivity, and hindered economic growth, fostering an ongoing cycle of poverty and ill-health[1].

The intricate link between poverty and malnutrition in Laos is evident through the economic challenges faced by its population. Despite the return of employment rates to pre-pandemic levels, the overall recovery has not been sufficient. The inflationary pressure, particularly evident in increased food prices, has eroded the purchasing power of households. In response, around two-thirds of families in Laos have implemented cost-cutting measures such as switching to cheaper food options, reducing food consumption, and cutting back on education and health spending. The impact has been especially severe on rural and poor families, constraining their already tight budgets and leading to substantial contractions in education and health expenditures[2].

The economic struggles faced by households in Laos contribute significantly to the persistently high rates of malnutrition, particularly among children. Despite overall economic growth, Laos continues to grapple with some of the highest rates of child and maternal mortality and malnutrition in Southeast Asia[3]. The national rates of stunting (short for age) and underweight children stand at alarming levels of 36 percent and 27 percent, respectively. The challenges are further exacerbated by the escalating rates of diabetes and non-communicable diseases[4]. The economic constraints faced by families, especially in rural and impoverished areas, make it difficult to access adequate nutrition. Interventions are crucial to break the cycle of poverty and malnutrition in Laos, addressing both economic disparities and healthy nutrition to ensure the well-being of its population, particularly vulnerable children and mothers.

## 1.2 Food scarcity

For many people, the availability of food is driven by seasonal cycles, and the availability of food is least in the pre-harvest months. During food scarcity periods, household food stocks from the last harvest have dwindled. This may coincide with food shortages in the local market, meaning that food that is still available is sold at inflated prices. In this period of the year, the nutrition security of the family is most at stake. Rural households may be forced to resort to various coping strategies to deal with food scarcity, such as reducing the diversity and quantity of their meals, which affects the macro and micronutrient deficiencies of household members. Other strategies to which farmers resort when food scarcity hits them, such as mortgaging or selling the land, livestock, and other household assets, may result in further spiralling into poverty. The challenges experienced during the scarcity period can be increasingly aggravated by the consequences of climate change. The psychological effects of food scarcity challenges are profound, and all family members may experience high levels of anxiety and stress during this period. Women are especially affected more, as their responsibilities often comprise food production, income-generating activities, and care for other household members (including

food preparation). The effects of food scarcity periods tend to be overlooked by policymakers, or may only get attention when these result from natural or human-made calamities.

The link between poverty and food scarcity in Laos is intricately woven into the country's development trajectory. Despite initial expectations that development would bolster food security, prevailing indications and trends paint a different picture[5]. Laos faces significant challenges in this regard, with the looming risk of acute food insecurity, particularly impacting vulnerable populations such as women and children. Laos experiences a moderate level of hunger[6], with 1.04 million people (13.9% of the Lao population) suffering from moderately acute food insecurity and 71,000 people (0.9%) facing severe acute food insecurity. This situation is likely to exacerbate during the lean season from May to October, or potentially even sooner[7].

The nation's dependence on imports for affordable food renders it susceptible to global events that reverberate within its borders. The repercussions of hunger, malnutrition, and disrupted food supplies not only weaken individuals but also compromise the fundamental pillar of national security—the well-being of the people. This vulnerability does not stem from a lack of food-production potential but rather from policy decisions that prioritize resource-centric development, inadvertently neglecting the ecosystems crucial for sustainable food production. Without a strategic shift in policy towards nurturing natural advantages in agriculture and safeguarding the environment, Laos remains on a trajectory where food insecurity persists, posing an ongoing threat to national security[5].

## 1.3 Objectives

The objective of SD=HS work on Local Food Plants for Nutrition is twofold: 1. To enhance dietary diversity[a] and food security; 2. To reduce the duration and severity of climate-related food scarcity seasons. This is achieved through promoting access to and consumption of diverse and nutritious local food plants while safeguarding local biodiversity and optimizing the management of these crucial plant resources. By achieving these goals, the initiative aims to improve overall nutrition security and resilience to climate challenges.

In order to improve the nutrition status of smallholder farmers and indigenous peoples, the following questions were addressed:

- What are, according to farmers, the local causes and consequences of malnutrition?
- What characterizes the food scarcity period and which strategies do farmers implement to cope with it?
- What is the role of local food plants in improving the diversity of the diet during the food scarcity and sufficiency periods?
- What is the role of the agroecosystems and local environments in the provision of local food plants?
- Are households that consume more local food plants less prone to suffer from food insecurity, food scarcity, and lower dietary diversity and quality?
- How can we best measure this? What are the implications of local food plant consumption for the most vulnerable households?
- What are the local food plants on which knowledge is shared by men and/or women in the communities?
- Which are the local food plants that are consumed during the food scarcity period?

[a] Diverse diets include a variety of foods from different food groups, including cereals; white roots and tubers; vitamin A-rich vegetables and tubers; dark green leafy vegetables; other vegetables; vitamin A-rich fruits; other fruits; organ meat; flesh meat; eggs; fish and seafood; legumes, nuts and seeds; milk and milk products; oils and fats; sweets; spices, herbs, and beverages. A diverse diet is important to ensure the intake of a wide variety of nutrients, which is needed for a healthy life.

- Who are the most powerful household members in terms of access to food?
- What are the roles of women and men in the acquisition of local food plants?
- Does gender affect the knowledge of local food plants?

This Briefing Note is an attempt to answer these questions, by comparing consumption of local food plants in food scarcity and sufficiency periods, and its effects on achieving dietary diversity and dietary quality throughout the year. It further addresses the role of local food plants in strengthening communities' coping strategies, given their demographic and socio-economic profiles. It also reflects the intention to raise awareness, stimulate discussions, and trigger feedback from a wider audience of stakeholders on the role that local food plants may play in improving nutrition and ensuring healthy and affordable diets. Finally, it provides information to support policies and legislation that promote diverse and healthy diets through improved and sustainable use of biodiversity available in the environment.

# 2 Methodology

## 2.1 Household survey

The household survey took place from 2020 to 2021 at two different periods (scarcity season and sufficiency season) in Sayaboury province of Laos [Table 1]. Data was collected by local enumerators who speak the local language. They were trained by the National Agricultural and Forestry Research Institute (NAFRI) and pilot-tested the questionnaire before collecting the data. Households that had been living for less than one year in the community or households that had not been engaged in farming were excluded from the sample. All informants participated freely and with prior informed consent.

**Table 1.** *Data collection periods during scarcity and sufficiency seasons in the surveyed province*

| Scarcity season (round 1) | Sufficiency season (round 2) |
|---|---|
| August 2020 | June 2021 |

This Briefing Note presents the results of the following survey modules: (1) demographic and socio-economic characteristics, (2) severity of food insecurity, (3) dietary diversity, (4) local food plant acquisition, (5) free-listings of local food plants, (6) features of the food scarcity season, and (7) sources of information modules of the household survey[b]. The demographic and socio-economic module includes collected data that allowed the calculation of variables related to gender and household vulnerability, and that gave a general indication of the main productive activities of the household, among others. All interviews (except for the demographic and socio-economic module) were conducted in both food scarcity and sufficiency periods.

Food insecurity was measured using the Household Food Insecurity Access Scale (HFIAS) and the Household Hunger Scale (HHS)[8] [Table 2]. According to the HFIAS indicator guide[9], a food-secure household experiences no food insecurity conditions, or it might rarely experience concerns about sufficient access to food. A mildly food insecure household often worries about not having enough food, it might be unable to eat preferred foods and have a more monotonous diet than desired, or it can even consume some foods considered undesirable. A moderately food insecure household often sacrifices quality more frequently, by eating a monotonous diet or undesirable foods and can start to cut back on quantity by reducing the size of meals or number of meals. Finally, a severely food insecure household has resorted to cutting back on

[b] The detailed explanation of each module, including the survey questionnaire, is accessible in the Baseline Tool document (http://bit.ly/2WSHfTf). The tool was revised and agreed upon with all partner organizations.

meal size or number of meals and its members can still run out of food, go to bed hungry, or go a whole day without eating[9].

**Table 2.** *Food insecurity indicators and their definitions*

| Food Insecurity Indicators | Abbreviation | Definition |
|---|---|---|
| Household Food Insecurity Access Scale | HFIAS | It measures the severity of household food insecurity during the past four weeks (30 days). It ranges from 0 to 27, indicating the degree of insecure food access. Households are categorized as food secure, mildly food insecure, moderately food insecure, or severely food insecure[8]. |
| Household Hunger Scale | HHS | It is derived directly from the HFIAS and it includes only three hunger-related aspects of insecure food access: "little to no hunger in the household", "moderate hunger in the household", or "severe hunger in the household"[8]. |

A 24-hour dietary recall-based interview was also conducted to capture detailed information about all foods and beverages consumed by the respondent in the past 24 hours[10]. Based on the results of the 24-hour recall, the Household Dietary Diversity Score (HDDS), Micronutrient Sensitive HDDS (MsHDDS), the Food Variety Score (FVS) and Dietary Species Richness (DSR), were all calculated [Table 3].

**Table 3.** *Dietary diversity indicators calculated based on the 24-hour recalls, and their definitions*

| Dietary Diversity Indicators | Abbreviation | Definition |
|---|---|---|
| Household Dietary Diversity Score | HDDS | It assesses a household's economic access to food (i.e. its ability to produce, purchase or otherwise secure food for consumption by all household members). The potential score range is 0-12[11]. |
| Micronutrient Sensitive HDDS | MsHDDS | It disaggregates and reorganizes the HDDS food groups into 16 micronutrient-based groups[12]. |
| Food Variety Score | FVS | It measures the number of different food items consumed from all possible items eaten (individual foods, food mixtures, food categories, or a combination of these)[13]. |
| Dietary Species Richness | DSR | It measures the number of different species consumed per day, assessing both nutritional adequacy and food biodiversity[14]. |

Local food plant acquisition events, based on a recall period of seven days, also captured the multiple environments from which local food plants were acquired, and gender roles related to their harvesting or gathering. A detailed explanation of how each index was calculated, alongside the rationale of each survey module, and the survey questionnaire itself are accessible upon request. The tools were revised and agreed upon by all partner organizations. Each partner could adapt, test the tools, and include specific sections relevant to their context.

The free listings of the food plants aim to provide an overview of local knowledge and were used for the development of a list of species based on the knowledge that is shared by community members. Given that knowledge is intrinsically related to gender, free listings were requested from the head of household and his/her spouse separately. The results of the free listings were analysed by using the cognitive salience index (CSI). The CSI combines frequency and order of mention across men's and women's lists for each plant species and reflects the knowledge of a

specific plant (the higher the CSI, the more representative the plant of the knowledge shared by community members)[15]. In addition, the species that are more widely used among households during the food scarcity season were identified using the traffic light exercise[16]. For that, the enumerator asked men and women to give a colour to each plant species in relation to the period when it is consumed, as follows:

- Green light: local food plant species are consumed during the sufficiency period, or when food may not be plentiful but generally available to the community in adequate quantities and qualities.
- Amber light: local food plant species are consumed during a period in which food reserves are alarmingly low.
- Red light: local food plant species are consumed during a situation in which the food supply is depleted, which condition requires emergency measures.

The food scarcity module not only assessed the months in which households have reduced access to food[17] but also captured the variety of local food plants, as well as unusual crop parts[c] and crop residues consumed in times of food scarcity. The sources of information module captured the current and preferred sources of information for the community households on health, sanitation, and nutrition issues, to help design strategies to communicate with farmers by using preferred channels.

The data was analysed with descriptive and non-parametric statistics. Spearman rank correlations were calculated between ordinal or continuous variables. Kruskal-Wallis ranked tests estimated correlations between one nominal variable that has two or more categories and a continuous variable. Mann-Whitney tests estimated correlations between one nominal variable that has two categories and a continuous variable. Finally, Chi-Square tests were calculated between two nominal variables.

## 2.2 Household locations

In total, data were collected from 63 households during the first survey round (scarcity season), and 69 households during the second survey round sufficiency season). Only households from Kor village were interviewed in both seasons, while households from the other villages were interviewed either in the scarcity season (Kongthieng) or sufficiency season (Samakixay and Mixay). Table 4 presents the distribution of the households within the four villages of Sayaboury province of Laos.

**Table 4.** *Distribution of sampled households across the four villages in the Sayaboury province of Laos*

| | Scarcity season (R1) | | Sufficiency season (R2) | |
|---|---|---|---|---|
| Villages | Number of households | Percentage of total number of households | Number of households | Percentage of total number of households |
| Kongthieng | 31 | 49% | 0 | 0% |
| Kor | 32 | 51% | 30 | 44% |
| Samakixay | 0 | 0% | 19 | 28% |
| Mixay | 0 | 0% | 20 | 29% |
| Total | 63 | 100% | 69 | 100% |

Figure 1 below shows the locations of the surveyed households within Sayaboury province of Laos.

[c] Crop parts that are not used for human consumption under normal conditions.

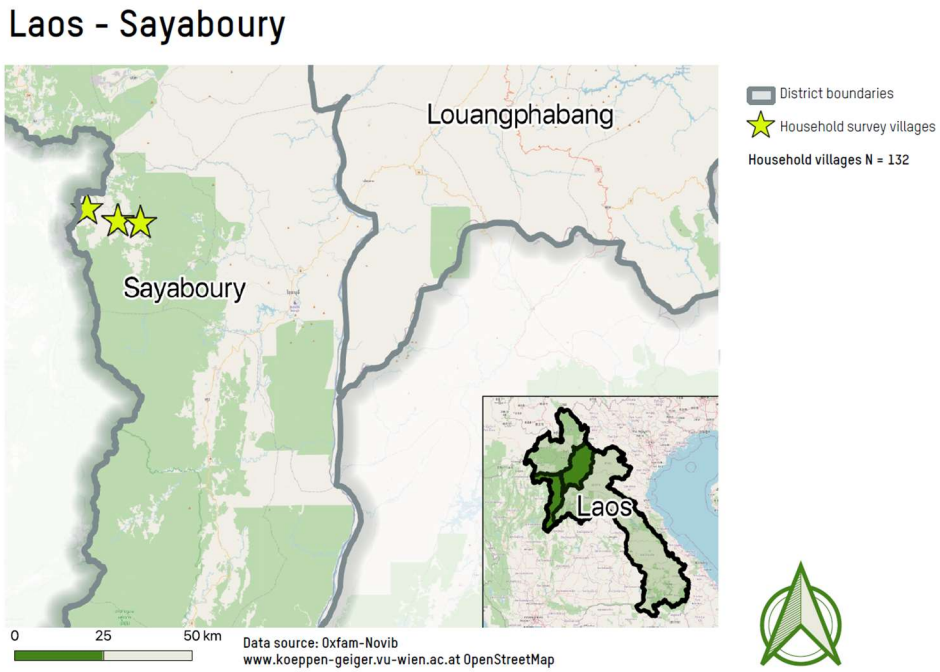


**Figure 1.** *Map indicating the locations of the households in Sayaboury province of Laos*

# 3 Results

## 3.1 Indigenous peoples and smallholder farmers in Laos

Indigenous peoples and smallholder farmers surveyed in Laos live in the agroecological region of Luang Prabang's montane rain forests[18]. The climate is divided into two distinct seasons: the rainy season, or monsoon, from May to mid-October, followed by a dry season from mid-October to April. In this area, the average annual rainfall ranges from approximately 1,300 to 3,000 mm. Plateau regions experience average temperatures around 20°C, while the plains encounter temperatures ranging from 25 to 27°C[19]. According to the Holdridge Life Zone classification [20,21], all of the communities involved are situated in the subtropical moist forest zone. Köppen Climate classification[22] indicates that two of the implementing communities (Kor and Mixay) have a climate of warm temperate winters and dry hot summers. The village Samakixay resides in an equatorial winter dry climate, while Kongthieng maintains a climate of warm temperate winters and dry warm summers. The surveyed communities mostly rely on upland rice and corn farming to sustain their livelihoods, which are mainly cultivated for consumption.

Table 5 presents the socio-demographic characteristics of the participating communities. The households investigated belong to the Prai ethnic group and had an average size of five household members and the majority of them were male-headed (87%), indicating the gender disparity in household dynamics. Almost 90% of the household heads work in farms as their main occupation, and their average age is 43 years old. The educational level and literacy rates of the surveyed households showed that 32% of household heads have never attended formal education, though 37% know neither how to read or write. Thirty-five percent of the household heads have attended primary education.

**Table 5.** *Results from the socio-demographic module of the baseline survey*

| Socio-demographic variables | Scarcity season interviews (R1) | | | |
|---|---|---|---|---|
| | N | % | Mean | St. D. |
| **Household size** | | | 5.2 | 3.4 |
| **Sex of household head** | | | | |
| Man | 55 | 87% | | |
| Woman | 8 | 13% | | |
| **Main occupation of household head** | | | | |
| On farm | 56 | 89% | | |
| Outside farm | 0 | 0% | | |
| Both | 7 | 11% | | |
| **Age of household head** | | | 43.2 | 14.6 |
| **Literacy of household head** | | | | |
| Only read | 4 | 6% | | |
| Only write | 0 | 0% | | |
| Both | 36 | 57% | | |
| None | 23 | 37% | | |
| **Education of household head** | | | | |
| Never attended formal education | 20 | 32% | | |
| Primary | 22 | 35% | | |
| Secondary | 11 | 18% | | |
| Highest education | 10 | 16% | | |
| **Number of migrants per household** | | | 0.1 | 0.4 |
| **Number of children (incl. orphans) per household** | | | 2.2 | 2.0 |
| **Number of chronically ill people per household** | | | 0.3 | 0.9 |
| **Number of women of child-bearing age per household** | | | 1.2 | 1.0 |
| **Total land area (ha) per household** | | | 1.6 | 1.0 |
| **Main productive activities per household** | | | | |
| Agriculture | 63 | 55% | | |
| Livestock farming | 29 | 25% | | |
| Fishing | 2 | 2% | | |
| Hunting | 0 | 0% | | |
| Gathering | 20 | 17% | | |
| Other | 1 | 1% | | |
| **Farm ownership** | | | | |
| Owned | 62 | 98% | | |
| Rented | 0 | 0% | | |
| Borrowed from family or friends | 1 | 2% | | |
| Communal land | 0 | 0% | | |
| Other | 0 | 0% | | |
| **Number of crops grown in the past 12 months, and for what use** | | | 7.0 | 2.5 |
| Sales | | | 1.6 | 1.6 |
| Consumption in the household | | | 6.4 | 2.3 |
| Barter | | | 0.2 | 1.1 |
| Other | | | 0.0 | 0.0 |
| **Market orientation (proportion of harvest for sale)** | | | 23% | 24% |
| **Presence of income from non-agricultural activities** | 9 | 14.3 | | |
| **Presence of home garden** | 43 | 68.3 | | |

**The results come out of the first round of the household survey in which 63 households participated. Household size: N=63 (missing value=0); Sex of household head: N=63 (missing value=0); Main occupation of household head: N=63 (missing value=0); Age of household head: N=63 (missing value=0); Literacy of household head: N=63 (missing value=0); Education of household head: N=63 (missing value=0); Number of migrants: N=63 (missing value=0); Number of children: N=63 (missing value=0); Number of chronically ill people: N=63 (missing value=0); Number of women in child-bearing age: N=63 (missing value=0); Total land area (hectares): N=63 (missing value=0); Main productive activities: N=63 (missing value=0); Farm ownership: N=63 (missing value=0); Number of crops grown on the past 12 months: N=63 (missing value=0); Market orientation: N=63 (missing value=0); Presence of income from non-agricultural activities: N=63 (missing value=0); Presence of home garden: N=63 (missing value=0); The percentages are calculated over the valid number of responses for each variable, excluding missing values.*

In terms of their productive activities, 55% of the households interviewed work in agriculture and 25% of them in livestock. An average of seven crops were grown by the households in the past 12 months and the average sale proportion from their harvest was almost 23%, while the rest was mostly consumed in the household. Interestingly, only 14% of the households have an income from non-farming activities, while almost 70% of them cultivate a home garden.

## 3.2 Understanding local diets

The baseline survey showed that household dietary diversity (HDDS) and micronutrient-sensitive dietary diversity (MsHDDS) were higher during the sufficiency season compared to the scarcity season [Table 6]. That means that when food is more available, the investigated households consume more diverse diets. However, it is important to note that both the HDDS and MsHDDS indicators simply group food plants in categories such as cereals, tubers, vegetables, fruits, and legumes and measure to what extent the household diet contains crops from these groups. Unfortunately, these indicators cannot capture the diversity of food plants consumed within each food group, e.g. diversity of vegetables, fruits, etc. FVS and DSR[13,14] indicators could help us to capture this level of information but the data collected was not sufficient.

**Table 6.** *Dietary diversity (HDDS and MsHDDS) differences between scarcity and sufficiency seasons*

| Dietary diversity | Scarcity season (mean ± sd) | Sufficiency season (mean ± sd) |
|---|---|---|
| HDDS (0-12) | 4.8 ± 2.2 | 8.9 ± 2.1 |
| MsHDDS (0-16) | 6.5 ± 2.7 | 11.4 ± 3.0 |

** The results are deduced from the baseline household survey, in which 63 households participated in the first round (scarcity season), and 69 in the second round (sufficiency season). During the first survey round (scarcity season) no values were missing (N=63), while during the second survey round (sufficiency season), 2 values were missing (N=67).*

Regarding the dietary diversity in relation to the specific food groups, we noted that vegetables and cereals were the most consumed food groups during both the scarcity and sufficiency seasons, though their frequency of consumption was higher during the scarcity season [Table 7].
Interestingly, tubers and roots, and legumes, nuts and seeds were two of the least consumed food groups, during both seasons, especially during the scarcity season. Whereas available food quantities might be less during the scarcity periods, the dietary diversity appeared not to be statistically different between these two seasons, suggesting that improving the role of local food plants in local diets might be important throughout the year and regardless of the nature of the season.

**Table 7.** *Main food groups consumed during the scarcity and sufficiency seasons*

| Food Group | Scarcity season | | Sufficiency season | |
|---|---|---|---|---|
| | N | % HHS | N | % HHS |
| Cereals | 57 | 19% | 69 | 11% |
| White tubers and roots | 19 | 6% | 54 | 9% |
| Vegetables | 63 | 21% | 69 | 11% |
| Fruits | 39 | 13% | 60 | 10% |
| Meat | 12 | 4% | 50 | 8% |
| Eggs | 28 | 9% | 57 | 9% |
| Fish and other seafood | 30 | 10% | 55 | 9% |
| Legumes, nuts, and seeds | 16 | 5% | 45 | 7% |
| Milk and milk products | 16 | 5% | 23 | 4% |
| Oils and fats | 16 | 5% | 42 | 7% |
| Sweets | 6 | 2% | 36 | 6% |
| Spices, condiments and beverages | 2 | 1% | 50 | 8% |
| Total | 304 | 100% | 610 | 100% |

** The results are deduced from the baseline household survey, in which 63 households participated in the first round (scarcity season), and 69 in the second round (sufficiency season). During either round, no households were missing.*

## 3.3 Local food plants diversifying the diet

Table 12 presents the food groups in which some important local food plants in the Sayaboury province of Laos are categorized. These plants have been selected for their importance in food scarcity season and/or due to their high nutritional value.

**Table 8.** *Important local food plants during the food scarcity season and/or due to their high nutritional value*

| Scientific name | English name | Local name | Food group |
|---|---|---|---|
| *Zea mays* | corn | ສາວີເຂົ້າໜຽວ | cereals |
| *Capsicum frutescens* | chilli | ໝາກເຜັດ | vegetables |
| *Diplazium esculentum* | edible fern/ vegetable fern | ຜັກກູດ | vegetables |
| *Vigna unguiculata* | cowpea | ຖົ່ວ | legumes, nuts and seeds |
| *Manihot esculenta* | cassava | ມັນຕົ້ນ | roots and tubers |
| *Sesamum indicum* | sesame | ໝາກງາ | legumes, nuts and seeds |
| *Bauhinia malabarica* | Malabar orchid tree | ໃບສົ້ງບ່າ | vegetables |
| *Centella asiatica* | Asiatic pennywort | ຜັກໜອກ | vegetables |
| *Vigna unguiculata* | yardlong bean | ຖົ່ວຜັກຍາວ | legumes, nuts and seeds |
| *Canavalia gladiata* | sword bean | ຖົ່ວຜັກຜ້າ | legumes, nuts and seeds |
| *Canna indica* | arrowroot | ມັນສາຄູ | roots and tubers |

## 3.4 Measuring the severity of food insecurity

The baseline survey showed that household food insecurity was higher during the scarcity season compared to the sufficiency season [Table 9]. As expected, this demonstrates the crucial negative impact that lean periods, linked to growing seasons, have on household food security.

**Table 9.** *Food insecurity (HFIAS, HHS) differences between scarcity and sufficiency seasons*

| Food Insecurity | Scarcity season (mean ± sd) | Sufficiency season (mean ± sd) |
|---|---|---|
| HFIAS (0-27) | 4.3 ± 3.3 | 1.2 ± 1.3 |
| HHS (0-6) | 0.5 ± 0.9 | 0.1 ± 0.4 |

** The results are deduced from the baseline household survey, in which 63 households participated in the first round (scarcity season), and 69 in the second round (sufficiency season). During the first survey round (scarcity season) 12 values were missing for HFIAS (N=51), and 5 for HHS (N=58), while during the second survey round (sufficiency season), 15 values were missing for HFIAS (N=54), and 13 for HHS (N=56).*

The HHS is derived directly from the HFIAS, but it only assesses the most severe experiences of hunger. Therefore, the results show that during the scarcity season, 22% of the interviewed households were experiencing moderate hunger, with rates of little to no hunger almost 80% [Table 10]. During the sufficiency season, only 4% of the households reported experiencing moderate hunger, while most households (96%) reported little to no hunger. Again, this demonstrates the crucial impact that lean periods have on household food security. Interestingly, no households reported severe hunger in either season.

**Table 10.** *Percentage of households that suffer from food scarcity throughout the year*

| Household Hunger Scale (HHS) | Scarcity season | | Sufficiency season | |
|---|---|---|---|---|
| | N | % Hhs | N | % Hhs |
| Little to no hunger (% total Hhs) | 45 | 78% | 54 | 96% |
| Moderate hunger (% total Hhs) | 13 | 22% | 2 | 4% |
| Severe hunger (% total Hhs) | 0 | 0% | 0 | 0% |

** The results are deduced from the baseline household survey, in which 63 households participated in the first round (scarcity season), and 69 in the second round (sufficiency season). During the first survey round (scarcity season) 5 values were missing (N=58), while during the second survey round (sufficiency season), 13 values were missing (N=56). The percentages are calculated over the valid number of responses for each variable, excluding missing values.*

## 3.5 The food scarcity period

Given the important links between food scarcity and food insecurity, it was important to look into the current length of the scarcity period within the investigated areas in Laos. Table 11 presents the percentage of households in Sayaboury province that suffer from food scarcity throughout the year. August to November, which is within Laos rainy period, were the months when the largest food shortages were reported (more than 60% of households). Food shortages however also appear in July and December (more than 30% of households).

**Table 11.** *Percentage of households that suffer from food scarcity indicated per calendar month*

| Months | Percentage of households |
|---|---|
| January | 11% |
| February | 3% |
| March | 2% |
| April | 3% |
| May | 13% |
| June | 29% |
| July | 35% |
| August | 60% |
| September | 73% |
| October | 78% |
| November | 70% |
| December | 37% |

**The results come out of the first round of the household survey in which 63 households participated and no values (households) were missing (N=63).*

## 3.6 Food plants during the food scarcity season

The average number of food plant species used in times of food scarcity per household was 0.6 (± 1.5). Table 12 presents the most frequently used food plants in times of scarcity. Banana and bamboo seem to be the plants mentioned with the highest frequencies (mentioned by more than 10% of the households). Although banana is considered to be a popular food worldwide, it seems to play an important role during food scarcity, perhaps in reduced volumes.

**Table 12.** *Key food plant species used during the food scarcity period*

| Food plants used in food scarcity | Local name | Scientific name | Number of households | Percentage of households |
|---|---|---|---|---|
| banana | *kluai nam wa* | *Musa acuminata x balbisiana* | 9 | 15% |
| bamboo | *slender bamboo/ albociliata bamboo/ sang bamboo* | *Schizostachyum blumei/ Gigantochloa albociliata/ Dendrocalamus brandisii* | 6 | 10% |
| Asiatic pennywort | phuk nok | *Centella asiatica* | 4 | 6% |
| corn | sali | *Zea mays* | 3 | 5% |
| taro | | *Colocasia esculenta* | 3 | 5% |

**The results come out of the first round of the household survey in which 63 households participated and one value (household) was missing (N=62).*

## 3.7 Multiple environments can support diverse diets: Local food plant acquisition

### Sourcing of local food plants

More than three-fourths of households (78%) in the scarcity period harvested at least one of the local food plants they brought home for consumption. Fewer households said they sourced the local food plants they mentioned through gathering (20%) or purchasing (3%). During the sufficiency season, more than half of households (58%) reported having harvested at least one of the local food plants they mentioned. At the same time, the number of households that reported to have gathered (32%) and purchased (9%) a local food plant was larger compared to the scarcity season. This indicates how food scarcity influences the extent and the way in which households source local food plants for consumption.

In the scarcity period, a greater variety of different species was reported to be gathered (51) compared to the sufficiency season (38). A similarly big number of species was reported to be harvested during both the scarcity (58) and sufficiency (51) seasons, while fewer species were reported to be purchased in both scarcity (9) and sufficiency (7) seasons. This suggests that gathering is used more during the food scarcity period, possibly due to the lower food availability.

### Sites where the local food plants originate from

During the scarcity period, the majority of the local food plants listed are collected from the agricultural fields (77%), and the home gardens (56%) [Table 13]. When food is more available, during the sufficiency season, the majority of local food plants are mainly brought from the home gardens (74%), with considerable contributions from the forests (39%) and public spaces (39%), such as roadsides, riversides and lakes. This highlights the important role of home gardens in food provision, especially during the scarcity season and suggests the minor role of the market.

**Table 13.** *Number of plant species and sites where they originate from*

| Place of origin | Scarcity season | | Sufficiency season | |
|---|---|---|---|---|
| | Number of species | Percentage of species | Number of species | Percentage of species |
| Agricultural field | 26 | 77% | 15 | 31% |
| Home garden | 19 | 56% | 36 | 74% |
| Forest | 11 | 32% | 19 | 39% |
| Public spaces | 7 | 21% | 19 | 39% |
| Roadside | 3 | 9% | 7 | 14% |
| Lake | 1 | 3% | 5 | 10% |
| Riverside | 3 | 9% | 7 | 14% |
| Market | 5 | 5% | 2 | 4% |
| Other | 3 | 9% | 2 | 4% |

** The results are deduced from the baseline household survey, in which 63 households participated in the first round (scarcity season), and 69 in the second round (sufficiency season). In total, 1 household was missing in the scarcity period (N=62), and 1 during the sufficiency period (N=68). During the first survey round (scarcity season), 34 plant species were mentioned. During the second survey round (sufficiency season) 49 species were mentioned. The percentages reflect the number of species brought from each different place, divided by the total number of different species mentioned.*

## 3.8 Women's and men's roles: Local food plant acquisition

### Household members that acquire local food plants for the household

Baseline survey data showed that both men and women bring home a considerable number of species during both seasons [Table 14]. In particular, the results demonstrate that during the

scarcity season, men (68%) acquire more local food plants than women (50%), while, when food is more available, women acquire the majority of local food plants (63%). Children also contribute a small number of local food plants to their households, especially during the food scarcity season. Whereas the species provided by women and men show considerable overlap, the total number provided by women is larger. This demonstrates the important role women have in sourcing local food plants and nourishing the family.

**Table 14.** *Number of plant species that are acquired by various family members*

| Family member | Scarcity season | | Sufficiency season | |
|---|---|---|---|---|
| | Number of species | Percentage of species | Number of species | Percentage of species |
| Man | 23 | 68% | 23 | 47% |
| Woman | 17 | 50% | 31 | 63% |
| Both genders | 28 | 82% | 29 | 59% |
| Children | 6 | 18% | 4 | 8% |
| Others | 0 | 0% | 0 | 0% |

** The results are deduced from the baseline household survey, in which 63 households participated in the first round (scarcity season), and 69 in the second round (sufficiency season). In total, 1 household was missing in the scarcity period (N=62), and 1 during the sufficiency period (N=68). During the first survey round (scarcity season), 34 plant species were mentioned. During the second survey round (sufficiency season) 49 species were mentioned. The percentages reflect the number of species brought from each family member, divided by the total number of different species mentioned per season.*

## 3.9 Women's and men's knowledge on local food plants

Men (6.4 ± 3.3) listed a similar number of plants than women (6.3 ± 4.3), suggesting that men and women have similar knowledge of local food plants. Likewise, as a group, men reported a similar total number of plant species (27 different species/ 39 men), compared to women (30 different species /25 women). Plant species such as banana, chilli, Chinese broccoli, Chinese Mistltoe (markkadom), morning glory and Asiatic pennywort, were mostly listed by women, while species like pumpkin, taro, upland rice, corn and bean were mostly listed by men. Annex 1 presents the full list of plants and the frequencies in which they were mentioned by men and women.

## 3.10 Relationships with dietary diversity and food insecurity indicators

A significantly positive relationship was found between the number of crops grown in the past 12 months for consumption and the household dietary diversity (HDDS and MsHDDS), during the food scarcity period ($p<0.01$). This indicates that, when food is less available, the households that grow a larger number of crops for consumption have higher dietary diversity.

Likewise, during food scarcity season, a significantly positive relationship was found between the number of local food plants that were brought home and the household dietary diversity (HDDS and MsHDDS) ($p<0.05$), meaning that the households that acquired more local food plants have a higher dietary diversity.

## 3.11 Preferred ways to promote the use of local food plants by local communities

Health facilities and community health are the channels by which most households obtain information, and these are also most preferred [Table 15]. Radio is the next source of information that is used by the responding households. No reference was made to extension services and agriculture-related information sources were only preferred by 8% of the interviewed households. This suggests that support to cope with food scarcity and dietary needs is better received when obtained from health providers.

**Table 15.** *Current and preferred sources of information*

| Sources of information | Current sources | | Preferred sources | |
|---|---|---|---|---|
| | N | % Hhs | N | % Hhs |
| Neighbour | 12 | 7% | 10 | 7% |
| Health facilities | 39 | 23% | 31 | 23% |
| Community health | 38 | 23% | 26 | 19% |
| Support group, farmer group, FFS | 12 | 7% | 11 | 8% |
| NGOs | 5 | 3% | 1 | 1% |
| Radio | 28 | 17% | 26 | 19% |
| School children | 11 | 7% | 10 | 7% |
| TV | 7 | 4% | 7 | 5% |
| Pamphlet | 0 | 0% | 0 | 0% |
| Cell phone | 13 | 8% | 12 | 9% |
| Other | 2 | 1% | 1 | 1% |
| Total | 167 | 100% | 135 | 100% |

**The results come out of the first round of the household survey in which 63 households participated and 9 values (households) were missing (N=54). The questions were asked in a way that allowed households to provide multiple responses. The percentages reflect the number of households that mentioned the source of information, divided by the number of households that responded to the question.*

# 4 Conclusions

In summary, the study reveals several key insights into the household dynamics, agricultural practices, and food security situation in Sayaboury. The findings underscore the gender disparity in household dynamics, with a significant majority of households being male-headed. The predominant occupation in the surveyed households is farming, and a substantial portion of household heads lack formal education.

Agriculture plays a central role in the livelihoods of the surveyed households, with a majority engaged in either crop or livestock farming. The diversity of crops grown is notable, yet a significant percentage of the produce is for own consumption. During periods of scarcity, households with a higher variety of crops experience greater dietary diversity.

The study identifies pronounced food shortages during the rainy season, emphasizing the vulnerability of households during specific growing periods. Household food insecurity is notably higher during scarcity seasons, underscoring the need for interventions to mitigate the impact of lean periods on food security.

Local food plants constitute a vital component of household diets, particularly during scarcity periods. The study highlights the collection of local food plants from agricultural fields and home gardens, emphasizing the importance of indigenous knowledge in addressing malnutrition. Sustainable solutions should be culturally and environmentally sound, promoting healthy and nutritious diets while conserving biodiversity.

Moreover, the study advocates for targeted support to indigenous communities in Sayaboury, especially during food scarcity periods. Health providers are identified as key stakeholders in delivering effective strategies, and collaboration with agriculture and nutrition departments is recommended. Engaging indigenous communities in the promotion of local food plants emerges as a promising avenue to combat malnutrition while preserving plant biodiversity.

In conclusion, the findings emphasize the interconnectedness of agriculture, nutrition, and indigenous knowledge in addressing the multifaceted challenges of food security in Sayaboury. Effective interventions should be context-specific, culturally sensitive, and collaborative across various sectors.

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# 6 ANNEX 1. KNOWLEDGE OF LOCAL FOOD PLANTS

| | | | Freelistings | | | | | | | | | | | Food Scarcity | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Food plant | English name | Scientific name | Total percentage (men + women) | Percent of men | Percent of women | Sutrop CSI men | Sutrop CSI women | % of men that indicated traffic light: | | | % of women that indicated traffic light: | | | % of hh that indicated traffic light: | | |
| | | | | | | | | green | amber | red | green | amber | red | green | amber | red |
| bai siew pa | | | 9% | 3% | 20% | 0,00 | 0,02 | 100% | 0% | 0% | 100% | 0% | 0% | | | |
| bamboo | slender bamboo/ albociliata bamboo/ sang bamboo | Schizostachyum blumei Nees/ Gigantochloa albociliata (Munro) Kurz/ Dendrocalamus brandisii (Munro) Kurz | 70% | 67% | 76% | 0,19 | 0,17 | 54% | 42% | 4% | 95% | 5% | 0% | 67% | 0% | 0% |
| kluai nam wa | banana | Musa acuminata x balbisiana Colla | 22% | 13% | 36% | 0,03 | 0,08 | 60% | 40% | 0% | 56% | 33% | 11% | 56% | 22% | 11% |
| bean | | Phaseolus vulgaris | | 28% | 0% | 0,04 | 0,00 | 82% | 18% | 0% | 0% | 0% | 0% | | | |
| cabbage | | Brassica oleracea | 14% | 8% | 24% | 0,02 | 0,04 | 67% | 33% | 0% | 83% | 17% | 0% | 0% | 0% | 0% |
| cassava | | Manihot esculenta | 16% | 21% | 8% | 0,03 | 0,01 | 25% | 75% | 0% | 100% | 0% | 0% | | | |
| chilli | | Capsicum annuum | 42% | 38% | 48% | 0,07 | 0,10 | 87% | 13% | 0% | 92% | 8% | 0% | | | |
| corn | | | 44% | 51% | 32% | 0,13 | 0,09 | 70% | 25% | 5% | 100% | 0% | 0% | 0% | 67% | 0% |
| cucumber | | Cucumis sativus | 42% | 44% | 40% | 0,07 | 0,09 | 76% | 24% | 0% | 100% | 0% | 0% | | | |
| eggplant | | Solanum melongena | 45% | 46% | 44% | 0,09 | 0,08 | 94% | 6% | 0% | 100% | 0% | 0% | | | |
| euphorbiaceae | | | 11% | 18% | 0% | 0,03 | 0,00 | 43% | 29% | 0% | 0% | 0% | 0% | | | |
| job's tears | | | 3% | 3% | 4% | 0,00 | 0,01 | 100% | 0% | 0% | 100% | 0% | 0% | | | |
| kai-lan vegetable | Chinese broccoli | Brassica rapa var. parachinensis | 41% | 31% | 56% | 0,10 | 0,14 | 58% | 42% | 0% | 79% | 21% | 0% | 0% | 0% | 0% |
| markfuk | | | 5% | 5% | 4% | 0,02 | 0,02 | 50% | 50% | 0% | 100% | 0% | 0% | | | |
| markkadom | Chinese Mistltoe | Gymnopetalum chinensis | 6% | 0% | 16% | 0,00 | 0,03 | 0% | 0% | 0% | 100% | 0% | 0% | | | |
| markkor | | | | | | | | | | | | | | 0% | 50% | 0% |
| marknod | | | 3% | 0% | 8% | 0,00 | 0,01 | 0% | 0% | 0% | 100% | 0% | 0% | | | |
| marknumtao | | | 2% | 0% | 4% | 0,00 | 0,04 | 0% | 0% | 0% | 100% | 0% | 0% | | | |
| morning glory | | Ipomoea aquatica | 5% | 0% | 12% | 0,00 | 0,02 | 0% | 0% | 0% | 100% | 0% | 0% | | | |
| munpa | | | | | | | | | | | | | | 100% | 0% | 0% |
| onion | | | 2% | 0% | 4% | 0,00 | 0,00 | 0% | 0% | 0% | 100% | 0% | 0% | | | |
| papaya | | | 2% | 0% | 4% | 0,00 | 0,01 | 0% | 0% | 0% | 100% | 0% | 0% | | | |
| peanut | | | 5% | 3% | 8% | 0,01 | 0,01 | 100% | 0% | 0% | 100% | 0% | 0% | | | |
| phuhad | | | | | | | | | | | | | | 0% | 0% | 0% |

| | | | Freelistings | | | | | | | | | | | Food Scarcity | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Food plant | English name | Scientific name | Total percentage (men + women) | Percent of men | Percent of women | Sutrop CSI men | Sutrop CSI women | % of men that indicated traffic light: | | | % of women that indicated traffic light: | | | % of hh that indicated traffic light: | | |
| | | | | | | | | green | amber | red | green | amber | red | green | amber | red |
| phuk did | | | 9% | 5% | 16% | 0,03 | 0,03 | 100% | 0% | 0% | 75% | 25% | 0% | 0% | 0% | 0% |
| phuk good | fiddlehead fern | Diplazium esculentum (Retz.) Sw. | 33% | 21% | 52% | 0,07 | 0,09 | 75% | 13% | 13% | 77% | 15% | 8% | 0% | 50% | 0% |
| phuk ka | | | 6% | 3% | 12% | 0,01 | 0,09 | 0% | 100% | 0% | 33% | 33% | 33% | | | |
| phuk khom | amaranthus | Amaranthus viridis | 14% | 15% | 12% | 0,05 | 0,05 | 100% | 0% | 0% | 100% | 0% | 0% | 0% | 0% | 0% |
| phuk nok | | | 6% | 5% | 8% | 0,03 | 0,03 | 100% | 0% | 0% | 100% | 0% | 0% | 50% | 25% | 0% |
| phuk pa | | | | | | | | | | | | | | 0% | 0% | 100% |
| phuk tob | | | 2% | 0% | 4% | 0,00 | 0,01 | 0% | 0% | 0% | 0% | 0% | 100% | | | |
| pumpkin | | Cucurbita | 34% | 46% | 16% | 0,08 | 0,06 | 89% | 11% | 0% | 100% | 0% | 0% | | | |
| sesame | | Sesamum indicum | 13% | 8% | 20% | 0,01 | 0,04 | 67% | 33% | 0% | 100% | 0% | 0% | | | |
| sweet potato | | Ipomoea batatas | 16% | 18% | 12% | 0,03 | 0,02 | 43% | 57% | 0% | 100% | 0% | 0% | 50% | 50% | 0% |
| taro | | Colocasia esculenta | 25% | 41% | 0% | 0,12 | 0,00 | 69% | 31% | 0% | 0% | 0% | 0% | 0% | 100% | 0% |
| upland rice | | Oryza sativa | 42% | 54% | 24% | 0,28 | 0,25 | 57% | 10% | 33% | 67% | 33% | 0% | | | |
| vegetables | | | 23% | 38% | 0% | 0,15 | 0,00 | 80% | 20% | 0% | 0% | 0% | 0% | | | |
| yardlong bean | | Vigna unguiculata | 6% | 5% | 8% | 0,01 | 0,01 | 100% | 0% | 0% | 100% | 0% | 0% | | | |

**The table presents the results of the 'free listing' module, and the 'plants in food scarcity' module of the first round of the baseline survey; In total, 39 men and 25 women out of 63 participating households, responded to the 'free listing' module and listed 27 (men) and 30 (women) species; Regarding the 'plants in food scarcity' module, out of the 63 households, 1 was missing and 62 did actually participate and listed a total of 15 species; Sutrop CSI reflects the knowledge of a specific plant (the higher the CSI, the more representative is the plant of the knowledge shared by community members); Colour visualization: Green= used in affluent period, Amber= used in moderate food scarcity period, Red= used during severe food scarcity period.*