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Diet diversity among women in Attapeu Province, Lao PDR

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1. Introduction

1.1. Background

Food and nutrition security are high priorities for the Government of Laos. Malnutrition is high and is related to chronic food insecurity. Currently, over 40% of WRA suffer from anemia, and approximately 33% of U5 children are stunted, according to Lao Social Indicator Survey (LSIS) II in 2017 (Lao Statistics Bureau, 2018), which negatively impacts their growth, cognitive development, and future productivity. The importance of aquatic foods in promoting sustainable and healthy diets is well established (UN Nutrition, 2021). Fish have long been a staple of diets in rural Laos and provide much of the protein and micronutrients required for good health. In Lao PDR, Fishing was seen as a key livelihood activity for rural household for their food security, nutrition, and income generation (Phonevisay, 2013). The annual fish consumption rate in Attapeu was 19 kilograms per capita (Clayton et al., 2023) while the national consumption rate of fish and other aquatic foods was 29 kg per capita per year (Phonevisay, 2013), surpassing the global average of 21 kg (SEAFDEC, no date). Fish and other aquatic animals (OAAs) are an important source of food for local farmers; 49% of household animal protein intake comes from fishes and OAAs. Farmers meet standards in terms of protein intake (about 2,300 kcal person per day) but have an insufficient nutrition intake as they consume small amounts of fish and meat (Phouthavong et al, 2018). However, despite this high consumption rate and its nutritional benefits, malnutrition remains a significant issue in the country.

The ASEAN CGIAR Innovate for Food and Nutrition Security Program's Intervention Package 3, focused on enhancing the use of agrobiodiversity and landscape biodiversity,¹ along with the CGIAR Initiative on Agroecology,² led by the International Water Management Institute (IWMI) in Lao PDR, are implementing pilot projects in two districts—Sanamxay and Samakkhixay in Attapeu Province. These initiatives aim to promote regenerative and agroecological food production systems e.g., through the use of wild, neglected, and underutilized plants and aquatic foods in integrated rice-fish farming systems, thereby increasing income and improving nutrition through sustainable practices and better nutrition behaviors among households.

To better understand the dietary practices in the area, the project team conducted a study on the food consumption and nutrient adequacy of WRAs using the Minimum Dietary Diversity for Women (MDDW) tool, developed by the Food and Agriculture Organization (FAO) and FHI 360 in 2016 and updated in 2021 (FAO, 2021).

Additionally, the study identified policy engagements and support mechanisms that influence sustainable improvements in nutrition behaviors, recognizing that many neglected wild and aquatic foods have been overlooked by researchers, breeders, and policymakers. The findings will serve as a valuable reference for future interventions in the project areas.

1.2. Objectives of the study

1. To determine the proportion of respondents consuming at least five food groups over a 24-hour period.

¹ <https://www.cgiar.org/news-events/news/asean-and-cgiar-launch-joint-program-on-accelerating-innovation-in-agri-food-systems/>

² <https://www.cgiar.org/initiative/agroecology/?section=about>

2. To determine the frequency of consumption of fish and fish-based processed products (FBPPs) among respondents over a 7-day period.
3. To identify the types of wild foods/ neglected plants (fruits and vegetables) consumed among respondents over a 24-hour period.
4. To identify existing institutional and policy engagements influencing the utilization of wild foods/ neglected plants in land and water in the target areas.

2. Methodology

2.1. Survey respondents and areas

For the MDDW survey, the village chief from each of the five project villages informed women aged 15 to 49 years in advance about the opportunity to voluntarily participate in the interviews. The survey team aimed to interview 20 women of reproductive age (WRA) from each village. Women who arrived at the village center at the designated time and provided consent were interviewed. In total, 100 women were interviewed across Donemueng and Donephay villages in Sanamxay district, as well as Hom, Tammaleuy, and Inthy villages in Sammakhixay district (Figure 1).

For the key informant interviews (KII), the team conducted a total of 14 interviews, comprising 71% men and 29% women. These included five village authorities who are the chief or deputy chief, five officials responsible for nutrition promotion from the two District Health Offices and the Provincial Health Office, and four officials responsible for the agricultural promotion and extension services from the two District Agriculture and Forestry Offices and the Provincial Agriculture and Forestry Office.

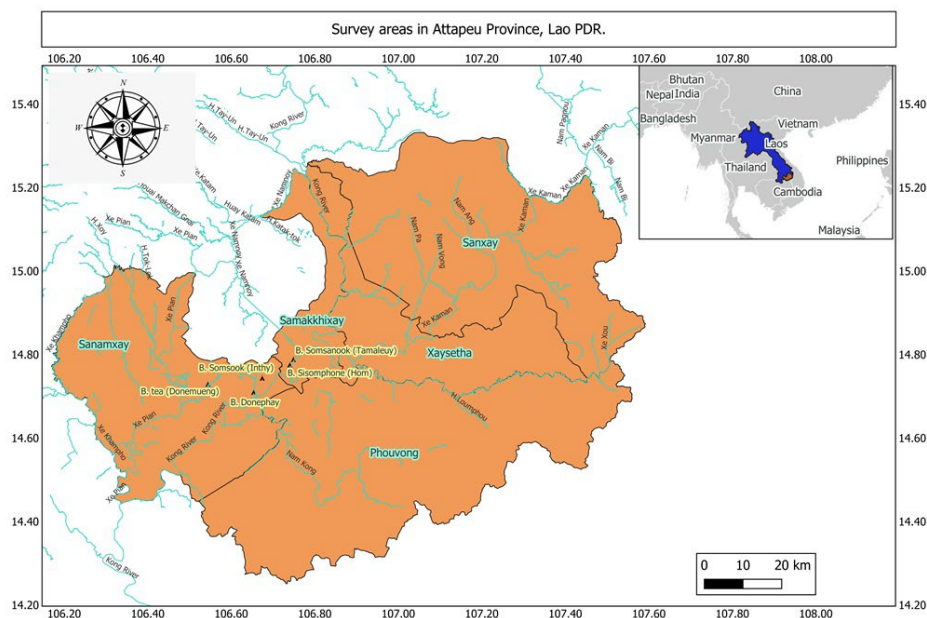


Figure 1. Villages surveyed in Attapeu Province. Illustrated by: Ei Ei Phy, WorldFish.

2.2. MDDW survey tool

The survey employed a 24-hour dietary recall method along with a 7-day recall to assess the consumption of fish and fish-based processed products (FBPPs). It utilized the Minimum Dietary Diversity for Women (MDD-W) score, as outlined in the “Minimum Dietary Diversity for Women: A Guide for Measurement” by FAO and FHI 360, originally published in 2016 and updated in 2021 (ibid). The tool evaluates dietary diversity based on the consumption of 10 food groups, with a score of 5 out of 10 groups as a proxy indicator for micronutrient adequacy. The online questionnaire was translated in Lao language for easy understanding during interviews.

The guide identifies 22 distinct food groups, which are consolidated into the following 10 categories that are strongly correlated with micronutrient sufficiency:

1. grains, white roots and tubers, and plantains
2. pulses (beans, peas and lentils)
3. nuts and seeds
4. dairy products
5. meat, poultry and fish
6. eggs
7. dark green leafy vegetables
8. other vitamin A-rich fruits and vegetables
9. other vegetables
10. other fruits

For the key informant interviews, the team explored knowledge, attitudes, and practices (KAP) related to promoting wild foods, neglected plants, and underutilized foods within institutional and policy frameworks. The questions aimed to understand their thoughts for overcoming local challenges in promoting and consuming these foods.

2.3. Ethical approval

Before conducting the research study, the study was approved by the National Ethics Committee for Health Research (NECHR) under ethical approval number 81/NECHR dated 2 September 2024.

2.4. Enumerator training

Before data collection, the lead and co-lead researcher conducted a half-day, in-person training in English and in Lao languages. A total of 7 enumerators (3 women, 4 men) from government institutions; National Agriculture and Forestry Research Institute (NAFRI) via the Policy Think Tank (PTT), Lao Tropical and Public Health Institute (LTPHI) and National University of Lao PDR (NUOL) participated. The training supported in familiarizing the questionnaire uploaded on the Kobo application and clarified the 22 food categories, types of aquatic foods, and examples of wild, underutilized, and



Figure 2. Dr. Inthanousone Keonakhone (L) and Dr. Dalaphone Sittideth (R) practicing the interviews. ©Quennie Vi Rizaldo

neglected foods that should be noted during interviews, as well as the questions for key informant interviews. To test the MDDW survey and the KII questionnaires, enumerators conducted practice interviews with each other, and any issues or challenges were discussed and resolved (Figure 2). In addition, the research team reviewed the target respondents, survey areas, and the schedule for the upcoming days. In the afternoon, the survey team conducted additional practice interviews with local women who shared similar profiles to the survey respondents.

2.5. Meeting among village chief and key informants

The survey team held a brief meeting with the village chiefs and committee members to explain the activity and seek their support in informing and gathering the target respondents at the village center (Figure 3). Any concerns regarding data collection, scheduling, venue, and target respondents were addressed.



Figure 3. Meeting with the village authorities before conducting the data collection. ©Quennie Vi Rizaldo

2.6. Data collection

The MDDW survey and the KII was conducted on 8-12 October 2024. Data was entered directly into tablets using the open-source software Kobo (<https://www.kobotoolbox.org/>). After verifying all responses, enumerators uploaded the completed questionnaires online each evening (Figures 4 and 5). For KII, however, responses were recorded on paper, and the co-lead researcher collected the completed questionnaires daily. All the interviews were conducted in Lao language.



Figure 4. Ms. Syda Xayyavong interviewing one of the respondents. ©Quennie Vi Rizaldo



Figure 4. Dr. Saysouda Lasakit interviewing one of the village chiefs. ©Quennie Vi Rizaldo

3. Profile of respondents

The majority of respondents (99%) were aged 19-49, almost half of respondents attended primary school and 96% being married. Sixty-eight percent belonged to households with 4-6 members, while a quarter lived in households with over 7 members. More than half of the respondents reported having 1-2 children under five years of age in their household, while 43% had none. Regarding income sources, 55% were engaged in agriculture, followed by 29% in labor, with smaller numbers in government/salaried jobs, shop ownership, and receiving

remittances. Half of the respondents reported a household income exceeding 3,000,000 LAK³ (137 USD) per month, followed by 15% with an income of 2,500,000 LAK (115 USD) per month. In Lao PDR, a monthly income of 80 USD⁴ for one person is considered the poverty line. For a household of five members, the average size in the surveyed areas, this equates to a total household income at the poverty line.

4. Survey Results

4.1. Diet diversity

Based on the results, the mean dietary score is 4 which is below the minimum diet diversity score of ≥ 5 from the 10 food groups, and only 30% of the women interviewed reached the minimum diet diversity score of 5 and over. The score of 5 and above indicates micronutrient adequacy in diets, a key dimension of diet quality.

Figure 6 shows the most to least consumed food groups, with rice, the staple of Lao diets, having the highest consumption rate. Animal-source proteins such as meat, poultry, and fish closely followed, with a consumption rate of 99%, and dark green leafy vegetables (74%), while milk or milk products, nuts or seeds, and beans or peas were the least consumed food groups.

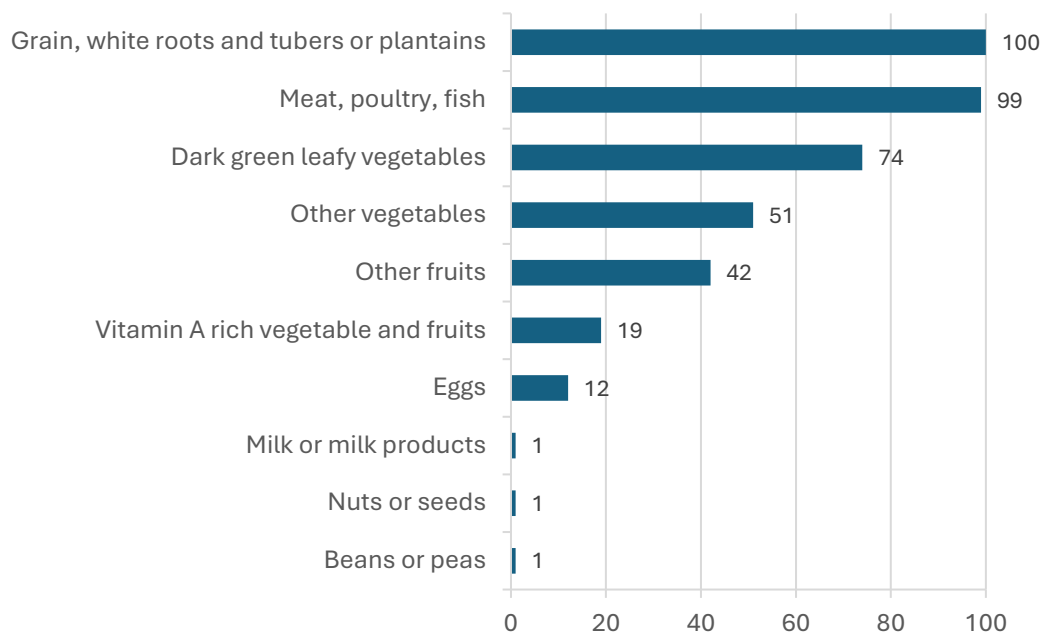


Figure 5. Food groups consumed by respondents in the previous 24 hours

³ 1USD=22000 LAK

⁴ 3.65 USD for person/day for 22 days equivalent to a month income

Examining the 22 food groups in more detail (Figure 7), fish was the most consumed animal-source protein. It can be assumed that accessibility and availability is due to the village’s proximity to inland water bodies such as rivers, streams, ponds, and irrigation channels.

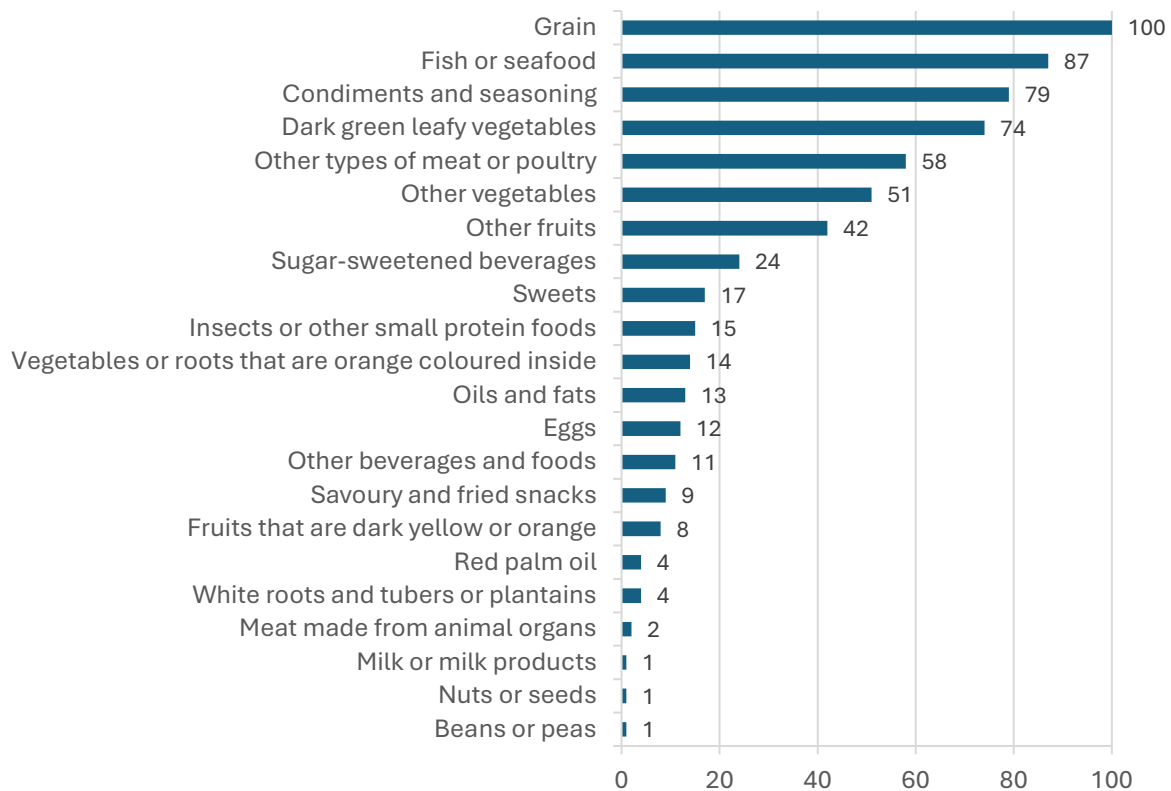


Figure 6. Food categories consumed in the previous 24 hours

High consumption of condiments and seasonings (e.g., fish sauce, fermented fish, fish/shrimp paste) as well as sugar-sweetened beverages (e.g., juices, cola) and sweets was also reported. These foods, which are high in salt and sugar, are associated with increased risks of cardiovascular diseases, obesity, and other non-communicable diseases. In addition, insects and other small protein sources (e.g., snails), primarily sourced from the wild, were an important dietary contribution.

Respondents with an income of over 137 USD consumed meat, poultry, dark green leafy vegetables, other vegetables, beverages (such as alcohol), and sweets compared to those with lower incomes during the interview. Meanwhile, respondents earning less than 45 USD consumed insects and other small protein sources (see annex 1).

Furthermore, respondents with children under 5 years old at home were more likely to consume orange- and yellow-colored vegetables, meat or poultry, and sugar-sweetened beverages compared to those without young children (see annex 2).

4.2. Aquatic foods consumption over the previous 7 days

Over the past seven days, respondents consumed a diverse range of aquatic foods, including fish, snails, frogs, and algae, totaling 39 different species (see detailed list in annex 03). Among these, nine were small indigenous fish species, such as spotted barb, loach, and glass fish. Of

the 38 species, 35 were wild-caught, while three species—Silver barb, Tilapia, and Common Carp—were farmed.

4.3. Consumption of Small Indigenous fish Species (SIS) over the previous 7 days

Small indigenous fish species (SIS) are defined as fish that reach a mature length of up to 25 cm and are found in freshwater bodies such as rivers, rice fields, and irrigation channels (Figure 8). When consumed whole (with head and bones intact), they provide rich sources of micronutrients and essential fatty acids.

According to the results, over 60% of respondents reported consuming SIS at least 1-3 times over the past seven days, while 30% reported no consumption. Among those who consumed SIS, 85% ate the fish whole, thereby benefiting from its rich nutrient content.



Figure 7. Example of small indigenous fish species available in the area (bottom).
©Quennie Vi Rizaldo

4.4. Consumption of fish-based processed products over the previous 7 days

Smoking, drying, and fermentation are traditional fish preservation methods used for centuries, especially during seasons of abundance or in areas without cold storage facilities, such as rural communities.

Over half of the respondents reported consuming fish-based processed products in the past seven days, including dried fish, smoked fish, fish paste, shrimp paste, and fermented fish. Among these, fish paste was the most commonly consumed (46%), followed by smoked fish (17%), shrimp paste (17%), and dried fish (13%).

4.5. Sources of fish

In terms of where respondents source the fish that they consumed, over 70% reported to catch from the rivers, streams and other open water bodies, followed by purchased from the market (29%), from own pond (21%), and from ambulant vendors (5%).

5. Key informant interviews

Stakeholders shared their insights into the community's knowledge, attitudes, and practices regarding the use of wild, neglected, and underutilized foods in the area. They highlighted major challenges and offered recommendations to promote policy engagement aimed at conserving and making better use of these valuable resources. The key findings are summarized as follows:

5.1. Knowledge of wild foods and relevant policy frameworks

Key informants demonstrated a strong understanding of the increasing consumption trend of wild foods. However, only a few informants at the provincial and district levels were aware of relevant policy frameworks. Based on input from the majority of key informants, it can be inferred that foods from the natural sources, home gardens and local markets are where people from Attapeu source their food despite limited awareness of their nutritional benefits.

Commonly consumed indigenous fish from natural sources include redbtail barb (Pa Khuen) *Barbonymus Schwanenfeldii*, common name is snakehead (Pa Khor) *Ophicephalus striatus*, walking Catfish (Pa Douk) *Clarias batrachus*, slidestripe rasbora (Pa Seew) *Rasbora paviana*, and snakeskin gourami (Pa Kar Duerd) *Trichopodus trichopterus*. Frequently consumed wild plants include bamboo shoots, rattan shoots, mushrooms, and tubers.

Regarding policies, only a few key informants identified relevant frameworks for promoting and protecting wild foods and neglected plants. These included the National Plan of Action on Nutrition (NPAN) developed by the Ministry of Health (MOH) and the Agriculture Development Strategy (ADS) to 2025 and Vision to 2030 by the Ministry of Agriculture and Forestry (MAF), which emphasizes promoting agricultural food production and commercialization through crop cultivation, livestock, and fisheries. Additionally, informants mentioned the National Socio-Economic Development Plan and the provincial plan for local socio-economic development as significant policy frameworks.

5.2. Attitude towards the utilization of wild foods

The majority of key informants expressed positive attitudes toward the consumption of wild foods as a means to support food security and nutrition. They also emphasized the need to conserve natural food sources for sustainable use. Many believed that the demand for food from natural sources is increasing; however, they expressed concerns about a declining supply due to resource degradation. This decline is attributed to activities such as the expansion of cash crop production (e.g., cassava, bananas, and sugarcane) and mining. Additionally, a few informants noted that development priorities focusing on agricultural production and commercialization have negatively impacted the supply and rehabilitation of natural resources.

Regarding factors influencing demand, many informants believed that the high demand for wild foods is driven by a growing population, particularly in rural households. These households often rely on wild foods for consumption, income generation, and their perceived health benefits, as these foods are considered organic. However, a few informants indicated that the consumption of wild foods might decrease due to emerging concerns about food safety and a preference for foods with traceable sources.

Nevertheless, there is little consensus that these concerns about food safety standardization will positively impact on the demand for foods from organic agricultural production systems.

5.3. Experiences in interventions towards promotion of the wild foods

The majority of key informants have experience in promoting nutrition-related interventions and agricultural production. However, they were unaware of any projects specifically focused on promoting the consumption and utilization of wild foods or neglected plants. It was evident that relevant sectors had collaborated to promote food production and nutrition security in addition

to fulfilling their regular mandates. For instance, the Provincial Multisectoral Nutrition Committee was established as a coordination mechanism to implement the NPAN.

The health department contributes by providing knowledge on recommended food groups and cooking nutritious meals, while the agriculture department focuses on agricultural production, livestock, and fisheries extension services to enhance food security and prevent malnutrition. One example is the "Agriculture for Nutrition (AFN)" II project, a joint initiative by the agriculture and health departments, which educates communities on various nutritious foods and promotes the cultivation of highly nutritious vegetables. Additionally, the education department plays a role by teaching basic nutrition and supporting activities like school gardens.

At the community level, village authorities, led by village chiefs, facilitate and host coordinated interventions across relevant sectors. These interventions include agricultural promotion initiatives aimed at village households. Common agricultural interventions at the local level include the establishment of rice banks, self-sufficient rice production, commercialization of crops (e.g. cassava, banana), home gardens, and cultivation of fruit trees.

The AFN project led by MAF as mentioned above, was also highlighted. The project's key activities include nutrition education campaigns, malnutrition treatment, and promoting the consumption of six essential food groups. Furthermore, the project will introduce school-based interventions such as a school lunch program and school gardens.

However, policies like the National Action Plan on Agrobiodiversity have not yet been implemented in the area.

5.4. Challenges affecting the utilization of wild foods

Key challenges to the utilization and consumption of wild foods include issues related to supply, cultural beliefs about food, and the lack of supportive programs. Most key informants attributed the decreased availability of wild foods to forest degradation, driven by the growing demand for commercial plantations (e.g., banana, cassava, and sugarcane) and mining activities. The seasonal nature of wild foods also contributes to the limited supply.

Cultural food taboos present another significant challenge. For example, lactating women are discouraged from eating fish with spikes, red tails, or scales, such as snakehead. Pregnant women often avoid eggplants due to fears of difficult childbirth. Mothers with newborns refrain from eating buffalo meat, red-tail fish, or eels, as eels are believed to feed on dead bodies.

A few key informants also noted that a lack of knowledge about the nutritional value of wild foods among rural communities impacts their consumption. Without awareness of their benefits, people may neither consume nor protect these valuable natural resources.

Additionally, there is limited support for interventions that promote the sustainable utilization of natural resources, which serve as vital sources of food and livelihood for many rural villagers. While the District Agriculture and Forestry Office (DAFO) can provide extension services, budget constraints hinder the implementation of initiatives such as training, seedling distribution, and demonstration projects that could improve villagers' knowledge and practices.

Coordination among relevant sectors was also identified as a challenge. Each sector tends to focus narrowly on its specific mandate. For example, the health department is not effectively engaging in nutrition-related activities in collaboration with non-health sectors such as agriculture and education.

5.5. Recommendations

Below are the five key recommendations from the Key Informant Interviews (KIIs):

- **Rehabilitation and conservation of forests and wildlife** to enhance their availability and sustain food sources for the community. Examples include promoting conservation-focused tourism, sustainable hunting and harvesting of natural foods, and establishing forest conservation areas in each village.
- **Community awareness campaigns** to educate people on the nutritional value of wild plants, particularly neglected plants and indigenous fish species, as well as the importance of practicing sustainable use of natural resources.
- **Regular extension support** for cultivating crops and propagating wild plants to enable their growth in domestic gardens where feasible. Suggested examples include mushrooms, certain bamboo species, i.e., *Nor Lai* (a name in Lao), and rattan shoots.
- **Strengthening cross-sectoral collaboration** among relevant sectors to promote the consumption of nutritious foods, with the health sector taking the lead in nutrition interventions.
- **Enforcement and implementation of policies and plans** that promote the consumption of wild food through practical measures such as zoning of forest conservation sites in each village where applicable, and promotion of clean agricultural production to minimize agro-chemical use.

6. Discussion

The report highlights the foods consumed the previous day by women of reproductive age (WRA) in villages involved in the CGIAR Initiative on Agroecology Initiative and the ASEAN CGIAR Innovate for Food and Nutrition Security program-IP3 projects. Due to resource constraints (time, money, and staff), the survey team conducted a single round of interviews during the monsoon season when food availability is generally higher than in the dry season. These interviews were held at the village center, which limited participation to women living nearby or those who did not go out to their farms, potentially affecting the results. Therefore, it is crucial to interpret the findings within this context and avoid overgeneralization.

Despite these limitations, the results provide valuable insights to support government bodies, IWMI, WorldFish, and other stakeholders in designing and implementing strategies and policies that address nutrition gaps. Additionally, the findings underscore the potential and the community needs for conserving and utilizing wild, neglected, and underutilized foods to improve nutrition outcomes and enhance rural livelihoods.

Diet Diversity

Only 30% of respondents achieved a minimum dietary diversity score of 5 or higher, which is significantly lower compared to the 72% reported in a national survey, but this data excluded Attapeu Province due to the covid19 restrictions at the time of data collection (Global Diet Quality Project and UNICEF, 2021). Hence, could explain the conflicting results. To our knowledge, recent published data on Attapeu Province is unavailable. However, in 2017, only

15% of WRA in the province achieved the minimum dietary diversity score (NIPN, 2017) which aligns quite well with our study. The findings from our study raise critical nutrition and health concerns, particularly during pregnancy, lactation, and the first 1,000 days—a period spanning from conception to when a child reaches two years of age. This period is crucial, as nutritional deficiencies can cause irreversible damage to infants and young children, affecting their cognitive development, school performance, and long-term productivity.

Rice emerged as the most consumed food, reflecting its role as a staple in Lao diets, similar to other Asian countries. Followed by animal source foods (ASF), and dark green leafy vegetables. Among the ASF, fish was widely consumed by respondents, it can be attributed to the community's proximity to inland water bodies, making it an accessible and abundant resource, during the monsoon season when the survey was conducted (Clayton et al., 2023). Repeating similar studies in other seasons would be beneficial for comparative analysis.

Milk and dairy products, not traditionally part of Lao diets, were consumed by only a few respondents. Similarly, nuts, seeds, beans, and peas—good sources of protein, B vitamins and other nutrients—were among the least consumed. These foods are especially important in contexts where animal products are unavailable or unaffordable.

Respondents reported consuming a variety of aquatic foods such as algae, snails, frogs, and finfish, mostly sourced from the wild. This highlights the importance of these foods in rural communities (Rodericks, 2020; The Ministry of Natural Resources and the Environment, 2016). Unlike Thailand and Vietnam, where farmed fish consumption is rising due to aquaculture developments (FAO, no date), the surveyed communities rely heavily on wild-caught species. Small indigenous fish species (SIS) were notably consumed, offering higher nutritional value (e.g., vitamin A, iron, calcium, and essential fatty acids) when eaten whole compared to filleted large fish (Bogard et al., 2017). Community-based management of these resources is vital for conservation and equitable utilization.

Transition of diets

There is a growing shift from traditional diets to ultra-processed foods (UPF), mostly high in sugar, salt, and unhealthy fats, this is in parallel to the trend happening in other Southeast Asian countries (Baker et al., 2020). Consumption of UPF is linked to non-communicable diseases like cardiovascular diseases, diabetes, obesity, and cancer (Lane et al., 2024; Cordova et al., 2023). Examples of such foods consumed include cola, sweetened milk, bread, and cakes. This findings is similar to the national survey mentioned earlier (Global Diet Quality Project and UNICEF, 2021). Respondents with relatively higher incomes reflect a broader trend where increased purchasing power leads to reliance on convenient but less healthy options (Phulkerd et al., 2023). This trend is more pronounced in urban areas due to busy lifestyles and the inability of people to produce their own food. In addition, respondents with children under five years old at home were also more likely to consume sweetened beverages. This behavior can be modeled by young children, making it especially challenging to correct, as children often emulate the habits they observe in adults. Consumption of these foods can displace nutritious foods needed for child growth and development (Pries et al., 2019).

To counter this, food environments must ensure the availability and accessibility of nutritious and safe foods among local consumers. In addition, promoting food-based dietary guidelines and social behavior change communication can help encourage positive nutrition behaviors. To our knowledge, food-based dietary guidelines are not available in the country. As a next step,

follow-up discussions on consumption behaviors and the rural food environment are recommended to better understand the shift among rural households.

Wild, neglected, and underutilized plants

The consumption of insects and small proteins, such as snails, by 15% of respondents underscores the importance of wild foods as vital sources of nutrients for rural communities. Other wild foods consumed include mushrooms and bamboo shoots, which are excellent sources of protein, vitamins, minerals, and fiber. However, the contribution of wild foods to nutrition and livelihoods is often underreported due to inadequate data collection methods (FAO and Bioversity International, 2017).

In the study areas, where many Mon Khmer communities reside and poverty rates are high (FAO et al., 2022), wild foods serve as an essential food source, particularly during the lean season. However, food taboos exist as mentioned in the KII which can be harmful for women and children who needs essential nutrients during the critical period e.g. pregnancy, lactation. These taboos and perceptions on particular fish species are also common in other countries like Myanmar (Rizaldo et al., 2023).

Although the research team made an effort to document wild foods consumed by providing photos of common aquatic foods and compiling a list of underutilized and neglected wild foods, some items may have been overlooked due to unfamiliarity with local names. This oversight could understate the role of these foods in local diets. To address this gap, the team plans to conduct follow-up consultation meetings with stakeholders, including local authorities, community members, and experts in non-timber forest products (NTFPs).

Policy framework for the promotion of wild foods

Relevant policies identified during the KII included NPAN 2021–2025 (MOH, 2021), ADS to 2025 and Vision to 2030 (MAF, 2015), and the National Agro-Biodiversity Programme (NABP) II 2015–2025 (MAF, 2016). Among these, NPAN was somewhat familiar to a few key informants at the provincial and district levels. However, most key informants did not recognize these policies as frameworks relevant to supporting the utilization of wild foods and neglected plants in their communities, even though they are.

For instance, one of NPAN's intervention priorities is to promote community participation in planning, managing, and sustainably using natural resources and non-timber forest products (MOH, 2021). In the case of NABP II, which was more clearly known when stakeholders heard agrobiodiversity terminology, it was reported that it has not yet been introduced in the province.

The lack of awareness of these policies among key informants might be attributed to insufficient dissemination, including frequency of meetings, limited comprehensive knowledge sharing, and a lack of emphasis on the connection between these policies and their supporting interventions.

Another possible explanation is that the promotion of wild foods has not been a central focus or primary activity in development projects implemented in the area. For example, while the ADS highlights the importance of wild foods and the domestication of certain wild animals for rural food security (MAF, 2016), its main emphasis on agricultural food production through cultivation, livestock, fisheries, and commercialization may overshadow or divert attention from its intent to promote alternative food supply systems, such as wild foods.

Development programmes promoting the utilization of wild foods

The majority of key informants were unaware of any interventions promoting the utilization of wild foods and neglected plants in their communities. A few informants recalled previous efforts related to the protection of natural resources. This lack of awareness may be attributed to limited information and knowledge about project activities, particularly those focused on the promotion of wild foods.

For example, the CGIAR Initiative on Agroecology promotes the conservation and sustainable use of water resources in Nonglom Lake and the development of aquatic food systems (Borah et al., 2024; Mam and Xaydala, 2024). However, these activities were not mentioned or recognized by local authorities. Similarly, the Agriculture for Nutrition (AFN) II project aims to promote the conservation of wild foods for sustainable use (Centre for Development and Environment, 2024; International Fund for Agricultural Development, 2022), yet only a few key informants were aware of its existence and were unaware that one of its objectives is to promote the use of natural resources and the effective utilization of wild foods.

Another reason for the lack of interventions related to wild foods could be the focus and flexibility of development projects, which often prioritize high-value crop cultivation and livestock production. Globally, as agricultural systems intensify, wild foods are frequently marginalized in favor of agricultural modernization and commercialization (Zhu et al., 2024). Some informants expressed concerns that the supply of wild foods is declining due to the extensive promotion of farm-based and market-oriented production systems.

Attitudes and knowledge of wild foods

The majority of key informants acknowledged the positive contributions of wild foods to food security and income generation, particularly for rural households that often rely more on natural sources than markets. Many informants predicted an increasing demand for wild foods due to several factors; their seasonal availability, the impact of forest exploitation for crop plantations on the diversity and supply of wild foods, and a growing population.

These observations regarding the importance of wild foods for rural households and the challenges of decreasing supply have also been documented in reports such as the ADS to 2025 and Vision to 2030 (MAF, 2015), the NABP II 2015–2030, and the study by (Broegaard et al., 2017) who found that in areas where agricultural land was extensively used for commercial plantations, wild foods contributed less to household diets. The same authors also found that conservation efforts, while beneficial in many ways, can sometimes restrict the provision of wild foods to surrounding communities.

Many key informants highlighted the need for targeted support to rehabilitate and conserve forests and wildlife to enhance their availability and sustain food sources for communities. Achieving sustainable supplies of wild foods for local communities should be a key focus for effective external support. Broegaard et al. (2017) also recommended creating stronger linkages between wild food provisions, commercialization, and natural resource conservation efforts.

Additionally, some key informants proposed community campaigns to raise awareness about the nutritional value of wild plants, particularly neglected plant species and indigenous fish. They noted that many households lack knowledge of the benefits of wild foods beyond their immediate use for household consumption and income generation. One of the explanations is

that villagers may learn general benefits of wild food, but not the specific nutritional value and benefits, as a previous study by Wieringa et al. (2023) whereby they found that rural villagers in the southern areas had some basic knowledge about the health and nutritional benefits of consumption vegetables, diverse foods, and supplements through regular community health interventions, for instance.

Some key informants suggested that enhancing community knowledge of nutrition and healthy diets could foster greater interest in the sustainable utilization of wild foods. For example, Pha Kao Lao⁵, a knowledge platform that provides nutrition information of wild and indigenous foods is well- established in the country.

From the authors' perspective, the continued promotion of the integrated rice-fish-vegetable production system, introduced by the CGIAR Initiative on Agroecology, could be another ready to scale up intervention in the area to help meet local needs for the propagation of indigenous fish. This recommendation is inspired by a study conducted in northern provinces of Lao PDR by (Li et al., 2023), which concluded that integrated rice-fish farming, along with using rice fields as fish refuges, can promote the propagation of indigenous fish and other aquatic species such as snails, frogs, and crabs. Similarly, a study by (Inphonephong et al., 2024) reported positive feedback from farmers practicing this system, favoring local tradition like fish culture in the rice fish systems and access to nearby fish hatchery centers.

7. Conclusions

In conclusion, this report highlights the limited diversity in the diets of women of reproductive age interviewed, which may indicate nutrient inadequacies with negative nutrition implications. Additionally, it reveals a shift from consumption of traditional foods to ultra-processed foods. Most importantly, the study underscores the critical role of wild, neglected, and underutilized foods in improving nutrition, particularly for rural communities in Lao PDR.

Despite challenges such as declining wild food availability, changing dietary patterns, and limited implementations of policies promoting wild food utilization in the target areas, these foods remain essential for food security, income generation, and biodiversity conservation. Strengthening community awareness to have a better understanding on the importance of wild foods can influence ownership to protect natural food sources for sustainable utilization.

Scaling up of the integrated farming practices like rice-fish-vegetable systems where indigenous fish and other aquatic animals can migrate into the fish culture area has a big potential for nutrition and livelihood for the communities. An increased flexible implementation approach among development programs to ensure comprehensive alignment with policies such as NPAN and NABP II should be another crucial step forward. Collaborative efforts among stakeholders are needed to ensure sustainable use, conservation, and equitable access to wild foods, addressing both immediate nutritional needs and long-term food and nutrition security goals. The convergent approach to implement the NPAN among relevant sectors can be seen as an example and part of the entry point to strengthen the recommended cross sectoral cooperation.

⁵ <https://phakhaolao.la/>

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9. Annex

9.1. Annex 1- Food consumption by income bracket

Food Categories	<= 45 USD	46 USD- 90 USD	91 USD- 136 USD	>136 USD
Grain	100	100	100	100
Vegetables or roots (Orange coloured)	28.6	21.1	9.1	11.5
White roots and tubers	0	5.3	4.5	3.8
Dark green leafy vegetables	57.1	57.9	68.2	84.6
Fruits dark yellow or orange inside	0	15.8	13.6	3.8
Unripe mango and papaya, white/cream-fleshed bananas	14.3	52.6	50	38.5
Other vegetables	14.3	42.1	45.5	61.5
Meat made from animal organs	0	5.3	0	1.9
Meat or poultry	42.9	57.9	54.5	61.5
Eggs	14.3	15.8	13.6	9.6
Fish or seafood	85.7	89.5	90.9	84.6
Beans or peas	0	0	0	1.9
Nuts or seeds	0	0	0	1.9
Milk or milk products	0	5.3	0	0
Insects or other small protein foods	28.6	15.8	13.6	13.5
Red palm oil	0	5.3	4.5	3.8
Oils and fats	14.3	5.3	18.2	13.5
Savoury and fried snacks	14.3	10.5	9.1	7.7
Any sweets	0	15.8	18.2	19.2
Sugar-sweetened beverages	0	31.6	31.8	21.2
Condiments and seasonings	28.6	73.7	81.8	86.5
Other beverages and foods	0	10.5	4.5	15.4

Figure 8. Food categories by income bracket. Source: Quennie Vi Rizaldo

9.2. Annex 2- Food consumption with or without children under 5 years old at home

Food categories	no U5	>=1 U5	Total	Difference
	%	%	%	
Grain	100	100	100	0
Vegetables or roots (Orange coloured)	4.7	21.1	14	16.4
White roots and tubers	7	1.8	4	-5.2
Dark green leafy vegetables	81.4	68.4	74	-13
Fruits dark yellow or orange inside	4.7	10.5	8	5.8
Unripe mango and papaya, white/cream-fleshed bananas	37.2	45.6	42	8.4
Other vegetables	62.8	42.1	51	-20.7
Meat made from animal organs	2.3	1.8	2	-0.5
Meat or poultry	39.5	71.9	58	32.4
Eggs	7	15.8	12	8.8
Fish or seafood	88.4	86	87	-2.4
Beans or peas	0	1.8	1	1.8
Nuts or seeds	0	1.8	1	1.8
Milk or milk products	0	1.8	1	1.8
Insects or other small protein foods	9.3	19.3	15	10
Red palm oil	2.3	5.3	4	3
Oils and fats	16.3	10.5	13	-5.8
Savoury and fried snacks	4.7	12.3	9	7.6
Any sweets	11.6	21.1	17	9.5
Sugar-sweetened beverages	14	31.6	24	17.6
Condiments and seasonings	88.4	71.9	79	-16.5
Other beverages and foods	9.3	12.3	11	3

Figure 9. Food consumption among respondents with or without U5 year old children. Source: Quennie Vi Rizaldo

9.3. Annex 3- Aquatic foods consumed for the past 7 days

	Aquatic foods	Common Lao name	Frequency	Source	SIS
1	Striped snakehead	pa khok	76.0	Capture fishery/wild	No
2	Frog	ກົບ	69.0	Capture fishery/wild	NA
3	Climbing perch	Kheng	59.0	Capture fishery/wild	Yes
4	broad head walking catfish	pa duk oui	48.0	Capture fishery/wild	No
5	Dwarf scissortail rasbora (SIS)	No common name	47.0	Capture fishery/wild	Yes
6	Walking catfish	pa duk	46.0	Capture fishery/wild	No
7	Silver Barb	pa pak kom	36.0	Farmed/ capture fishery	No
8	Tilapia	ປານິນ	36.0	Farmed/ capture fishery	No
9	Snails	ຫອຍ	31.0	Capture fishery/wild	NA
10	Crab	ບູ	23.0	Capture fishery/wild	NA
11	Puntiophites falcifer	pa sa kang	21.0	Capture fishery/wild	NA
12	Snails	ຫອຍ	19.0	Capture fishery/wild	NA
13	Krill	Krill	17.0	Capture fishery/wild	Yes
14	Mud Carp	Pa Keng	14.0	Capture fishery/wild	No
15	Spotted barb (SIS)	ປາສູດຈູດດ່າ	14.0	Capture fishery/wild	Yes
16	Eel	Lot	14.0	Capture fishery/wild	No
17	Amblypharyngodon chulabhornae	No common name	14.0	Capture fishery/wild	Yes
18	Hampala barb	pa sood	12.0	Capture fishery/wild	No
19	Mystus catfish	pa kot leuang	10.0	Capture fishery/wild	Yes
20	River carp	pa pak	8.0	Capture fishery/wild	No
21	Nandid perch	Ka	8.0	Capture fishery/wild	No
22	Frog	ກົບ	8.0	Capture fishery/wild	NA
23	Wallago attu	Khao	6.0	Capture fishery/wild	No
24	Snails	ຫອຍ	5.0	Capture fishery/wild	NA
25	Common Carp	Pa Nai	4.0	Farmed/ capture fishery	No
26	Black sharkminnow	pa phia ii kam	3.0	Capture fishery/wild	No
27	Krempf's catfish	pa suay hang leuang	2.0	Capture fishery/wild	No
28	peppered horseface loach	hak kouay	2.0	Capture fishery/wild	Yes
29	glass catfish	peek kai	2.0	Capture fishery/wild	Yes
30	Thicklip barb (pa eun khao)	pa eun khao	2.0	Capture fishery/wild	No
31	Fresh water algae	ເທົານ້ຳຈືດ	2.0	Capture fishery/wild	NA
32	Frog tadpole	ຮວກ	2.0	Capture fishery/wild	NA
33	Gray mullet	ປາແຕັດສີເທົາ	2.0	Capture fishery/wild	No
34	Mackerel	ປາທູ	2.0	Capture fishery/wild	No
35	Asian red tail catfish	pa kheung	1.0	Capture fishery/wild	No
36	Nilem carp	pa nok kow	1.0	Capture fishery/wild	No
37	leaf fish	Mor	1.0	Capture fishery/wild	Yes
38	Sardines	ປາຊາດີນ	1.0	Capture fishery/wild	Yes

Figure 10. List of Aquatic foods consumed by respondents. Source: Quennie Vi Rizaldo

9.4. Annex 4- List of field survey team

No.	Name	Designation	Agency
1	Mr. Viengkeo Bounthavongkham	Staff- Technical Office, Center for Research on Rural Economy and Agriculture on Climate Change Adaptation	National Agriculture and Forestry Research Institute, Ministry of Agriculture and Forestry
2	Dr. Inthanousone Keonakhone	Food and Nutrition Research	Lao Tropical and Public Health Institute, Ministry of Health
3	Ms. Saysouda Lasakit	Staff- Department of Rural Economics and Food Technology, Faculty of Agriculture	National University of Lao
4	Mr. Seangphed Phommachanh	Staff- Department of Livestock and Fishery, Faculty of Agriculture	National University of Lao
5	Mr. Hoth Singnoy	Staff- Technical Office, Data Center National Agriculture and Forestry Research Institute	National Agriculture and Forestry Research Institute, Ministry of Agriculture and Forestry
6	Dr. Dalaphone Sitthideth	Deputy Head- International Program for Health and Tropical Department	Lao Tropical and Public Health Institute, Ministry of Health
7	Dr. Syda Xayyavong	Head of Department- Food and Nutrition Research	Lao Tropical and Public Health Institute, Ministry of Health