CGIAR BETTER DIETS AND NUTRITION

Food systems, environment, nutrition: A structured evidence framework (FoodSENSE Framework).

Phuong Ngo Thi Ha[1], Mai Truong Tuyet[1], Thinh Nguyen[2], Trang Tran Thi Thu[1], Ngoc Vuong Thi Ho[1], Paula Dominguez[2,3], Emily Ouma[2] and Jim Hammond[1]Authors

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Authors: Phuong Ngo Thi Ha[1], Mai Truong Tuyet[1], Thinh Nguyen[2], Trang Tran Thi Thu[1], Ngoc Vuong Thi Ho[1], Paula Dominguez[2,3], Emily Ouma[2] and Jim Hammond[1]

1- National Institute of Nutrition
2- International Livestock Research Institute
3- University of Greenwich

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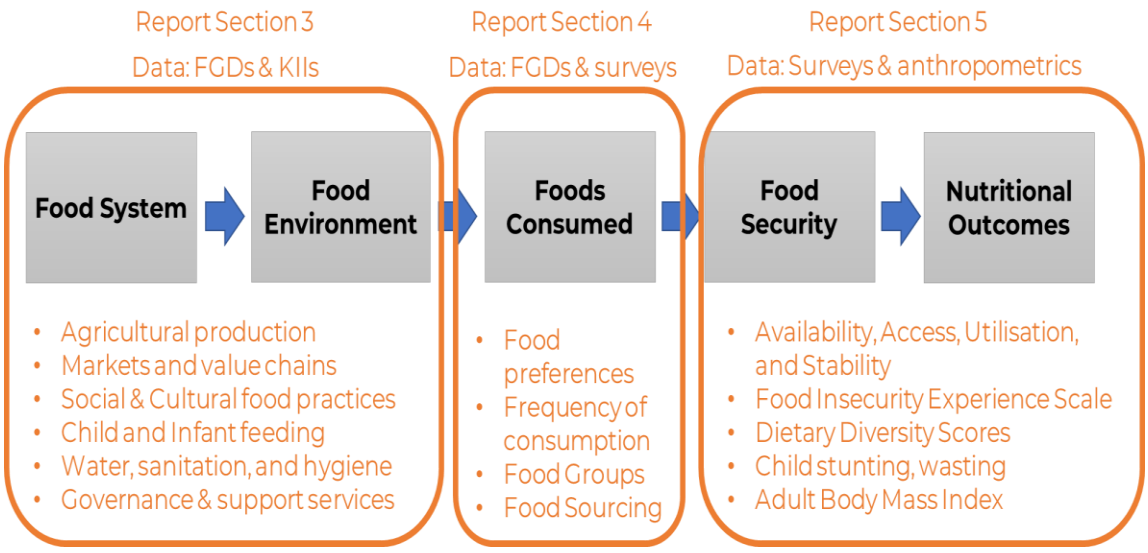
Summary

It is recognized that to achieve food and nutrition security coordinated action between multiple sectors is required. The causes of food and nutrition insecurity are multifaceted and often interconnected. Therefore, a holistic understanding of the whole food system is important to identify and prioritize intervention entry points. The UN agencies and national governments are developing food systems action plans, but there is a gap at finer-grained spatial levels, where there are few guidelines on how to implement food systems thinking at the more local levels, to guide local decision making.

This report presents the second implementation of the Food Systems, Environments, and Nutrition: Structured Evidence Framework (FoodSENSE Framework), designed to be used at sub-national levels, guiding the description of the food system, food environment, food security and nutritional outcomes. Through application of the framework and a stakeholder engagement process, bottlenecks to improving food and nutrition security can be identified and prioritized, groups of people requiring specific support identified, and potential solutions shortlisted.

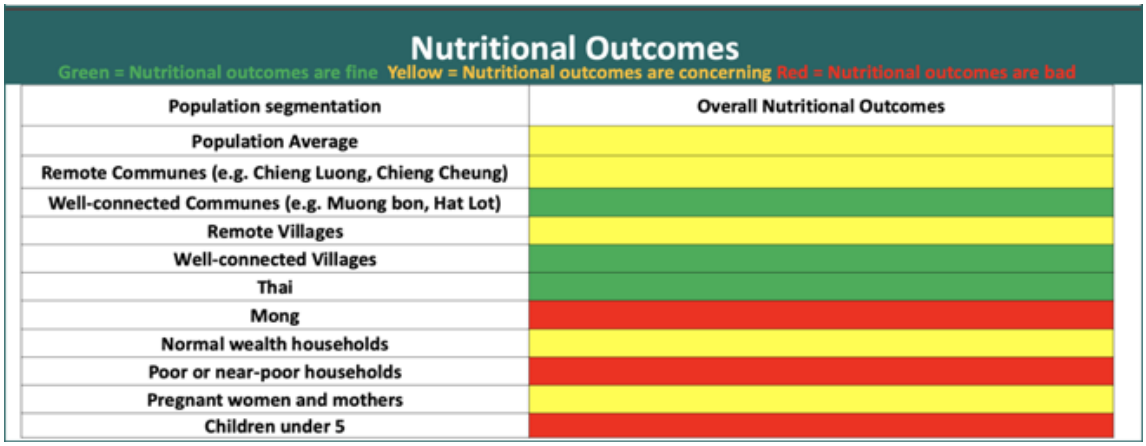
The main issues contained within the framework are illustrated in Figure S1. Information for this report is gathered from both primary and secondary sources. Primary sources encompass focus group discussions, key informant interviews, and stakeholder evaluations conducted during workshops, while secondary sources include household surveys and grey local reports. Information is synthesized into a standardized reporting format. An excel-based tool is used to match challenges with potential food and nutrition-related interventions, which are then put to stakeholders for evaluation and prioritization. A clear chain of evidence is thus presented for each intervention.

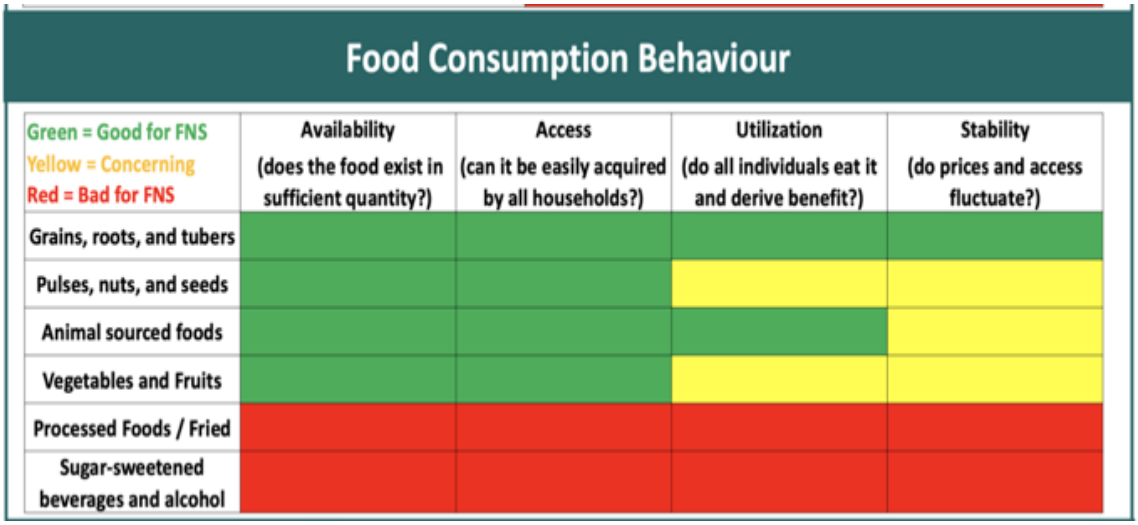
Figure S1: Topics assessed in the FoodSENSE Framework

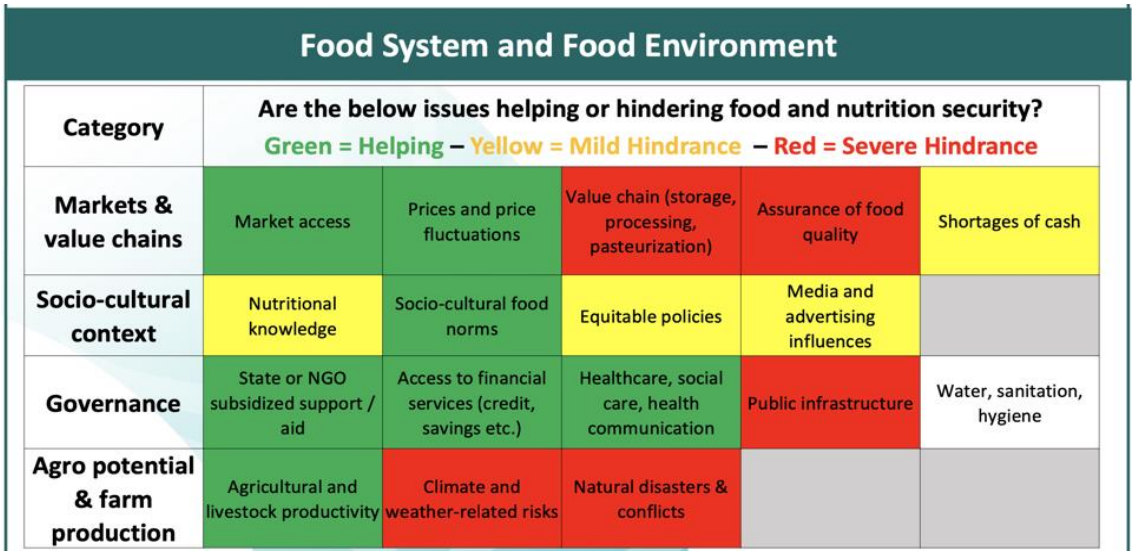


This framework was implemented in four communes (Muong Bon, Hat Lot, Chieng Chung, Chieng Luong) in Mai Son district, Son La province, in the Northwest region of Vietnam, under the CGIAR Initiative on Sustainable Animal Production (SAPLING). Bottlenecks hindering food and nutrition security were identified and were related to markets and value chains, cultural and social norms, nutrition knowledge, public infrastructure, sanitation, and farm production.

Figure S2: Three score cards showing assessments of (a) top left, the nutritional situation for different demographic groups; (b) top right, food security assessments regarding four major food groups and two unhealthy food groups; and (c) the status of various aspects of the food system, in terms of degree to which they hamper healthy diets. In each case, red indicates a problem of undesirable situation, yellow indicates cause for concern, and green indicates little or no concern.







Introduction

The “Food System” concept has become an organizing narrative in recent years, culminating in the UN Food Systems Summit, in 2021[1]. Definitions generally agree that the food system is an integrative concept which “gathers all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the output of these activities, including socio-economic and environmental outcomes” (HLPE 2014). The concept tends to be used in an instrumental manner towards achieving broad sustainability outcomes and improved nutritional and health outcomes (van Braun et al. 2021, Béné et al. 2019). Analysis of food systems tend to stress the interconnections between system elements, internal and external (societal) drivers, and the systems may be conceptualized at multiple (nested) levels from local to global food systems (von Braun et al. 2021).

The UN Food Systems Summit brought together national leaders with international agencies and experts to set the agenda for improving food systems. Over 100 countries signed up to create “national pathways to sustainable food systems” which entails high-level political dialogue and action planning[2,3]. High profile frameworks of food system metrics tend to focus at national level (e.g. Fanzo, Haddad et al. 2020) and are intended to support these processes. The Food Systems, Environments, and Nutrition: Structured Evidence (FoodSENSE) framework was created for a different purpose: its scope is to be used at relatively local levels, where the thinking around system interactions is typically much less advanced and there is a lack of methods to operationalize food systems approaches. It is hoped that this effort will, in due time, connect with the national pathways approach and support the local level implementation. The FoodSENSE Framework is intended as a guide on the issues to consider within a local food system, and a process to spark multi-stakeholder interactions focusing on food security and nutrition within a specific local food system.

The necessity for a multisectoral approach to address food and nutrition insecurity

There is an increasing recognition that achieving food security and good nutrition requires coordinated action between multiple sectors. The causes of food and nutrition insecurity are multifaceted and often interlinked thus require various actors at different levels. The four pillars of food security – availability, access, utilization, and stability (1) – can be seen to play out amongst various sectors of the food system. These include agricultural production, food processing, marketing, cultural knowledge around food and food preparation, as well as managing temporal supply issues and interpersonal equity issues. Environmental factors also play a role in nutrition, including access to clean and safe water, good sanitation facilities and hygiene practices. These can prevent diarrhoeal diseases and infections of the digestive system which limit nutrient absorption (especially among children). Unsafe foods also contribute to food borne diseases which lead to inadequate nutrient intake and other complications related to the diseases. Poor health can lead to reduced food intake due to loss of appetite and other complications. Lack of health services delivering micronutrient supplementation of iron, vitamin A, and folate can lead to poor nutrition out comes especially among women and children. Lack of awareness and limited nutrition knowledge by consumers can lead to poor diet consumption even when healthy foods are available and accessible (2). Similarly, gender barriers and other social cultural practices can prevent consumption of healthy foods leading to poor nutrition outcomes. Coordinated collaboration among sectors is therefore necessary as the agricultural sector alone cannot address food and nutrition security challenges (3)(4). Given this interconnectedness, policy interventions designed in consideration of only one dimension of a food system may be ineffectual, or even lead to undesirable consequences, hence there is need to consider the big picture when designing food security and nutrition policies or interventions (4).

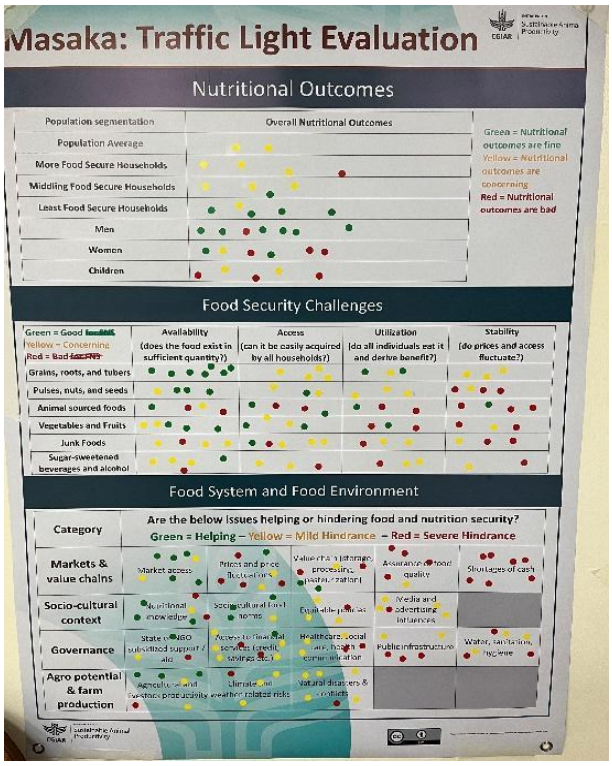
Against this complex backdrop, it can be difficult to decide which elements of a food system to study and understand, and especially difficult to identify the most influential leverage points, where interventions can deliver the desired outcomes. To address this challenge, as part of the CGIAR Initiative for Sustainable Animal

[1] https://www.un.org/en/food-systems-summit

[2] https://www.un.org/en/food-systems-summit/news/more-100-countries-sign-develop-national-strategies-transforming-food-systems

[3] https://www.unfoodsystemshub.org/member-state-dialogue/dialogues-and-pathways/en

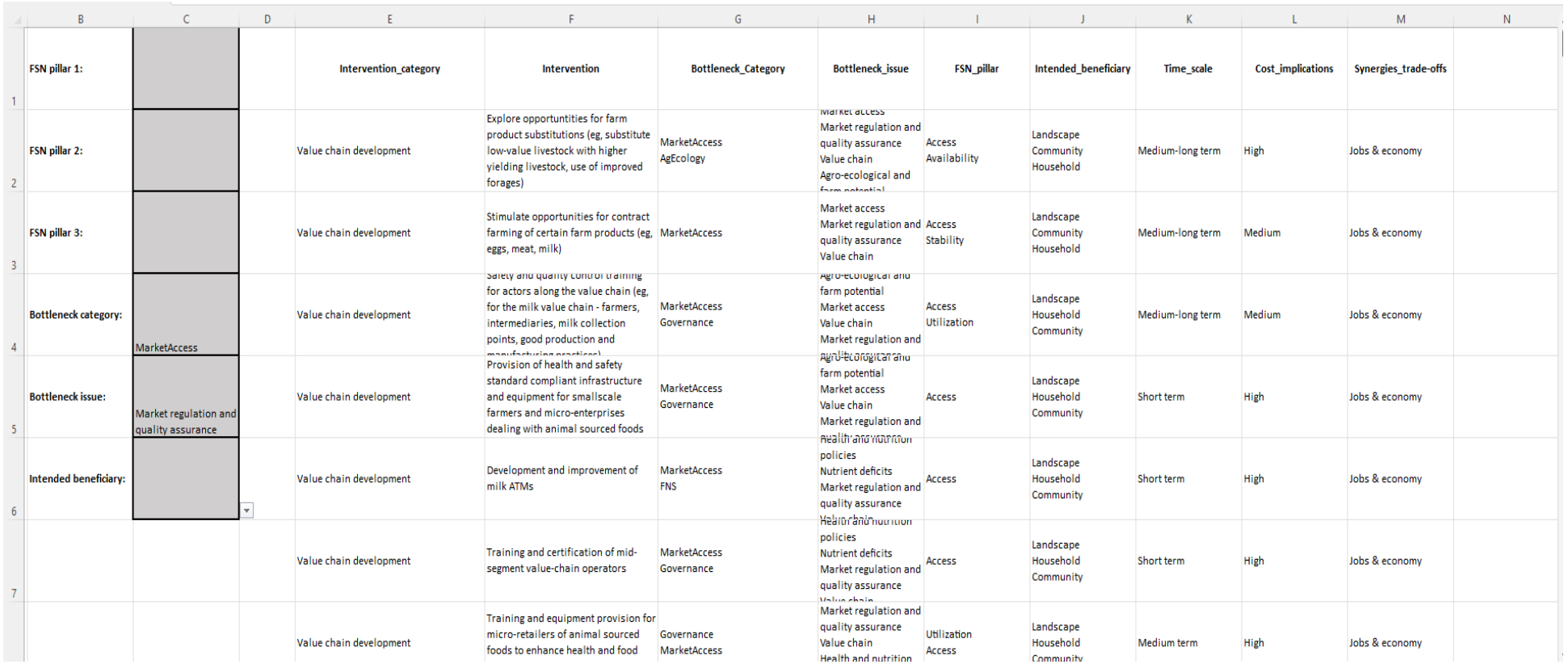
Productivity, a decision support framework was developed that brings together elements of the food system and environment. The FoodSENSE framework aims to assess food security and nutrition outcomes in specific locations while taking into consideration the context and trade-offs within the local food system, to allow an evidence-based prioritization of challenges and interventions aiming to enhance food security and nutrition.



Long list of potential solutions

From the stakeholder evaluation meeting, it should be possible to count the number of “votes” for each challenge within the food system and environment topic, the food consumption topic, and to identify the most vulnerable demographic groups for nutritional outcomes. This informs the prioritization of challenges to address within the local food system. Then priority issues can be inputted to the Intervention Recommendation Tool in Figure 4, providing a long-list of potential solution ideas. These should be screened for relevance by the implementation team and then presented to the stakeholder group for short-listing

Figure 1: Screenshot from the excel-based Intervention Recommendation Tool. The priority issues identified can be inputted and are matched to a database of over 200 food and nutrition interventions, resulting in a long list of potential solution ideas.



	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**FSN pillar 1:**			**Intervention_category**	**Intervention**	**Bottleneck_Category**	**Bottleneck_issue**	**FSN_pillar**	**Intended_beneficiary**	**Time_scale**	**Cost_implications**	**Synergies_trade-offs**	
2	**FSN pillar 2:**			Value chain development	Explore opportuntities for farm product substitutions (eg, substitute low-value livestock with higher yielding livestock, use of improved forages)	MarketAccess AgEcology	Market access Market regulation and quality assurance Value chain Agro-ecological and farm potential	Access Availability	Landscape Community Household	Medium-long term	High	Jobs & economy	
3	**FSN pillar 3:**			Value chain development	Stimulate opportunities for contract farming of certain farm products (eg, eggs, meat, milk)	MarketAccess	Market access Market regulation and quality assurance Value chain	Access Stability	Landscape Community Household	Medium-long term	Medium	Jobs & economy	
4	**Bottleneck category:**	MarketAccess		Value chain development	Safety and quality control training for actors along the value chain (eg, for the milk value chain - farmers, intermediaries, milk collection points, good production and manufacturing practices)	MarketAccess Governance	Agro-ecological and farm potential Market access Value chain Market regulation and quality assurance	Access Utilization	Landscape Household Community	Medium-long term	Medium	Jobs & economy	
5	**Bottleneck issue:**	Market regulation and quality assurance		Value chain development	Provision of health and safety standard compliant infrastructure and equipment for smallscale farmers and micro-enterprises dealing with animal sourced foods	MarketAccess Governance	Agro-ecological and farm potential Market access Value chain Market regulation and quality assurance	Access	Landscape Household Community	Short term	High	Jobs & economy	
6	**Intended beneficiary:**			Value chain development	Development and improvement of milk ATMs	MarketAccess FNS	Health and nutrition policies Nutrient deficits Market regulation and quality assurance Value chain	Access	Landscape Household Community	Short term	High	Jobs & economy	
7				Value chain development	Training and certification of mid-segment value-chain operators	MarketAccess Governance	Health and nutrition policies Nutrient deficits Market regulation and quality assurance Value chain	Access	Landscape Household Community	Short term	High	Jobs & economy	
				Value chain development	Training and equipment provision for micro-retailers of animal sourced foods to enhance health and food	Governance MarketAccess	Market regulation and quality assurance Value chain Health and nutrition	Utilization Access	Landscape Household Community	Medium term	High	Jobs & economy	

Participatory assessment, shortlisting of solutions and feasibility assessment

A second meeting of stakeholders should be convened, for a half-day, to evaluate the proposed long list of food and nutrition interventions. This may be the day following the first evaluation workshop; it is possible to prepare the intervention recommendations within an evening. The excel-based Intervention Recommendation Tool should be demonstrated to the stakeholders, and the prioritized food system challenges should be reported back. The selected challenges and the resulting intervention recommendations should be presented. The stakeholders should first be given the opportunity to discuss the selection of the priority challenges. They may not agree with the prioritization or may not agree with one another. It could be possible to generate new recommendations in such a situation. Once the priority challenges are agreed, the potential solutions should be evaluated. First, there should be a "weeding" exercise to remove any which are clearly unsuitable given the local context. Next there should be a "prioritization" exercise to identify the most promising, in terms of feasibility and in terms of anticipated impact. Some interventions may address multiple challenges or may be perceived to provide cascading benefits. A shortlist of approximately five priority interventions is a sensible number to aim for. These should be discussed further, identifying the niche within the local food system, the required participants, the level of funding required, and any next steps which could be taken.

Final writing and presentation of the results

Finally, a full report combining the initial assessments and the stakeholder evaluations should be written up. This should also be presented back to key stakeholder groups and used as a spur to further action. The format of this report can serve as a template for final reports.

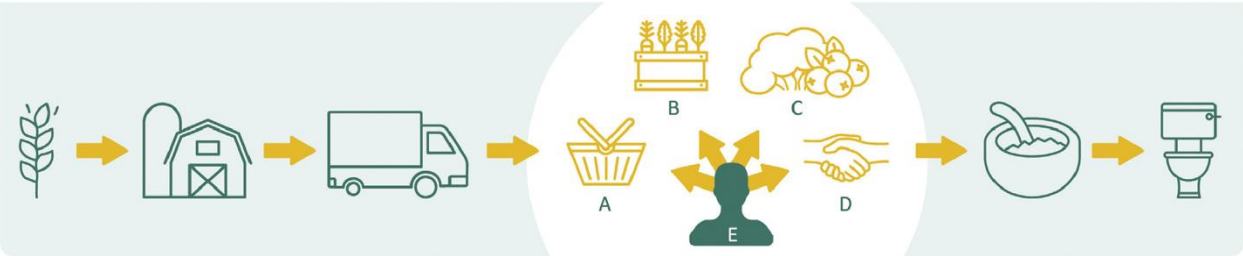
Topics addressed within the framework

The major topics addressed in the framework are described in more detail in this section, with reference to the supporting literature. Those topics are the food system, the food environment, food consumption, food security, and indicators of nutritional outcomes.

The Food System and the Food Environment

The food system involves all elements involved in from food production, through consumption, to sewage disposal – this includes the people, institutions, environments, infrastructure and activities involved in food production, aggregation, processing, distribution, preparation and consumption, including the outputs of these activities such as socio-economic and environmental outcomes (HLPE 2017) (5). Local food systems can be conceptualized more simply than global or national food systems, but they are still complex. The basic model employed in this framework draws upon Turner et al 2018 (6) and entails food production; food storage and processing; transport; the food environment, which includes food acquisition from markets and other sources; food consumption; and waste disposal as illustrated in Figure 5.

Figure 2: Figure 5: A conceptualization of the main stages in a local food system. From left to right these are food production; food storage and processing; transport; the food environment, which includes food acquisition from markets and other sources; food consumption; and waste disposal.



Source: Turner et al 2018.

The food environment space in which decisions around food acquisition and consumption are made by individuals, and it influences the health and nutrition outcomes of the consumers (7) (6) (8–10). The food environment incorporates both external and personal domains. External domains include elements such as food availability, prices, markets and vendors, and regulation; while personal domain issues include food affordability, accessibility, preferences, food preparation, convenience, and desirability. Food environment typologies differ for given contexts, for example between urban and rural, or formal and informal (Downs and Demmler 2020) (11). In this framework we combine the concepts of the food system and food environment.

The following topics are covered to describe the food system and the food environment: farm production and agro-ecological potential, including small scale production and the harvesting or hunting of wild foods; markets and other food purchase points, food prices, and the presence of value chains; social and cultural norms around food preferences and food culture, expectations on who should eat what, and child feeding norms; sources of knowledge regarding food preparation and nutrition; the water, sanitation, and hygiene situation, practices, and attitudes; and governance issues, including regulation, and official or unofficial support systems such as health care or food aid. The topics and sub-topics are each defined in Appendix 10.3 of this report.

The majority of the information regarding the food system and food environment was sourced from FGDs with community members (described more detail below) and from KIIs with professionals and experts working in the local communities. However other data sources could also be valuable, such as official statistics on food production, analyses of agricultural potential or agricultural plans from official sources, value chain assessments, market surveys, or farm surveys. In this case pre-existing farm survey data was used to supplement the information on local farm produce.

The topics listed for the food system and food environment are used as headings and sub-headings of Section 3 of this report. The topics were also used a check list of issues for stakeholders to consider and prioritise during the participatory evaluation process. Finally, the topics were used as “tags” assigned to food and nutrition interventions, so that interventions could be matched to specific challenges within a food system.

Foods Consumed

The foods people consume, and why they chose to consume them, is important information to understand the result of the food environment, and to understand the nutritional situation. There are many food stuffs which may be consumed, and many ways of preparing them. Different people also consume different foods, influenced by personal, cultural, and economic factors; and foods consumed may vary seasonally.

Food stuffs were grouped into ten main food groups, according to nutritional profile and conceptual similarity, following the guidelines for the minimum dietary diversity for women indicator (12). These were grains, roots, and tubers; pulses; nuts and seeds; dairy; meat, fish, and poultry; eggs; dark green leafy vegetables; vitamin A rich fruit and vegetables; other vegetables; and other fruits. In addition, three categories were added for sweet snacks, fried or savory snacks, and beverages.

Food consumption was measured using various approaches. Household survey data which collected the frequency of food group consumption at household-level during a lean month and a flush month (as defined by the respondent), where each food group may be reported as consumed “daily or almost daily”, “weekly”, “monthly”, or “not consumed”. The FGDs held with community members reported on which foodstuffs (within each food group) were commonly consumed, rarely consumed, preferred, disliked, and commonly self-produced or purchased. The FGDs also reported on foodstuffs especially preferred or disliked/discouraged for different demographic groups. The groups were infants (<3 years), children (3-12 years); male and female youth (13-21 years); pregnant and breastfeeding women; male and female adults (22-59 years); and male and female elderly people (>60 years). Key informants were asked to comment on which foods were over- or under-consumed in the locality; the consumption of unhealthy or junk foods; the most important foods from a nutritional point of view; and if there were demographic differences in food consumption.

Food consumption is reported in Section 4. In addition to the survey, focus group, and key informant, stakeholders were asked to give a participatory evaluation of the food consumption situation. Stakeholders commented on six food groups, aggregated to permit rapid and participatory evaluation. Those food groups were: grains, roots, and tubers; pulses, nuts, and seeds; animal source foods; vegetables and fruits; junk foods; sugar-sweetened beverages and alcohol. Stakeholders were asked to comment on the availability, access, utilisation, and stability of each food group.

Food Security

Food security is defined as when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Food security has four pillars: availability, access, utilization, and stability (FAO 2001) (13). Availability addresses the “supply side” – i.e. whether or not the food exists – and is determined by the level of food production, stock levels and net trade. It is possible to have food available at national level, but it is lacking at household level. Access to food

includes the ability to purchase it or otherwise attain it. Access is influenced by incomes, markets, and food prices. Utilization relates to individual's consumption and absorption of nutrients, and includes feeding and care practices, food preparation, intra-household distribution of food, and how the nutrients are used in the body. Stability is when the other three pillars are maintained throughout time. External factors such as the economy and prices, climate, and conflict can affect the stability pillar of food security.

There have been calls, yet to be concluded, to update this definition and include two more pillars: agency and sustainability (Clapp, Moseley et al. 2022) (14). Agency relates to the capacity of individuals and groups to exercise voice and make decisions about their food systems. Sustainability relates to the long-term viability of the ecological and social basis of food systems.

We considered the four food security pillars in the FoodSENSE framework. The four pillars informed the design of the data collection tools, the topics covered under the food system and environment section, the participatory appraisal of food consumption, and the selection of nutritional outcome indicators. As such, the report section does not address food security in isolation, but food security issues pervade the entire report. Food and nutrition interventions were "tagged" as addressing specific pillars, and as such could be searched according to particular needs identified within a food system.

Nutritional Outcomes

The primary outcome of interest in the FoodSENSE framework is the nutritional status of individuals. A large literature exists around assessment of nutritional outcomes. Methods range from relatively light-touch, such as a one-off, ten-minute questionnaire exercise; to moderately invasive, such as taking body measurements of height, weight, and other body parts (e.g. mid-upper arm circumference); to invasive, such as taking monthly blood samples. More invasive methods are typically more precise but entail higher financial and social costs.

In the FoodSENSE Framework, we recommend using the best available data to describe the nutritional outcomes of the target population. However, as the framework is intended for use in lower- and middle-income countries, it is quite possible that indicators will be drawn from the more light-touch end of the spectrum. These are also more feasible to collect on lower budgets if no usable data already exists. Such indicators include the Food Insecurity Experience Scale (FIES) – used to assess household or individual access to sufficient quantity of food (Ballard et al 2013) ; various dietary diversity metrics such as the Household Dietary Diversity Score (HDDS; Swindale & Bilinsky, 2006) (15), used to measure household economic access to food; and Minimum Dietary Diversity Score for women (MDD-w) to measure the women's micronutrient adequacy (16), Rodríguez-Ramírez et al. 2022) (17). There are other diet quality indicators, such as Global Dietary Recommendation Score (Herforth et al. 2020) (18), Healthy Eating Index (19) (Kennedy et al. 1995), the Diet Quality Index (Patterson et al. 1994) (20), Global Dietary Quality Score (21) among others. Slightly more demanding are anthropometric measurements, such as weight and height, which can be used to determine Body Mass Index (BMI), which gives information on whether adults are underweight, overweight, or healthy weight. Children's anthropometric measurements can also be assessed using height, weight, age, and sex. Metrics include stunting, wasting, and being underweight. Mid-Upper Arm Circumference (MUAC) for wasting. Stunting (low height for age) indicates inadequate long-term growth because of chronic undernutrition. Wasting (low weight for height) is an indicator of acute undernutrition – i.e. rapid weight loss. MUAC is used only for children under 5 years of age and if the circumference of the upper arm is below thresholds it indicates wasting or severe malnutrition.

In this application of the framework, the following have been used as indicators of nutritional outcomes: BMI for men and for women, reporting the percentage of the population above the normal weight and below the normal weight. For children, the percentage of underweight, stunted, and wasted. These were sourced from the Vietnam General Nutrition Survey (DHS; Ugandan Bureau of Statistics, 2018). Also from the DHS surveys, the percentage of households drinking water from unimproved sources and the percentage of children who had diarrhea in the last two weeks. From another household survey (Caufield et al 2021) (22) , indicators were calculated for the FIES (Ballard et al 2013); an adapted version of the HDDS, which reports on the frequency of food consumption during a "lean" and "flush" month during the last year (Fraval et al 2018) (23); individual dietary diversity scores for men and women based on a 24 hour recall, the proportion of households who consumed animal sourced foods in the past 24 hours, and an estimate of potential calorie availability per person per day, considering all on-farm production and incomes combined (Frelat et al 2015) (24). The count of months with food shortages and the differences between the flush and lean season dietary diversity scores were also reported. Mean indicator scores, standard deviations, as well as the proportion below acceptable thresholds (where such thresholds have been defined), and the links between the indicators and the four pillars of food security are all reported in Section 5.

The nutritional outcome indicators are intended to be used to appraise the degree of success achieved by the local food system, as well as to identify groupings of people who may need to be prioritized for food and nutrition support. Such groups may be defined by sex, age, wealth, location, ethnicity, or other features. Where possible the nutritional indicators have been reported along the relevant lines of differentiation, and stakeholders were asked to prioritize the food and nutrition situation of different demographic groups as part of the participatory evaluation exercise. It is already acknowledged that the local food system will incorporate agriculture and several key actors in other sectors to address malnutrition problems. The nutritional indicators relating to specific pillars of food security were used to inform prioritization of which pillars to address with interventions. The food and nutrition intervention selection tool allowed input for targeting towards identified priority demographic groups and food security pillars. As such, the nutritional outcome indicators were used to inform the selection of potential interventions.

Analysis and Interpretation

This report draws on multiple data sources, which entail different methods of analysis, aggregation, and reporting. In addition, sometimes the different data sources produce conflicting results. In those cases, this has been highlighted in the text with possible explanations given. However, conflicting results are inevitable as different studies drew from different respondents, and none were considered to be wholly representative of the systems studies. The layout of the results sections of this report first present the information from each data source (notably household surveys, FGD, KIIs, and stakeholder evaluations), followed by a synthesis section in which the authors of the report attempt to conclude on the most probably balance of facts.

Results from the four FGDs were aggregated into two tables per topic – one table for men's focus groups and one for women's. In general, the results reported between the study sites (one peri-urban, one rural) were similar, especially regarding food consumption, hence the findings aggregated for presentation. Focus group facilitators were instructed to guide focus groups towards agreement of the "common situation" and thus not to record outlying observations. However, in occasions where conflicting views were given by approximately equal proportion of respondents, both responses were reported. Thus, conflicting information is sometimes shown - for example a specific food may be listed as "preferred" and "disliked" if some respondents liked it and some did not. Where an outlying opinion was expressed and considered to be important or necessary to include, it has been done so with a caveat added to the text. Where differences occurred, these have been noted in the text. Numerical information reported from focus groups sometimes entailed a large range – for example when reporting the prices of foods. In those situations, an explanation of the range has been given in the table containing the large range – for example a high degree of seasonal price fluctuation, or dependent upon the quality or size of the item.

The KIIs were analyzed according to each topic they responded, and assessment of the claim made, or opinions given. Not all key informants responded on all topics. On each topic, the number of agreeing opinions were recorded, with the number of dissenting opinions also recorded. Generally, there was strong agreement between the key informants, with differences usually due to the specific details respondents chose to comment on rather than direct disagreements. When reporting the results of the KIIs in the text of the report, and indication of the frequency with which specific issues observations were made is usually given – for example "almost all key informants observed that…", or "it was occasionally observed that…".

The household survey data sources – DHS and RHoMIS – were analyzed for specific indicators and generally reported on a population basis. The DHS data was representative of the general population of Masaka district. The RHoMIS data was representative of farming households in Nyendo-Ssenyange, Kabonera, and Bukoto sub-counties (the same sub-counties in which the FGDs and KIIs were conducted). Indicator results from the household surveys are either reported at study population level, or sex- or age-disaggregated. Where thresholds have been defined for those indicators, they are presented in the results section along with the averages and the percentage of population below those thresholds.

Framework application in communes of Mai Son district, Son La province

The process outlined above was implemented in the four selected communes of Son La. The data utilized in the FoodSENSE framework pilot included both primary and secondary data. Primary data were collected through FGDs and KII conducted between April and June 2024. Compared to the FoodSENSE framework, the implementation in Vietnam lacked a household survey that would provide data on food and nutrition outcomes and indicators related to food security. To address this gap, we incorporated data from the Lichăn project. In addition, conducting pilot testing in Mai Son is a valuable step in ensuring that data collection tools and methods are appropriate to local contexts and needs.

Secondary data were gathered from various nutrition and agriculture-related reports supplied by the commune people's committee, commune health station, district agricultural department, district health center, provincial disease control center, and the Son La Provincial Department of Animal Husbandry, Veterinary, and Aquatic Products. Additionally, information from the Son La e-newspaper, the Son La provincial e-portal, and various law and policy sources were important for this report. To effectively gather data on the food system, food environment, food consumption habits, and food security situation of the people in the research area, we made several adjustments to the data collection tools and information sources in order to adapt the original structured framework for application in Vietnam.

Data collection

Literature review

The research team conducted a literature review using publicly available journal articles and reports. However, the review and the secondary data regarding the food environment, food security, and nutrition in the target locations revealed limited information that could be integrated into the framework.

Pilot test

Two FGDs were conducted in Hat Lot commune, Mai Son district, Son La province, on April 2024, at the local cultural house. The men's group included five participants, while the women's group had six, with each discussion lasting an average of three hours. The sessions were facilitated by one moderator and two secretaries: one for notetaking on paper and another for recording the entire discussion process, supplemented by audio recordings. Participants were actively engaged, but the lengthy discussion duration made it challenging for them to maintain focus. Questions Q1 and Q2 prompted the most extensive discussions, while questions Q6 (Food hygiene and safety) and Q7 (Food security and vulnerable groups) yielded minimal information. Recommendations included eliminating questions related to infant and young child feeding, refining Q5 to first inquire about main sources of information before identifying the most reliable ones, and removing Q6 and Q7, as this information can be sourced from secondary data. Additionally, it was suggested to adjust the questioning approach by starting with general inquiries before addressing specific subjects or pressing issues.

Six KIIs were conducted on the next day at the cultural house of Hat Lot commune, Mai Son district, Son La province. Participants included one health officer, two farmers, one seller, and one representative from the Mai Son district agricultural department, with each interview lasting between one to one and a half hours. Participants were enthusiastic and provided valuable information, although many could only answer questions related to their specific fields, making it challenging to gather broader insights. The interview included recording responses, and quick note taking. For unanswered queries, participants were prompted to indicate potential sources of information. Recommendations included conducting full interviews with representatives from the Department of Health, Center for Disease Control (CDC), district health center, commune health station, and the Department of Agriculture. For food sellers, the focus should be on questions related to food consumption (prices and purchasing behavior), food production (times of scarcity or availability), shopping and food markets, governance and policy, and interventions addressing food security and nutrition. Similarly, farmers should be asked about food consumption, production, shopping behaviors, governance, and relevant interventions to gather comprehensive insights.

Data collection tools

Given the multidisciplinary nature of the research encompassing agriculture, nutrition, education, and more, it was essential to customize the in-depth interview guide for each target group, including agriculture, health, cooperatives, farmers' associations, kindergartens, suppliers, and households. This approach ensured comprehensive data collection and capture the unique nuances of each field.

Primary data collection

The FGDs were divided by gender, and eight FGDs were held (one male group and one female group in each commune). A facilitator and two note-takers conducted the FGDs. They followed a pre-defined format to cover all the topics and facilitated recording written responses (audio recordings were also made). The duration of the FGD was between two and three hours. Information was collected on food consumption; foods preferred or discouraged for specific people; infant and young child feeding (only collected with female FGDs); food purchases; food knowledge, information, and choices; food hygiene and safety; definition of vulnerable groups related to food security. In applying the FoodSENSE framework in four communes of the Mai Son district, household data collection and anthropometric measurements were not conducted.



Photo of the male FDG in Mai Son district, Son La province



Photo of the female FDG in Mai Son district, Son La province

A total of 35 interviews were conducted with experts in the following roles: Provincial Agricultural Officer, District Agricultural Officer, District Health Officer, Commune Health Officer, Commune People's Committee Representative in charge of agriculture, Farmers' Association Representative, Household Representative, Vendor Representative, Kindergarten Representative. The interviews lasted an average of 45 minutes and followed a semi-structured format, in which a long list of open-ended questions was adjusted based on the preferences and knowledge of the key informants. Seven KII guides were specifically tailored for key groups, including health and agricultural officers, the Farmers' Association, livestock vendors, farmers, kindergarten representatives, and representatives from the Livestock Sub-Department. For 31 informants at the commune level, the interviews focused on the general situation and status of nutrition, agriculture, food security, nutritional security and specific characteristics of cultural and social norms in the area; meanwhile, 4 interviews with higher-level officials (district and provincial levels) in both the nutrition and agriculture sectors focused on exploiting governance and policy issues in Son La province in general and Mai Son district in particular.

Secondary data

The data collected in the study area includes:

Report on socio-economic development - national defense and security in the first quarter of 2024; directions and tasks in the second quarter of 2024 of the four communes.

Report on the management of Na Sy market in Hat Lot commune: status of the market, environmental sanitation work: Hat Lot commune

Report on Food Safety and Hygiene, April 2024 (communication on food safety and hygiene, inspection and examination work; management and certification of establishments meeting food safety conditions; food testing; food poisoning) of the four communes.

Report on the results of inspection of clean water and household toilets, report for the first quarter of 2024 (general hygiene of household water supply forms, treatment measures for household water supply forms; results of inspection of household toilets of the four communes.

Resolution Approving the socio-economic development plan of communes in 2024.

Situation Report Status and development status of livestock and poultry farming in Mai Son district. Mai Son District People's Committee, 2023.

Report on Livestock Development Results in 2023, first 6 months of 2024. Livestock Development Orientation Plan in the following years. Department of Agriculture and Rural Development, 2024.

Son La Electronic Newspaper: https://baosonla.org.vn

Son La province electronic information portal: https://sonla.gov.vn

Chieng Luong commune electronic information portal: http://xachiengluong.sonla.vnptweb.vn

Chieng Chung commune electronic information portal: http://xachiengchung.sonla.vnptweb.vn

Muong Bon commune electronic information portal: http://xamuongbon.sonla.vnptweb.vn

Hat Lot commune electronic information portal: http://xahatlot.sonla.vnptweb.vn

Law library information page: https://thuvienphapluat.vn

Stakeholder workshops provided valuable insights into the most relevant data sources, including local economic and social development reports, provincial websites, and local newspapers. These local data sources are expected to provide rich information on the economic, social, cultural, policy, program, agricultural, and health status of the study area. The research team used local reports to collect data on food environment and nutritional indicators. Relevant reports and data were collected from the People's Committee, the provincial agricultural department, the district and commune agrarian departments, and the farmers' association. This information includes economic status, geography, land use, population demographics, household details, and ethnic composition. In this study, we expanded the assessment of child nutrition to include the eating habits and food consumption of children aged 3-5 years by interviewing representatives of kindergartens.

Stakeholder participation

Three stakeholders' workshops were conducted for the co-design of the tool at the beginning and assessment, shortlisting of solutions and feasibility analysis after the writing up of initial findings and summary.

Co-design of tool

The initial design called for only one stakeholder workshop, but based on the implementation situation, two workshops were held – one with national experts and one with provincial, district and commune stakeholders in the study area. This allowed for better engagement and input from local stakeholders to ensure the research framework and tools were contextually appropriate.

The first stakeholder's workshop
It was held in March 2024 in Ha Noi, to brainstorm with the National Institute of Nutrition (NIN) colleagues and other stakeholders for further refinement of the FoodSENSE framework and tools. The participants were experts from NIN, General Department of Preventive Medicine, Ha noi University of Public Health, Vietnam Academic of Agriculture Sciences. Participants expressed concerns regarding the efficacy of data collection within the limited time allocated for FGDs and KIIs. To enhance data quality, it was recommended to leverage secondary data sources and diversify data collection methods, including market and household surveys. Key insights include:

Time Management: Adjusting FGDs and KIIs to focus on the most relevant topics will improve data collection efficiency.

Willingness to Pay: Incorporating structured questions about consumers' willingness to pay will provide valuable insights into economic barriers.

Value Chain Analysis: Engaging stakeholders across the value chain will identify inefficiencies and opportunities for improvement.

The second stakeholders workshop
It was held in April 2024 in Mai Son, Son La, to get the comments on FoodSENSE tool from the local stakeholders. 19 local delegates were involved in this workshop, including representatives at Province level (Department of Health, CDC Department of Animal Husbandry, Veterinary and Fisheries), Mai Son District level (District Medical Center, Agricultural Department) and commune level (People's Committees, Health Stations and Agriculture of Chieng Chung, Chieng Luong, Muong Bon and Hat Lot). The workshop highlighted significant gaps in data collection across the four communes involved in the project. While there is some available information on marketplaces and the nutritional status of children, comprehensive data on adult nutrition, food consumption, food security, and value chains remains lacking. Only one commune (Hat Lot) has a functioning market, and the existing reports primarily focus on food safety and environmental sanitation. The identification of additional secondary data sources presents an opportunity to enhance the FoodSENSE context analysis and improve understanding of local conditions. Addressing these data deficiencies is crucial for informing effective interventions and supporting sustainable development efforts in the region. The recommendations for enhancing the FGD guideline focused on improving clarity and participant engagement. First, simplify language in questions about food consumption, replacing terms like "consume" with "eat," and use closed questions with clear options. Tailor inquiries about favorite taboo foods to specific target groups and ensure questions regarding food consumption in young children are straightforward. For purchasing and receiving food, frame questions that facilitate easy responses. Clarify family roles in food purchasing, emphasizing the wife's key role, and focus questions on food hygiene and safety perceptions. Finally, revise response categories in Table 12 to reflect varying degrees of food security. By implementing these strategies, the toolkit will promote clearer communication and foster meaningful discussions, ultimately enhancing the quality of data collected for community interventions. In this workshop, participants identified the purchasing points for each commune based on the provided form.

The evaluation workshop

An evaluation workshop was held for the assessment and shortlisting of solutions in October 2024 in Mai Son, Son La to: (i) Debate with expert stakeholders (especially local stakeholders) the key findings of the report and receive stakeholders' views on the traffic light tables which diagnose the situation, and (ii) Debate with expert stakeholders recommended solutions and shortlist the most feasible. Seventeen stakeholders participated in this workshop, including representatives from provincial-level entities such as the Department of Health, the CDC, and the Department of Animal Husbandry, Veterinary, and Fisheries. Additionally, representatives from the Mai Son District level, including the District Medical Center and the Agricultural Department, were present, along with representatives from four surveyed communes: the People's Committees, Health Stations, and Agricultural Departments of Chieng Chung, Chieng Luong, Muong Bon, and Hat Lot. The participants discussed the survey findings related to three major issues in Mai Son: the Food System and Food Environment, Food Consumption Behaviors, and Nutritional Outcomes and Inequities. Concurrently, they completed the traffic light tables and conducted a vote on the challenges identified as critical, marked in yellow and red. As a result, three challenges received the highest number of votes: the Food Value Chain, Nutritional Knowledge, and Food Quality. The workshop culminated in the development of a shortlist of priority interventions aimed at addressing these challenges.

Description of research area

Son La is the largest mountainous province in Northern Vietnam with a total area of 1.4 million hectares and a population of 1.3 million people (General Statistics Office, 2020), located more than 300 km from the center of Hanoi, and is the province with the largest ethnic minority population. In Son La province, ethnic minorities account for 83% of the population and have the highest rates of poverty, malnutrition and gender inequality. Their livelihoods depend heavily on agriculture, especially livestock farming, but are mainly small-scale production. According to the report for the first 6 months of 2030, it is estimated that in Son La's total livestock herd, there are 111,595 buffaloes, 399,060 cows, 687,493 pigs and 7,051,000 thousand cows, respectively (25). Son La is a model locality, with the largest fruit growing area in the North and second largest in the country.

Within Son La province, Mai Son is a mountainous district and is a key economic district located in the economic triangle cluster of Son La City - Mai Son - Muong La. The development orientation of Mai Son district is to build and form 6 high-tech agricultural zones associated with tourism (mango, custard-apple, longan, citrus fruit, coffee and safe vegetable production zones) and focus on forming and developing high-tech large-scale livestock farming zones according to the Project on Developing Large-scale Livestock Farming in Communes in Region III and Particularly Difficult Villages in Son La Province for the period 2022 - 2025, with orientation towards 2030 , issued together with Resolution No. 156/NQ-HDND, dated December 9, 2022 and Plan No. 295/HD-UBND, dated December 13, 2023 on organizing and implementing the development of large-scale livestock farming in Communes in Region III and Particularly Difficult Villages in 2024 and the following years in Son La Province . Mai Sơn district has diverse livestock types, ranging from extensive grazing systems in mountainous areas to intensive systems combining crop and livestock farming in lowland areas, with various socio-economic and reproductive conditions. The livestock types include buffalo, beef cattle, pigs, goats, and poultry, with a total density of 0.36 tropical livestock units (TLU) per person. Livestock feed mainly comes from grass cultivation, natural grazing, corn, cassava, sugarcane tops, rice straw, banana leaves, and natural forests. The poverty rate across the district is as high as 18.5%.

In Mai Son district, among the four communes where data collection was conducted, two communes had previously participated in the Li-Chan project (Chieng Luong and Chieng Chung). The communes of Muong Bon and Hat Lot were included in the project based on the following criteria: 1) diversity in livestock types (three value chains were selected: cattle, pigs, and chickens); 2) local government priorities and support; and 3) potential for scaling up and market growth.

Characterized by the tropical monsoon climate of the Northwest mountains, the average annual temperature is 21°C, with hot, dry months from April to August, often cold from November to March of the following year, and often rainy from May to September. In 2023, due to complicated weather developments, it has significantly affected the lives and production of local people. At the time of the survey (April - May 2024), Mai Son district was affected by the prolonged El Nino phenomenon, with over 6,080 hectares of crops showing signs of wilting, leaf scorching, and fruit dropping, affecting productivity, quality, and economic efficiency. Additionally, forest fires occurred, causing damage to many hectares of forest land in the area. All four surveyed communes in Mai Sơn were experiencing drought which affected livestock and crops.

According to the initial report of the Li-chan project in the study area (2) , there appears to be mild food insecurity in the study area; March, April and May are months of food scarcity with households reporting mild food insecurity. The months of mild food insecurity correspond to the time of relatively harsh drought conditions, affecting the crops and livestock of the local population.

Characteristics of Chieng Luong commune

Chieng Luong is a commune in Region III [4]located in the Southeast of Mai Son District. It has a population of 10,546 with a total number of households of 2,156, divided into 17 different villages/hamlets and including 5 ethnic groups: Thai, Mong, Kinh, Xinh Mun and Kho Mu. The poverty rate is 11.56%. Chieng Luong Commune has 10

4 ***-Commune in region III (particularly difficult commune) in ethnic minority and mountainous areas is a commune that has not been recognized as meeting new rural standards and has 1 of the following 2 criteria: Has a poverty rate of 20% or more; has a poverty rate of 15% to less than 20% and has 1 of the following additional criteria: Has over 60% of poor households being ethnic minority households in the total number of poor households in the commune; There are 20% or more ethnic minorities aged 15 to 60 who cannot read or write in the common language... According to Decision 861/QD-TTg, dated June 4, 2021, approving the list of communes in Region III, Region II, Region I in ethnic minority and mountainous areas for the period 2021 - 2025 and Decision 33/2020/QD-TTg on Criteria for delimiting ethnic minority and mountainous areas according to development level for the period 2021-2025 issued by the Prime Minister.***

villages classified as extremely disadvantaged ethnic minority villages according to the government's decision. Among them, 4 out of 17 are Mong communities, which face more challenging economic conditions.

Chieng Luong has many mountain ranges running in a southeast-northwest direction, creating various alternating terrain forms: the average altitude is about 550-750 meters above sea level, surrounded by high mountains, with the commune center being a plain interspersed with low hills, sloping from Northwest to Southeast. The low slope areas are mainly concentrated in the center of the commune, with valleys and steep hills located in the West and Northwest of the commune. With a terrain featuring many hills and abundant feed resources, the development orientation of the commune is to promote effective and sustainable livestock farming, particularly ruminant livestock, with a focus on grass cultivation and confined feeding, effective implementation of disease prevention and control measures.

Characteristics of Chieng Chung commune

Chieng Chung Commune is a Region II commune [5]of Mai Son District, located 40km from the district center and nearly 20km from Son La City center. It is traversed by Provincial Road 117 for a length of 10.35 km. Due to this feature, the residents in Chieng Chung Commune tend to trade more at the city market rather than at the Hat Lot town market (Mai Son District).

The commune is home to three main ethnic groups: Thai, Mong, and Muong. The entire commune has 1,340 households, with a total population of 6,458 people, including 3,246 males and 3,212 females. The total area of the commune is 77,243.4 hectares, including: 1,374 hectares of agricultural production land, with an average of 1.02 hectares per household; 235 hectares of residential land, with an average of 0.17 hectares per household; 5,222 hectares of forestry land; and 644.4 hectares of other land. The commune has 10 villages, 2 cooperatives, and 4 agencies, units, and schools located within its boundaries.

As of the end of 2023, the average per capita income was estimated to be 21 million VND per person per year. The poverty rate is 7.11%, the near-poverty rate is 6.81%, and the rate of households escaping poverty is 1.29%. Among the poor households, in 2023, the commune People's Committee eliminated temporary houses for 15 households. However, poverty reduction results are not sustainable, with 2 households falling back into poverty during the year; the lives of the ethnic people in the highlands remain difficult.

Characteristics of Muong Bon commune

Muong Bon is a commune in Region I[6] of Mai Son district with an area of 39.46 km². As of 1999, the population was 5,164 people, with a population density of 131 people/km². The commune has 21 villages and is home to three main ethnic groups: Thai, Kinh, and Mong. Muong Bon is located within the district's economic driving force region, approximately 25 km southeast of Son La city and 5 km from the district center.

As a mountainous commune, the terrain is heavily fragmented. However, compared to other areas in the district, Muong Bon's terrain is relatively flatter, making it more favorable for infrastructure development, the construction of socio-economic development projects, production, and crop restructuring. Muong Bon achieved the criteria for a new rural commune (19/19 criteria) in 2018.

[5]***Commune in region II is still a difficult commune) Region II communes in ethnic minority and mountainous areas are the remaining communes after determining region III and region I communes.***

[6] **Communes in Region I, situated in ethnic minority and mountainous areas, are subject to the provisions of Article 2 of this Decision and must meet at least one of the following criteria: a poverty rate of less than 10% or official recognition for meeting new rural development standards.** ***According to According to Decision 861/QD-TTg, dated June 4, 2021, approving the list of communes in Region III, Region II, Region I in ethnic minority and mountainous areas for the period 2021 - 2025 and Decision 33/2020/QD-TTg on Criteria for delimiting ethnic minority and mountainous areas according to development level for the period 2021-2025 issued by the Prime Minister.***

Characteristics of Hat Lot commune

Hat Lot Commune is a commune in Region I, located in the southwest of Mai Son district. It is traversed by National Highway 6 and Road 4G, which facilitates the transportation of goods within the commune. The total natural area is 5,703.69 hectares, with a population of 10,818 people, a population density of 189 people/km², and a total of 2,724 households. The commune is home to five ethnic groups: Kinh, Thai, Muong, Kho Mu, and Mong. The commune has 16 villages and sub-villages (including 12 villages, 2 hamlets, and 2 sub-villages). As of March 20, 2023, the poverty rate in the commune was 95 households, accounting for 3.63% of the total number of households; the near-poverty rate was 115 households, accounting for 4.39% of the total number of households; and the number of households engaged in agriculture and forestry with an average standard of living was 699 households.

Up to now, Hat Lot commune has met 14 out of 19 criteria for an advanced new rural commune, specifically: Planning, Irrigation and Natural Disaster Prevention, Electricity, Education, Rural Trade Infrastructure, Information and Communication, Labor, Multidimensional Poverty, Income, Organization of Production and Rural Economic Development, Residential Housing, Public Administration, Environment, and National Defense and Security. The remaining 5 criteria that have not yet been met are: Transportation, Culture, Health, Legal Access, and Quality of Living Environment.

Figure 3: Map of Mai Son district



Location Summary

Among the four surveyed communes, Chieng Luong commune is the most difficult compared to the other communes. Details are summarized in Table 1 (28–31). However, due to the benefits of the national target programs of the state and the development orientation of the local government, most communes have had economic development in recent years. The irrigation system serving agriculture has been invested in and the transportation infrastructure has been concretized, allowing use in all four seasons. Compared to other areas in the district, Muong Bon commune has a flatter terrain, making it more favorable for infrastructure development, construction of socio-economic development projects, production development and conversion of crop structure.

Table 1: Demographic, Economic, and Social Characteristics of the 4 Communes in Mai Son District

Index	**Chieng Luong**	**Chieng Chung**	**Muong Bon**	**Hat Lot**
Region	Region III	Region II	Region I	Region I
Number of households	2,156	1,340	1,587	2,724
Population	10,546	6,458	5,164	10,818
Poverty rate (%)	11.56	7.11	3.7*	3.63
Nation	Thai, Mong, Kinh, Xinh Mun and Kho Mu	Thai, Mong, Muong	Thai, Kinh, Mong	Kinh, Thai, Muong, Kho Mu, Mong

The information displayed is based on the rreport on socio-economic development - national defense and security in the first quarter of 2024; directions and tasks in the second quarter of 2024 of the four communes.

* The poverty rate for Muong Bon is based on an article from Son La Newspaper. (https://baosonla.org.vn/vi/bai-viet/khoi-sac-muong-bon-28040)

Food systems and food environments

Markets and value chains

Market Access

The survey focused on the main food purchasing points for residents of the four communes in Mai Son district. The purchasing points include locations available within the commune or outside the commune. Among the four communes studied, only Hat Lot commune has a market within its territory (Na Si market). For animal-sourced foods, poultry (chicken, duck, goose) are more commonly self-supplied by residents than four-legged animals such as pigs and large livestock (cattle, buffalo).

In general, the purchasing points meet different needs for consumer food products. Everyday food items are often purchased in the village, at agents, or grocery stores (5-10 minutes on foot) and are usually handled by women. Special foods, such as "insects" or "grilled fish," which are not consumed regularly, are only purchased on special occasions with a frequency of about 1-2 times per month. These are often bought by both men and women (depending on the item) at locations that are farther away (15-20 km, about a 40-minute drive). These locations offer more items, better quality, and more choices (FGD female, Chieng Chung). The main purchasing points typically depend on distance (far or near). In the villages, although the shops/markets are not as abundant and the food is more expensive than at the market, they are "closer, more convenient, purchased more often by others, which makes people feel more secure" (FGD female Chieng Chung).

Chieng Luong Commune:

The main food purchasing points in Chieng Luong commune include retail outlets (grocery stores), stalls, gardens, village markets and markets. However, there is no official market within the commune, there are only small, informal "village markets" set up by residents. To reach a larger market, residents must travel to Co Noi commune (Co Noi market), about 6-7 km away, or to Hat Lot commune (Na Si market), which is about a 15-minute motorbike ride. However, most retail points within the commune are concentrated in the central area, within a 1 km radius of the Health Station. These retail points are mostly home-based shops and are open every day of the week, making shopping convenient. Based on the feedback from delegates at Workshop 2 regarding various retail points in the commune, the commonly sold items include packaged foods, milk, rice, pork, beef, chicken, vegetables, and tofu. Fish is sold less frequently. The sources of these food products are often self-supplied by households, such as "meat, fish, and chicken that residents raise and then sell at the market." Industrial eggs are often sourced from other provinces, and some foods are caught from streams (fish, shrimp) and forests (bamboo shoots, wild vegetables) (KII Chieng Luong).



Some photos of Na Sy market, Hat Lot town, Mai Son district, Son La province

Chieng Chung Commune:

According to statistics from the Chieng Chung Commune Health Station, the main food purchasing points in Chieng Chung Commune are retail stores within the commune (butcher shops, grocery stores), and markets, including Mai Son intersection market and city market, slaughterhouses in the area such as Muong Oanh Slaughterhouse, Hang Thoa Slaughterhouse (Chieng Chung), A Hung Bo Slaughterhouse (Ban May). Compared to the other 3 communes, Chieng Chung Commune has more slaughterhouses in the area, including Minh Thuy Slaughterhouse in Chieng Chung. Based on a survey of several retail points in the commune conducted by the Health Station, most retail points are in the commune center, with distances ranging from 1 to 4 km from the commune People's Committee, especially some located at the entrance to the commune's primary and secondary schools. These are home-based shops that mainly sell pork, vegetables and packaged foods such as sweets, instant noodles, chips and soft drinks.

Muong Bon Commune:

The main food shopping places in Muong Bon commune are local shops in the village, Hat Lot Market, small retailers (grocery stores), Na Si Market and Son La Market (because Muong Bon is closer to Son La city than Hat Lot town).

Hat Lot Commune:

The main food purchasing points for residents of Hat Lot commune are the markets: Hat Lot Market, Na Si Market, Chieng Mung Market, and Ban Rom Market. Chieng Mung Market and Ban Rom Market both sell essential food items, with Ban Rom Market being conveniently located near a school, offering a variety of snacks and making it convenient for families to buy food when picking up their children from school.

Table 2: Characteristics of some food markets in Mai Son district, Son La province

No.	Market	Chieng Luong	Chieng Chung	Muong Bon	Hat Lot	Purchase frequency	Description of food purchasing point	Differences from other places
1	Co Noi Market	x					Sells all kinds of fruits, vegetables, buffalo, pork, and chicken, meat, fish, seafood, forest insects, as well as clothes, shoes,	Cheaper than local shops, more diverse. Sells more diversity of food
2	Na Si Market	x		x	x	1-2 times a week. Every day for people in Hat Lot.	Ethnic specialties of the Northwest insect market (snails, eels, ticks, bugs, bees, frogs, toads) Insects are caught in the forest and sold in stalls or wholesale	Mountain specialties are typically cleaner and fresher. Men often shop based on their preferred foods, such as insects and grilled fish.
3	Mai Son crossroads market		x			1-2 times/week	Morning pig sale from 6:00 AM to 5:00 PM	
4	Son La city market		X	x		1 time /week		More items, better quality, more choices. “More variety of things, it is better in the city”.
5	Hat Lot Market			x	x			More diverse, cheaper, everything available
6	Chieng Mung Market				x		There are essential foods for sale, including tea and bamboo shoots.	
7	Ban Rom Market				x		Lots of sweet soup and snacks.	This is a sub-market of Hat Lot market. The location is ideally situated near a primary school, making it easily accessible and convenient for parents picking up their children.
8	Ban Lam Market (Thuan Chau District)[7]		x			Once a month or every few months	Vegetables, insects, meat, fish....	Cheaper, more items

[7] It is a Son La market of Thai and Mong people from 18 villages of the commune as well as neighboring communes to exchange goods. They come to the market bringing mountain and forest products, such as shiitake mushrooms, straw mushrooms, bamboo shoots. , banana flowers, fruits (like dates), peaches, plums, mangoes, mangoes, bananas, cardamom and wild vegetables... In the market there are agricultural products, knitting, production tools, harvesting and brocade products

Purchase points according to KII food sellers

In general, markets are highly valued for their variety of goods, offering both fresh and cooked foods; however, the limitations lie in hygiene and food safety, which are not as high as desired. Additionally, traveling to the market is less convenient due to the greater distance. On the other hand, grocery stores may not offer as diverse a range of products, but "at the store, it's cleaner (covered and protected better, and more hygienic than at the market). Stores and stalls both have proper documentation, and there are inspections of the origins and quality of the products. Village markets are often rated higher for convenience due to their proximity and the cleanliness of food items, including clean vegetables and occasionally clean meat. Food sourced directly from household gardens in the commune is assured to be "clean" and "delicious." "If you want to eat fish, crab, snail, shrimp, you have to go to the market. The store is closer, and the price difference is only about 5-10 thousand dong, but buying at the store feels safer." And when "you buy at the market, you can't return it, but if you buy at the store and it's not good, we can return it" (KII Muong Bon).

While items like eggs (more expensive at the market compared to the stores, where eggs are sold in larger quantities and at a lower price), chicken and fish tend to be more expensive, vegetables are generally cheaper.

Feedback from vendors suggests that market stalls are more accessible, offering a greater variety of goods, with many shops concentrated in one area. Most vendors focus on fresh foods. a Although eggs are frequently purchased at the market along with meat and vegetables, they are pricier and the majority are bought from grocery stores, where they are available in larger quantities and at lower prices. Overall, access to food sources for sale is within easy walking distance for most households.

Some retail locations in the upper area are considered "better" (Ban Nghiu is considered superior), more extensive, diverse, and attract more visitors. The infrastructure is improved, and the stalls are more organized and tidier. This area offers a full range of goods for the community, including food, iron, and plastic products (KII Chieng Chung).

Markets such as Co Noi Market and Na Si Market offer a wide variety of goods tailored to consumer demand, ranging from food products—including fruits, vegetables, meat, fish, buffalo, pork, chicken, seafood, cooked foods, and insects—to essential items like clothing and shoes. Na Si Market is particularly known for its food products, especially insects. "Individuals who collect insects from the forest often return to sell them at stalls or at Na Si Market, as well as Co Noi Market. Some vendors sell directly, while others engage in wholesale."

At Na Si market there is a lack of fixed business establishments, and the number of vendors fluctuates daily, typically ranging from 70 to 90 per session, with selling hours in the afternoon from 1:30 PM to 7:00 PM. This schedule generally meets the buying and selling needs of the community. Items at the market are considered diverse and less expensive compared to those sold at retail points within the commune.

Product prices

Overall, in the four communes, residents primarily rely on self-sufficiency and for those products residents are less concerned about the price (Male respondent, Chieng Luong commune). For the food items they do purchase, they generally find the prices reasonable. Locally produced items such as vegetables are also affordable and suitable for the residents' budgets.

For most food items, including grains and vegetables there are no periods of food scarcity where prices spike dramatically. There are seasonal price fluctuations, with prices rising when demand increases and supply decreases (during droughts, dry seasons, lean seasons[8], epidemics), and dropping when supplies are plentiful and readily available, "during the harvest season (e.g., sticky rice in August and September)." "Some items from the village are more expensive than regular items," likely due to the rarity of the product. (. Among animal products, fish and eggs are relatively stable in price, likely due to the ability of households to self-supply from their own ponds, rivers, or streams. For more variable products like rice, pork, chicken and, particularly beef, prices fluctuate according to the market, with the most significant price increases occurring around special occasions such as

[8] The lean season is the time between two crops (the transition season), usually occurring on "March 8", which is the time of the third lunar month, after Tet; the rice of the crop has run out, in the fields, the newly planted rice seedlings have not yet taken root, the previous crop has withered but the new crop has not yet arrived, and the fruit trees in the garden are just budding. In 2024, Son La is not on the list of provinces that the state provides rice to relieve hunger during the lean season.

Vietnam's National Day on September 2, Tet (Lunar New Year)[9] Festival celebrated by the Thai people in early spring (February in the lunar calendar, lasting 2-5 days—every 4 years, the festival lasts 2 days, and in the 5th year, it lasts 5 days). Beef is less frequently purchased due to its high price, with residents buying it mostly for special occasions. When the price of beef increases, residents still buy it but in smaller quantities, mainly those with better financial conditions (price increases to about 250,000 VND/kg from 150,000 to 200,000 VND/kg depending on the cut) because they enjoy it and can afford it (Male respondent, Chieng Luong commune). Pork is considered reasonably priced, easy to buy, and affordable for residents, varying on price according to the cut and quality. Pork´s price ranges from 150,000-270,000 VND/kg, with the usual range being 180,000-220,000 VND/kg. "Local pork" (Bản pork) is considered a specialty in highland communes (ethnic minority areas) and is more expensive than other types of pork. Local pork is available in Chieng Luong and Muong Bon communes (more common, more readily available, easier to access). The price of local pork ranges from 140,000-150,000 VND/kg, higher than regular pork (ranging from 90,000-120,000 VND/kg).

The prices of chicken vary significantly, with hybrid chickens costing between 70,000 and 80,000 VND/kg, while local chickens are priced higher, ranging from 130,000 to 140,000 VND/kg. During Tet, prices can reach 120,000 to 140,000 VND/kg, as chicken is a traditional dish for the holiday. Duck and muscovy duck are priced at 80,000 to 100,000 VND/kg, with Thai duck at 100,000 VND/kg and muscovy duck at 80,000 VND/kg. Although duck and muscovy duck are common food items, they are less popular than chicken, which is generally preferred by residents.

The price of fish (around 45,000-50,000 VND/kg) is much cheaper than that of livestock products such as pork and beef, making it more affordable for residents (Male respondent, Chieng Luong commune). Local carp costs is significantly more expensive, costing between 100,000 and 120,000 VND/kg, compared to market carp, which ranges from 40,000 to 50,000 VND/kg).

Eggs are divided into two types, with the usual price being 5,000 VND per free range chicken egg and 3,000 VND per industrial chicken egg. There are slight price fluctuations but nothing significant. Table 3 compiles the prices of different products.

[9] The Xen Ban and Xen Muong festivals are very important cultural and religious activities, preserved by the Thai ethnic community in Son La province for many generations. This spiritual ritual is deeply humane, expressing the desire for a peaceful life and the wish for a bountiful harvest and the growth of livestock. At the end of January and the beginning of February of the lunar calendar every year, when the Ban flowers begin to bloom, the Thai people will organize the Xen Ban and Xen Muong festivals to thank Pu Then, the local gods, Pu Muong and Pu Ban (the first people to build the village) and ancestors... for bringing a prosperous and peaceful life to their descendants and villagers. This festival is usually held at the same time from the district to the commune, the festival usually lasts five days, including the ceremony and the festival. However, the festival is gradually fading away.

RMIT Classification: Trusted

Table 3: Price list of some food items in 4 communes, Mai Son district

	Food item	Where to buy (source of supply)	Average price (VND)	Seasonal fluctuations in price and availability
Staple food	Staple food (1)	Purchases are made directly from households. The village has a Zalo group* that announces products for sale, allowing anyone in need to make a purchase. Information is shared by the village leader via the Zalo platform. Co Noi Market (1)	Rice, sticky rice Rice: 40,000/kg 18,000 – 25,000/kg for common (There are various types of rice, and the prices are different. Some kinds of local rice cost much more than the common.)	Less availability during drought season, and prices also increase. Price fluctuates during Tet at 60k/kg (sticky rice), easy to buy at the market. Harvest season: August, September; end of November => price decreases Price fluctuates about 2-3 prices compared to normal (2,000 – 3,000 VND/1 kg)
	Staple food (2)	Village people; self-sufficient (2)	Rice: 15,000-16,000/kg Paddy: 10,000/kg	
	Staple food (3)	Rice is primarily homegrown. However, if needed it can be purchased from a dealer.	18,000 – 25,000 VND/1 kg	Seasonal fluctuations in prices. During the harvest season in July and August, prices tend to be lower.
	Staple food (4)	Na Si market, Hat Lot market, rice shops (~2-3 shops), Grocery shops in the village (mainly), market	Rice: 17,000-18,000/1kg Average rice 15,000-20,000/kg Corn: 6,300 VND/1kg Corn on the cob: 5,000 VND/1kg Sweet potato: 20,000 VND/kg Potato: 8,000-9,000 VND/kg Spices	In April and May, the prices of rice and corn kernels rise, with corn increasing to around 63,000 VND per kilogram and rice reaching approximately 20,000 VND per kilogram. During the Tet holiday, prices generally do not increase but can fluctuate from year to year. Since the middle of last year, prices have risen, with rice for making wine priced at 13,000 VND per kilogram. Overall, prices have shown an upward trend, with consistent increases and fluctuations.
Beans	Beans (1)	Villages, markets		

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	Food item	Where to buy (source of supply)	Average price (VND)	Seasonal fluctuations in price and availability
	Beans (2)	Shop, sometimes at the market	Soybeans 15,000-20,000 VND/kg Black beans 45,000-50,000 VND/kg Green beans 50,000 VND/kg	No fluctuation
	Beans (3)	Wholesaler, market	25,000-30,000 VND/kg soybeans 50,000-60,000 VND/kg black beans 35,000 VND/kg green beans	Seasonal fluctuations in prices, with items typicallycheaper during the harvest season. This year, prices were higher compared to last year.
	Beans (4)	Rice wholesaler, homegrown, Si market, Hat Lot market, fertilizer wholesaler, in the village	Black beans: 30,000 – 60,000 VND/kg Green beans: 40,000 – 50,000 VND/kg Red beans: 50,000 VND/kg	During hot weather in April and May, the price of black beans is approximately 5,000 VND higher. Prices are lower during the harvest season but tend to rise as the planting season approaches.
Fish			Fish grass carp 100,000-120,000 VND/kg	
	Fish (1)	Village market	Market carp 40,000-50,000 VND/kg	
	Fish (3)	Fish bought at the market		
	Fish (4)	Market (mainly) (1-Female)	Fish: 60,000 VND/kg	
Eggs		Village market		
	Eggs (1)	Grocery (2)	Eggs 3,000 VND/egg	Easy to buy, no fluctuation
	Eggs (2)	Market, shops, neighbors	Free range chicken egg 5,000 VND, industrial eggs 3,000 VND	Eggs fluctuate seasonally (people buy a lot during Tet to make cakes)
	Eggs (3)	Market, shops	5,000 VND for one chicken egg	Eggs fluctuate with the seasons and weather.
	Eggs (4)	Market, shops	5,000 VND/egg	Eggs fluctuate according to market prices.

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	Food item	Where to buy (source of supply)	Average price (VND)	Seasonal fluctuations in price and availability
Pork	Pork (1)	Co Noi Market, in residential area The villages in the highlands of the commune are still poor: Mong village, pigs are bought in the village and market.	Local pork is more expensive than regular pork. Depending on the type of meat, the meat is delicious or not delicious. Delicious local pork 140,000 – 150,000/kg. Normal pork: 90,000-120,000 VND/kg, (normal price is 110,000 VND/kg)	Prices fluctuate significantly, increasing or decreasing based on market conditions. A decrease in pig slaughter leads to higher prices due to reduced supply. Recently, prices have been relatively stable. During the Tet holiday, prices tend to be higher. Conversely, in the summer and fall, prices are at their lowest, making it easier to buy and access these items.
	Pork (2)	The community is partly self-sufficient, with greater reliance on two-legged animals such as chickens, ducks, and geese compared to four-legged animals like pigs and large livestock (cows and buffaloes). While some animals are self-raised, others are purchased from markets, slaughterhouses, and grocery stores. Buffaloes and cows are typically bought at markets and slaughtered within the village.	Pig: 100,000-110,000 VND/kg	Prices fluctuate based on market conditions and seasonal factors, particularly during Tet. Currently, buffalo and cattle are relatively inexpensive, largely due to restrictions on exports to Laos and China since the COVID-19 pandemic. However, prices have remained stable.
	Pork (3)	Buy at grocery stores, markets (2), or on some occasions, share/meet with several families, restaurants, self-produced	Regular pig: 100,000-110,000 VND/kg Local pig: 140,000-150,000 VND/kg 80,000-120,000/kg pig	Depending on swine fever, near Lunar New Year, pork prices fluctuate (more expensive during Tet)

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	Food item	Where to buy (source of supply)	Average price (VND)	Seasonal fluctuations in price and availability
	Pork (4)	Market (mainly), shop, collide and cut, in the village, self-produced	Pork: 120,000 VND/kg Pork 90,000-130,000 VND/kg	Prices are somewhat stable, but certain factors affect them. Low water levels lead people to primarily buy fish at the market. Pork prices fluctuate, becoming significantly more expensive during Tet. For Tet, beef prices increase; while a whole cow may be relatively inexpensive, the price of beef cuts tends to be high.
Beef	Beef (1)	At least one animal is butchered in the village each week, with a specialized butcher serving the community. There is a large slaughterhouse located outside Co Noi, as well as options at the Hot Lot night market, local markets, and neighboring villages.	Beef: 180,000-220,000 VND/kg Beef 150,000 -200,000 VND/kg	There is little change in prices, and scarcity is minimal due to self-sufficiency. However, beef prices rise during periods of increased demand, such as Tet and other festivals, including the Lunar New Year, Thai Xen Ban Festival, and National Day (September 2). During Tet, beef prices range from 230,000 to 240,000 VND per kilogram, but it remains easy to buy and widely available.
	Beef (2)	Partly self-sufficient. Partly bought at the market, slaughterhouse, grocery store... Self-raised and bought at shops, markets. Buffaloes and cows bought at the market, in the village, slaughtered	Buffalo, beef 180,000-200,000 VND/kg	Fluctuating according to market price, season (Tet) Buffalo and beef are cheap (since Covid, they cannot be exported to Laos and China), stable price
	Beef (3)	Buy at grocery stores, markets (2), or on some occasions, share/meet with several families, restaurants, self-produced	180,000-270,000VND/kg beef	There is a slight variation.
	Beef (4)	Market (mainly), shop, collide and cut, in the village, self-produced	Beef: 200,000 VND/kg Beef 200,000-250,000 VND/kg	

RMIT Classification: Trusted

	Food item	Where to buy (source of supply)	Average price (VND)	Seasonal fluctuations in price and availability
Chicken, duck, goose meat	Chicken (1)		Chicken: normal 120,000 VND/kg, Tet 150,000 VND/kg	
	Chicken (2)	Chicken bought in the village, Duck bought in the village,	Chicken 130,000-140,000 VND/kg Duck 80,000-100,000 VND/kg (Thai duck 100,000 VND, Bau duck 80,000 VND)	Chicken fluctuates seasonally (Tet), depending on demand (buying a lot is expensive). Duck and goose prices do not fluctuate.
	Chicken (3)	Market (mainly), shop, butcher, in village, self-produced		
	Chicken (4)	Some families are 100% self-sufficient. Some families buy 50%.	120,000 VND/ 1kg Tet: 120,000-140,000 VND/ 1kg Hybrid chicken 70,000 - 80,000 VND/ 1kg	Varies with market
	Vegetables (1)	Go to the forest to get Market, village	Watermelon 10,000-15,000 VND/kg Plum 8,000-10,000 VND/kg Mango 20,000-25,000 VND/kg (off-season) 2,000-5,000 VND/kg in season	Seasonal Fluctuation, Easy to Buy
	Vegetables (2)	Self-sufficient Cabbage bought at shops, neighbors, in the village	Average vegetables 5,000-10,000 VND/bunch	Because vegetables and fruits are homegrown, there is generally no price fluctuation. Residents often consume seasonal produce. However, there are seasonal price fluctuations: during the harvest season, prices can be as low as 2,000 VND per kilogram, while out of season, prices may rise to 15,000 VND per kilogram.
	Vegetables (3)	Self-sufficient, or barter with neighbors, relatives, Market		Residents eat seasonally, with fruit prices fluctuating based on availability: they are cheaper when in season and more expensive out of season. Vegetable prices also vary depending on factors such as weather conditions and the volume produced, leading to fluctuations in prices when there is an excess supply that remains unsold.

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	Food item	Where to buy (source of supply)	Average price (VND)	Seasonal fluctuations in price and availability
	Vegetables (4)	The community is mainly self-sufficient, producing about 90% of their food. The remaining 10% is obtained through shopping, either from local markets or within the village.	Malabar spinach Vegetables From 5,000 – 7,000/bunch	Malabar spinach is currently scarce due to a lack of water, particularly during the dry season (February-March of the lunar calendar). Prices for vegetables change frequently, often becoming more expensive depending on the type. Off-season fruits are also pricier, while fruits in their main season are cheaper, with prices varying by season (e.g., plums at 5,000 VND per kilogram). Many off-season fruits cannot be sold and end up falling in the garden, where they are used as fertilizer.

(1) for Chieng Luong, (2) for Chieng Chung, (3) for Muong Bon, (4) for Hat Lot

The information presented is based on the results of focus group discussions.

* The Zalo group is a well-known and popular messaging platform in Vietnam, similar to WhatsApp or WeChat.

Exchange rate 1USD = 25,135 VND

Prices according to interviews with vendors

The prices of various meats (pork, beef, chicken) fluctuate throughout the year. Some vendors noted that "sales volumes remain consistent without significant changes; in recent years, sales have been steady without any significant spikes, even during holidays like Tet." In fact, over the past 2-3 years, prices have been stable due to self-sufficiency among residents and an increase in livestock. During Tet, for example, sales are sometimes lower because people organize communal pig or cow slaughters, and when harvests are low, people tend to save more during the summer. During other times of the year, sales are stable and consistent (KII Muong Bon). Price increases for certain food items are attributed to the demand for processing specific products for Tet, such as sausages, dried meat, and Chinese sausages. Beef prices, for example, typically increase slightly to 280,000 VND/kg during Tet and in December when demand is higher for making dried meat. Prices tend to rise in April and May due to post-Tet shortages, and in November-December due to higher year-end demand. Conversely, pork and beef prices in September-October tend to decrease as supply increases (KII Chieng Chung).

Price fluctuations also depend on supply; when fewer pigs are slaughtered, prices tend to rise. According to information collected from vendors (KIIs), pork prices are as follows: pork costs 110,000 VND/kg, pork ribs are 100,000 VND/kg, while during Tet, prices rise to 150,000 VND/kg for high-quality meat and 120,000 VND/kg for ribs. During holidays, supplies are scarce, and people often rush to markets to shop for their families before going home. Over the past 2-3 years, prices have remained relatively stable, with a slight decrease in September-October when pork is priced at around 100,000 VND/kg for good-quality meat and 90,000 VND/kg for ribs. This price decrease is due to increased supply during these months. Some items, such as tofu and potatoes, experience little price fluctuation due to stable production and self-sufficiency. Some vegetables and fruits, such as mangoes, are sold well during the harvest season (June, July, August). Vegetables like cabbage, tomatoes, and carrots see price increases during the dry season due to water shortages and limited planting areas, while prices decrease during the rainy season to about half the price during shortages (5,000-10,000 VND/kg). Certain vegetables, such as carrots (12,000-15,000 VND/kg), experience significant price increases before Tet, reaching up to 25,000 VND/kg due to high demand and limited supply. After Tet, prices drop to as low as 10,000 VND/kg as demand decreases, fewer weddings occur, and there is an abundance of crops. Around holidays (e.g., National Day) and Lunar New Year, residents purchase large quantities of pork and tofu due to festive consumption habits. During other times of the year, prices remain relatively stable and consistent.

Prices according to the results of interviews with farmers

For pork, prices tend to increase at the end of the year from December to February, with price decreases typically occurring mid-year from May to September-October. Chicken prices are generally stable, while goat and beef prices fluctuate in line with the overall food market prices (KII Chieng Chung).

The purchase prices for livestock in Chieng Chung are as follows: Cows (15-20 million VND each), Chickens (100,000-120,000 VND/kg, depending on whether it's a hen or rooster), Pigs (90,000 VND/kg), and Goats (90,000-120,000 VND/kg, depending on whether it's a male or female goat). Trading is not difficult as "transactions are easy because prices are negotiated between both parties" (KII Chieng Chung).

Survey results on the prices of certain livestock products in this study are quite consistent with local research and reports. According to market reports from Mai Sơn district, the selling price of local pigs can reach up to 80,000 VND/kg for pigs weighing over 60 kg, or 75,000 VND/kg for pigs weighing under 30 kg. Further along the value chain, retail prices for local pork can reach 110,000 VND/kg [3]. The seasonality of the pork value chain in the three surveyed villages is concentrated around the end of the year (December) and the Tet holiday (usually in January). In Mon village, residents also consume more pork on National Day. In Oi village, residents consume more pork during the wedding season from September to December [3].

At local markets, beef prices range from 230,000 to 250,000 VND/kg, while internal organs are often sold at much lower prices, usually under 100,000 VND/kg. The seasonality of the large ruminant value chain in the three surveyed villages is also concentrated around the end of the year (December) and the Tet holiday, usually in January. In Oi village, residents also consume more beef during National Day (August) and sell more cattle in September to fund their children's schooling [3]. According to a report from the first half of 2024 on livestock farming across the province, the total number of pigs increased by 1.72% compared to January 2024 (an increase of 11,651 pigs) due to the effective control of African swine fever, allowing for successful disease prevention and recovery of pig populations. The price of live pigs remained stable (estimated at 60,938 VND/kg in May). According to the Department of Agriculture, the poultry population has grown rapidly due to low costs, ease of raising, fast reproduction, and attention to vaccination efforts, resulting in stable markets with no disease outbreaks.

Value chains

Famer households

According to reports on the value chain across the province, for livestock value chains, dairy farming is currently linked with Moc Chau Dairy Cattle Breeding Joint Stock Company; however, there is no closed-loop value chain for beef cattle farming (32). Nevertheless, large-scale livestock farms have been established in the province with links in certain stages of the value chain (Resolution 156).

For both pig and cattle value chains, collective action would be an option that allows small farmers to access lucrative markets and improve their bargaining power when selling animals. Forming a group of producers to increase the number of animals brought to market at one time is a potential intervention to link them directly with a certain number of preferred collectors/traders or slaughterhouses, particularly those in Hat Lot town (32).

For the cattle value chain, supporting producer groups in developing and marketing high-value specialty products (e.g., dried beef) is also seen as an effective intervention to improve the livelihoods of producers and other stakeholders (32).

In our study, producers (farmer households) remain price-takers due to limited market information and low bargaining power, similar to the findings in the 2021 market report for Mai Son district, Son La (32).

Most of the farmer households interviewed raise a variety of livestock in small numbers, primarily for sale, with traders coming directly to purchase from the homes. "Household-scale farming ranges from a few animals to several dozen head of livestock." In Chieng Chung, livestock farming is primarily a household endeavor, with no cooperatives or large farms. The scale of beef cattle farming varies with household economic status: poorer households typically raise 1-2 cows for breeding, average households manage 3-9 cows, and those with 10 or more cows are considered relatively well-off. Additionally, different ethnic groups exhibit varying scales of cattle farming, with the Thai people tending to raise more beef cattle compared to the Mong people (33).

Livestock farm

According to statistics from the People's Committee of Mai Son district, there are currently 7 concentrated pig farms in the district, located in the communes of Co Noi, Chieng Mung, Chieng Chung, Hat Lot, and Muong Bon. There are no livestock farms in Chieng Luong commune. The challenges of forming closed-loop value chains include high transportation costs between communes with large distances, vast district and commune areas compared to lowland provinces, resulting in long transport kilometers and more difficult roads. Distribution is fragmented; although food distribution reaches each commune and village, consumers bear higher costs while having low incomes.

Slaughterhouses and food processing facilities

In Chieng Luong commune, there are no food processing facilities. Agricultural products in the locality from cultivation (crops, vegetables, fruits, etc.) and livestock such as fish, chickens, and eggs are usually exchanged, sold at village markets, or taken to markets outside the commune for sale or sold to collecting traders. Most livestock products like pigs, cows, and buffaloes are typically purchased by traders, who may then slaughter the animals or sell them to slaughterhouses outside of Co Noi market. Meat products are then resold to local vendors or shops or taken to other markets. Traders typically slaughter one pig or cow every 3 to 5 days. Thus, the pig and large livestock value chains (buffaloes, cows, etc.) generally include the stages of (1) production, (2) collection, (3) slaughter, (4) processing, and (5) retail, although one actor may handle multiple stages within the same chain. Currently, there are no companies linked to livestock farming in the area.

There are no centralized animal slaughter facilities in the province, with 372 small-scale livestock and poultry slaughtering establishments currently operating in the area. The Agricultural Services Centers of districts and cities, as well as the Agricultural Technical Center of Moc Chau, are responsible for controlling animal slaughter.

Livestock chains

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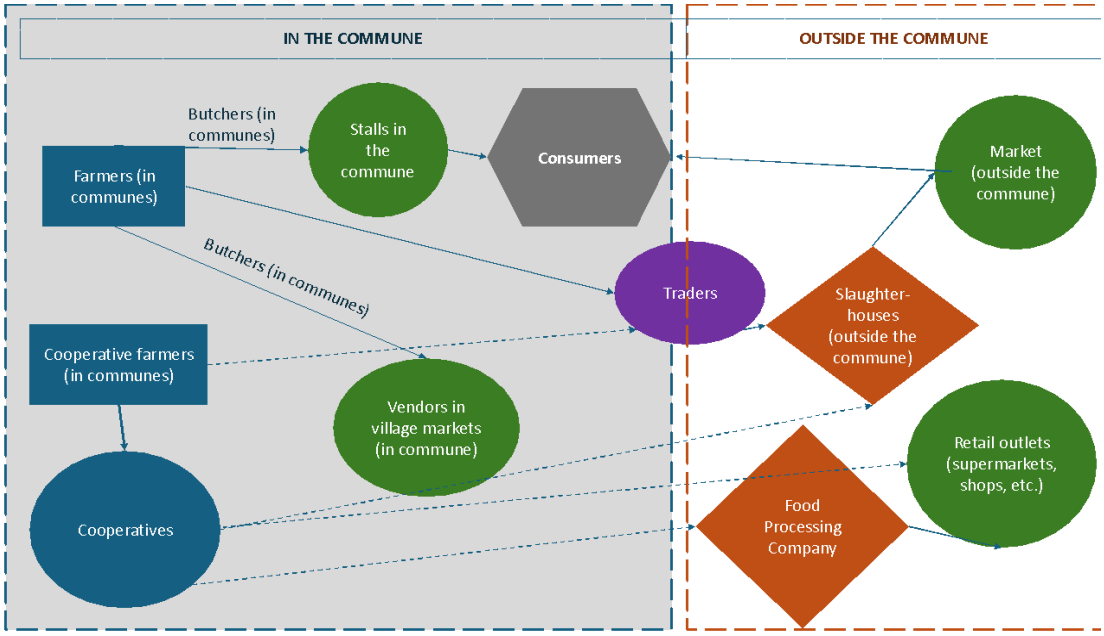
Figure 4: Livestock chain in Chieng Luong commune



In the value chain, the role of agricultural cooperatives has begun to be enhanced due to the direction of the commune's People's Committee in developing cooperatives in the area. Specifically, there are currently 2 limited liability companies and 13 agricultural cooperatives in the commune, with documents for establishing 2 additional cooperatives in Phu Luong and Chi hamlets being completed. According to the 2024 plan, another cooperative will be developed in Keo Lom Hamlet. However, livestock value chain cooperatives appear to be less effective and face more difficulties compared to agricultural product value chain cooperatives. The livestock value chain is also characterized by small-scale production and weak links between stakeholders.

The main reason for the ineffective operation is the lack of output markets, weak and unstable product sales prices. According to an agricultural officer (KII), certain cooperatives have established clear regulations governing processes from production to purchasing. However, the effectiveness of these cooperatives has been hampered by the low level of awareness among farmer households and their inability to implement appropriate techniques. This has resulted in diminished quality, reduced yield, and lower market prices. Due to products' failure to meet technical standards, the contracting unit refrains from making purchases, which complicates the search for viable market outlets. Additionally, some cooperative members, swayed by external traders offering higher prices, opt to sell their products to these traders. This practice undermines the cooperative's development and sustainability.

On the other hand, food production companies that guarantee output products only sign contracts with cooperatives and do not contract with individuals (e.g., Dong Dao Company (Doveco Son La branch)). Output standards have been instructed in training sessions and must be met, but due to the lack of people's awareness and incorrect application of techniques, the products are inconsistent.

Distribution and transportation of food face many difficulties, especially in highland villages of the Mong people due to impassable roads.

Box 1: Statistics of the chain of links in the whole Son La province

Statistics on the chain linkage in the whole Son La province (25)

Livestock farming through value chain links between enterprises, cooperatives, and households has achieved high economic efficiency and continues to be expanded and developed. This includes maintaining 4 pork value chains with a scale of 35,000 pigs and an annual output of 4,350 tons; 2 safe chicken meat value chains with a scale of 32,500 chickens and an annual output of 35 tons; and 7 safe honey value chains with 6,854 bee colonies producing 438 tons per year.

Livestock farming through production and product consumption value chains includes 11 chains (8 pork chains and 3 poultry chains under contract with C.P. Vietnam Corporation[10]).

Agroecological potential and agricultural production

Production and livestock

According to the soil map of Son La province, Mai Son district´s land consist of several soil types, some of which are highly suitable for growing rice, vegetables, and fruit trees. These include: 1) Feralitic Red Humus Soil on Metamorphic Rocks, predominantly found in hilly and mountainous areas; this red-yellow soil is suitable for forestry, fruit trees, and perennial industrial crops. This soil type accounts for the largest proportion of the total land area, with 43.50%. 2) Alluvial Soil along Streams is distributed mainly along streams such as Nam Pan, Nam Scan, and Nam Le this soil is very suitable for rice, vegetables, and fruit trees. It covers an area of about 2,541 hectares, accounting for 1.80% of the total land area. 3) Slope Soil is concentrated mainly in flat regions; this soil type is suitable for fruit trees and industrial crops. It covers an area of about 9,526 hectares, accounting for 6.67% of the total land area. Since most of the land is on slopes with low vegetation cover, attention needs to be paid to soil conservation measures to limit erosion and nutrient loss. Regarding the general climate, 2024 has been drier than previous years, affecting agricultural production. The period between March, April, and May is the driest of the year.

Crop production

The agricultural economy of the district continues to shift in a positive direction, gradually adapting to climate change and market demand while maintaining and developing some concentrated production areas for district-specific products (such as coffee, mango, longan, and custard apple). The area applying high-tech farming methods has expanded, laying the groundwork for increased crop yields and quality as the agricultural sector is restructured. Steps have been taken to transition from low-yield corn and upland rice fields to more economically effective crops, combined with the application of new scientific and technical advances in production, thereby contributing to increasing production value per unit area and raising income levels for rural residents.

Main crops (according to 2023 statistics) (34)

Annual crops include 82 hectares of winter-spring rice, reaching 100% of the plan; 125 hectares of summer-autumn rice, reaching 100% of the plan; 70 hectares of upland rice, reaching 100% of the plan; 981 hectares of corn, reaching 98.1%; grain production is estimated at 5,900 tons.

Vegetables and beans cover 22.1 hectares; sugarcane covers 1,382.79 hectares, reaching 88.75% of the plan.

Cassava covers 70 hectares, reaching 100% of the plan.

Arrowroot covers 17 hectares; strawberries cover 3.1 hectares; and forage grass for livestock covers 100.92 hectares, reaching 108.5% of the plan.

[10] C.P. Vietnam Corporation. https://www.cp.com.vn/en-US/Default.aspx

Maintenance of perennial crops: 83.9 hectares of coffee, reaching 100% of the plant, and 359 hectares of fruit trees, reaching 117.2% of the plan (with 32 hectares of newly planted custard apples). Fruit production is estimated at 460 tons *(with cumulative production of 120 tons of mangoes, 90 tons of plums, and 150 tons of longan).*

Livestock

According to the livestock production report for Mai Son district, there are 10 communes in the district with large livestock herds exceeding 2,000 head (5 communes in Region III: Chieng Noi commune, Phieng Cam commune, Phieng Pan commune, Chieng Luong commune, Ta Hoc commune and 5 communes in Region I: Co Noi commune, Hat Lot commune, Na Bo commune, Chieng Chan commune, Muong Bang commune) (35). Chieng Luong commune and Hat Lot are among the 10 communes with large livestock herds exceeding 2,000 head. Across Son La province, the average household livestock herd size is 2.49 head per household. Farms are classified as those having 10 or more livestock units.

The total livestock population in Chieng Luong commune is 12,164 heads (1,501 buffaloes; 2,090 cattle; 5,766 pigs; 2,807 goats). The poultry population is 52,484 heads. In Chieng Luong commune, two particularly disadvantaged hamlets, Keo Lom Village and Phieng Noi Village, have received assistance and guidance from the Mai Son District Agricultural Service Center. This assistance includes helping to build livestock pens and providing grass seeds for cattle feed, contributing to initial successes in implementing 12 policies of the district's Standing Committee regarding socio-economic development, national defense, and security for the 2021-2025 period.

Although the commune has annual plans for farming and livestock production, low awareness among residents has resulted in small-scale farming and limited participation in cooperatives. There is a need for region-specific planning to foster development. Often, people tend to mimic what others are growing or raising, leading to fragmented and unsustainable production ("They see others growing something, so they want to grow it too; they see others raising something, so they want to raise it too" - KII).

In Chieng Luong commune

The cultivation of mango, longan, and coffee is well-maintained, spanning the hillsides. Households have replaced corn, cassava, and upland rice with longan, mango, and coffee plants. The District Agricultural Service Center has supported the installation of drip irrigation systems, focusing on intensive wet rice cultivation, coffee planting, and fruit tree farming to increase income. In addition, Chieng Luong commune has invested in constructing a solid irrigation system to ensure water supply for planting. Chieng Luong is a sugarcane area within Mai Son district. Passion fruit is also grown. The residents primarily grow fruit trees and vegetables, with sugarcane being the main crop guaranteed for sale. As a result, livestock farming has decreased. About 80% of food consumption is self-supplied; however, the diversity of food is lacking due to self-sufficiency.

In Chieng Chung commune

Son La's Arabica coffee (in Mai Son district, Yen Chau, and Son La city) is grown on the slopes of low mountains or hillsides at altitudes ranging from 900m to 1,200m above sea level. Arabica coffee is the main crop in Chieng Chung commune, bringing high economic value to the locals. In 2022, Son La province recognized two high-tech coffee cultivation areas in 18 hamlets across three communes: Chieng Ban, Chieng Chung, Chieng Dong in Mai Son district.

In Hat Lot commune

Leveraging favorable climate and soil conditions, Mai Son district has, in recent years, promoted the development of citrus fruit production areas into large-scale concentrated production zones, thereby increasing production value. Orange cultivation is concentrated in communes such as Hat Lot, Chieng Ban, Co Noi, Phieng Cam and Chieng Mung. Custard apple is also a key fruit crop in the area.

The main income for residents comes from selling agricultural products such as longan and mango. Livestock farming is primarily for personal consumption, but livestock numbers are small, and pigs often suffer from diseases. This year, the longan and mango crops were damaged due to several months without rain. If the longan and mango crops fail, residents rely on pigs and chickens. If only a few chicken eggs are available, they are kept for the family; if there are more, they are sold. Some households raise many chickens and keep the eggs to hatch into chickens to sell. ("Most sales are to traders" - Male FGD).

"Spontaneous cultivation, selling to traders, growing mangoes, longan, and coffee on the hills. This year, there aren't many mangoes, the weather is harsh (no rain, dry fields); it has not rained for many months," (Female FGD, Hat Lot commune).

Sugarcane farmers provide raw materials for the sugar factory, with an average yield of 7 tons/ha. The spring rice area has been sown and planted in time by the people of Na Sy village. The total fruit tree area in the commune is 1,827 ha, *(including: Mango: 925 ha; Longan: 608 ha; Grapefruit: 158 ha and 136 ha of other fruit trees).*

Due to the complicated and erratic weather, it is a favorable condition for livestock diseases to arise and spread easily. The total herd of livestock and poultry in the area is currently 101,460 (*Including 309 buffaloes, reaching 92% of the plan; 2,010 cows, reaching 106% of the plan; 10,190 pigs, reaching 68% of the plan; 3,635 goats, reaching 59.4% of the plan; 85,316 poultry, reaching 84.4% of the plan);* bee colonies: 690.

In Muong Bon commune

In Muong Bon, the commune committee has established enterprises, cooperatives, and concentrated agricultural production areas focused on key crops such as longan, mango, and safe vegetables. Concurrently, efforts are being made to attract investment from enterprises, form production linkage chains, and enhance productivity and product quality. The Muong Bon commune committee maintains a stable population of nearly 6,000 cattle and 20,300 poultry. Plans are underway to develop four livestock models: raising beef cattle in Lam Cut and Xa Can villages, pigs in Ta Xa and Tien Xa villages, goats in Mai Quynh village, and Lac Thuy chickens in Xa Can village.

"In Muong Bon commune, residents mainly grow rice because the commune has the Tien Phong Lake, which provides water[11]. The Thai people here mainly eat sticky rice, while the Mong people primarily eat regular rice. Mong men (except for those from the Mua and Giang families) traditionally abstain from eating heart due to a custom. There was once a young man who didn't believe in this tradition and ate the heart, but he couldn't swallow it and had to perform a ritual. Corn is the main crop, and it is entirely purchased by traders to produce animal feed or sold abroad. This area does not have a pig slaughterhouse, so pigs must be taken to the Hat Lot night market" (Male FGD, Muong Bon).

Muong Bon commune is generally divided into two areas, upper and lower, based on terrain, with significant differences in the ethnic groups living there, production activities, and resulting socio-economic conditions. This leads to differences in food consumption habits and marketing practices. There is no slaughterhouse in Muong Bon commune. In the upper area, which includes villages such as Bon, Me, Mo Cha, Thong Nhat, Mai Tien, and Un, key crops include wet rice and various gardening products, such as fruit trees and green beans, supported by irrigation from Tien Phong Lake. This region is predominantly inhabited by the Thai ethnic group, who primarily consume sticky rice. In contrast, the lower area, known as Pine Forest, focuses on crops like corn, sugarcane, cassava, and fruit trees. It is mainly inhabited by the Mong people, with some Kinh and Thai residents. The Mong community primarily consumes regular rice and mèn mén, a traditional dish made of steamed corn powder. Corn is the main crop in this area, with local traders purchasing it directly from households for livestock feed production and export. The corn planting season occurs in April and May, with harvesting taking place from September to December.

Box 2: Some major agricultural and livestock production and processing facilities in Mai Son province

Son La Sugarcane Factory (Hat Lot town, Mai Son district).
Doveco Factory (Muong Chanh commune).
Aratay Cooperative (coffee, in Chieng Chung commune).
Doveco Son La Vegetable and Fruit Processing Center
Amo Green Agricultural Cooperative (Muong Bon commune)

[11] Tien Phong irrigation lake (formerly known as Ban Mon irrigation lake) is located in Hat Lot commune (Mai Son) with a water surface area of over 70 hectares, ensuring irrigation water for production and daily life for households in Muong Bon and Hat Lot communes. https://baosonla.org.vn/vi/bai-viet/xung-quanh-viec-lan-chiem-ho-thuy-loi-tien-phong-ky-i-ky-uc-cua-nhung-nguoi-ngan-dong-dap-dap-40064

Minh Thuy Chieng Chung Animal Husbandry BHL Son La Agricultural Products Processing Joint Stock Company (Muong Bang Commune)

For households that typically raise chickens, ducks, geese, cattle, and pigs, they also grow elephant grass, corn, sweet potatoes, cassava, plums, rice, and sugarcane, but only enough for personal consumption. In small-scale livestock farming, farmers usually say, "If we can't eat it all, we sell it, or we sell when we need money." However, cattle and buffalo are "no longer sold as frequently as before." Pigs are sold only when they are big enough, usually at 70-75 kg live weight, selling for 75,000 VND/kg; smaller pigs sell for 100,000 VND/kg. Chickens, ducks, and geese are typically sold to residents, with chicken prices averaging 110,000 – 120,000 VND/kg, and duck/goose prices ranging from 80,000 – 100,000 VND/kg.

Other food sources

Besides purchasing and producing on the farm, several other food sources were mentioned during the FGDs. Some foods are gathered or caught from the wild, such as fish, bamboo shoots, forest vegetables, and insects, which are also important in the daily diet of the local people.

For preschool children, those attending school are provided with two meals a day (one main meal at lunch and one snack in the afternoon). At some remote schools where meals are not provided, parents bring food for their children to class. "At the remote schools where parents bring food, some children might have an egg, some might bring a piece of grilled meat, while others might have nothing. As for vegetables, if any parent has vegetables, they might bring them and ask the teachers to cook soup for the children." (KII Chieng Luong commune).

Social and cultural norms

Culinary culture

Food consumed and Favorite Food

Overall, men and women generally exhibit similar dietary practices, with variations primarily reflecting personal preferences. In certain contexts, specific foods may be prioritized for older individuals, such as minced meat, which is prepared to be softer, or chicken thighs, which are reserved for children (FGD Chieng Luong commune). While both genders consume the same foods, the differences in their choices are predominantly based on individual preferences.

According to the results from the women's group discussions, certain foods are especially preferred or trusted by different groups. Different consumer groups were identified that were characterized by consumption of certain foods.

Children from 2 to 5 years old: They often eat porridge, milk, fruit, snacks, eggs, pork, chicken, and fish because these foods provide adequate nutrition, are easy to eat, and milk is especially rich in nutrients. Fried chicken, fruits and snacks, are well accepted due children's taste, since they are incredibly "Easy to eat, delicious, cool, and attractive"

Children from 6 to 10 years old: They often eat porridge, sticky rice, milk, chicken, pork, beef, fish, chicken thighs, eggs/fried eggs, sausages, beans in tomato sauce, candy, vegetables, fruits, candy, chips, zero-degree green tea, soft drinks, orange juice, milk tea. The noteworthy point is that " Mong people prioritize lean meat, delicious for children." T

Adolescents (11 to 17 years old): For adolescents (11 to 17 years old), most children eat like adults; foods consumed are sticky rice, instant noodles, spicy noodles, milk tea, carbonated drinks, sausages, vegetables, fruits, chicken, fish, and pork. In addition, dried meat floss, pate bread, sour foods, and snacks are also frequently consumed. Some typical foods commonly consumed in this age group are instant noodles, spicy noodles, and milk tea. This result is similar to many studies on food consumption among adolescents. The tendency to consume

these foods is due to "being easily influenced by friends, following trends," movements, and hot trends on the internet (FGD of female commune Hat Lot). One thing that is easy to see is that sweets are women's favorite food.

Pregnant and lactating women: Along with children, pregnant women and nursing mothers are also subjects of greater concern and priority. Foods typically consumed by pregnant women are nutritious food products such as maternity milk, animal-source foods such as chicken, meat, carp, and eggs, tubers and vegetables; some foods mentioned, such as carp, papaya, and spinach, are good for pregnant women, according to local beliefs. Coconut water and sugarcane juice are drinks frequently consumed by pregnant women. The foods that are prioritized for use after giving birth are nutritious foods that stimulate milk production (honeydew, green papaya, spinach, carrots, chayote, stewed green jackfruit, boiled jackfruit leaves, stewed chicken, fish, eggs). In particular, some foods that help wounds heal quickly and enrich the blood (like turmeric-fried pork) are favored and consumed. The food that is trusted is the food that meets the standards of being good for health and suitable for the child: "Have milk for the child, many nutrients for the child." For men, the preferred food is "beer and wine" because they believe that drinking alcohol is for "relaxation, entertainment, for work." (FGD Chieng Luong commune).

In addition to the usual lactation-boosting dishes like other ethnic groups, such as pig's feet, green papaya, spinach, carrots, and chayote, nutritious dishes (stewed/cooked chicken, eggs), Mong postpartum women will eat rice instead of sticky rice and drink boiled jackfruit leaves, chicken (stewed, cooked), fish, eggs. For the Mong people, it is customary to consume only eggs with a generous amount of pepper after giving birth, avoiding any other spices. This practice is believed to help increase milk production.

Elderly people: Specific dietary preferences are noted within this age group. For elderly men, milk is a typical choice, while women often prefer FAMI milk (soy milk). From the perspective of women FGD, medicinal wine is identified as a common food for elderly men. Dietary choices are influenced by family circumstances and health considerations, rather than by gender.

Forbidden foods The FGDs revealed that most types of food are deemed permissible for all individuals, and strict taboos are largely considered outdated, having minimal impact on the local population. While insects are viewed as a specialty sold in various local markets, they are regarded as taboo for children and men due to potential allergy risks. Additionally, individuals who travel long distances for work are advised against consuming dog or duck meat.

The specific taboo foods of the Thai and Mong communities in Chieng Luong commune remain largely unexplained. Notably, residents across all communes acknowledge the detrimental effects of alcohol on health and daily life. Within the male group, there are no specific food taboos; however, dietary restrictions may be observed in cases such as hypertension, where the consumption of salty foods is discouraged.

Other dietary considerations mentioned in the discussions included avoiding chicken during episodes of tooth pain, as buffalo and beef are often associated with exacerbating such conditions. Certain types of dog and white buffalo meat are also discouraged due to their high protein content. Individuals with cuts or wounds are advised against consuming sour bamboo shoots, as they are believed to cause pus and hair loss.

Children: forbidden foods are spicy foods, blood pudding, alcohol, insects, and carbonated drinks to prevent affecting health. Regarding some foods, people believe that beef is tough, and fish has bones that can easily cause choking, so they are forbidden for children. Children under two years old are also advised against consuming salty foods and should have limited intake of MSG.

Pregnant women: They are advised to avoid certain foods, including alcohol, carbonated soft drinks, and spicy dishes. It is recommended that they refrain from consuming spinach, bitter melon, pickled eggplant, bananas, pineapple, pennywort, purslane, and water mimosa due to concerns regarding the potential risk of miscarriage. Additionally, pregnant women should avoid longan and lychee, which are considered "hot" foods, as well as raw foods due to the risk of parasites, green tea due to its stimulant properties. Longan and lychee are particularly cautioned against because they are classified as "hot" fruits. There is also a prevailing belief that the consumption of raw foods may lead to worm infestations, and the intake of green tea, alcohol, and other stimulants is discouraged. Traditional beliefs suggest that eating bamboo shoots may lead to reduced amniotic fluid levels, adversely affecting the pregnancy. Malabar spinach, papaya, alcoholic beverages, and custard apples are also prohibited for pregnant women, according to the FGDs conducted in the Hat Lot commune. Local beliefs indicate that Malabar spinach and pineapple may increase the risk of miscarriage, and custard apple is thought to contribute to premature birth.

Lactating women: The local people believe that eating sour bamboo soup, sour fruits, bitter vegetables, and alcohol is not suitable for their health. Furthermore, beef is considered an unsuitable food for women after childbirth due to

its association with scarring and delayed wound healing. According to the male participants in FGDs in Chieng Chung, grass carp, carp, and beef are regarded as taboo foods for postpartum mothers. Alcohol, spicy and sour foods, dog meat, raw foods, buffalo, and beef are also deemed inappropriate for consumption during the month following childbirth, particularly beef, which is strongly advised against. Additionally, there are concerns that alcohol may negatively impact the infant, affect the mother's digestive health, and influence milk production, as these substances can be transmitted through breast milk, thereby affecting the baby.

Gender: No differences in animal consumption were observed between genders. However, food taboos are primarily focused on pregnant women and nursing mothers. For men, certain foods, such as water spinach, are avoided due to concerns about scarring. Additionally, alcohol, raw foods, and spicy or sour dishes should be limited.

The list of forbidden foods for women is shorter compared to other groups, primarily including alcohol, cigarettes, and tobacco, as these are considered harmful to women. For the elderly, both men and women share similarities in their lists of forbidden foods. Typically, these are dietary restrictions related to specific diseases, as certain foods are deemed unsuitable for managing those conditions. There is no specific food that is universally forbidden.

Ethnic groups and food cultures

Some taboo foods vary according to ethnicity. However, the strictness of these concepts regarding taboo foods has diminished over time. FGDs in Hat Lot Commune revealed that many believe "taboo foods are dietary restrictions related to specific diseases, as they are not beneficial for those conditions." Additionally, opium is considered a food that should be avoided among the Mong people, as noted in FGDs in Muong Bon Commune. A progressive viewpoint regarding food safety has emerged, emphasizing the importance of avoiding raw foods, salads, and "lạp" despite its status as a traditional dish), especially for vulnerable groups such as children, pregnant women, and nursing mothers.

The Thai people in the research area consume traditional foods characteristic of their culture, including sticky rice, grilled dishes, and dipping sauces made with chili, garlic, and lemon leaves, which are considered essential. For the Black Thai community, their typical diet includes sticky rice, dipping sauces, soybeans used for making soy sauce, fish salad, dried fish, sour fish, dried meat, fish sauce, "lạp," "pịa," bamboo rice, "phỉnh tộp" fish, "mo" fish, insects, and various wild vegetables. Some traditional Thai dishes, such as "Lap" (raw beef salad) and "Goi" (a kind of Thai fish salad made with fresh fish and banana blossom of are also considered foods to be avoided. These dishes are rarely consumed and must have a clear origin before being deemed safe to eat. (1-Male FGD of Hat Lot Commune). Eating sticky rice is both a long-standing tradition and a practical choice, as it is more filling than other foods. Common dishes in this diet include grilled foods, " chẩm chéo " (a dipping sauce made of salt, grilled chili, garlic, MSG, and essential mắc khén, is a key accompaniment in Sơn La Thái cuisine), and "tho o" (rotten sauce) for raw vegetables. Other popular items are fish salad, "lap" (This Northwest soup combines slow-cooked internal organs, cartilage, meat, and spices like mắc khén and fresh chili), grilled minced meat, grilled fish, grilled chicken, and dried meat (meat hung in the kitchen). Additionally, they enjoy "canh bon," fermented buffalo or cow skin (fermented for 3-4 days to develop a distinct smell), fresh skin wrapped in leaves, and "pịa."

For the Mong people, meals may include rice with water (a custom that ensures there is always food available), "mèn mén" (a type of corn porridge), and squash soup without spices for cooling effects. Fried or grilled sticky rice cakes are also common. For the Mong people, taboos can be linked to family names; for example, members of the Giang family are advised to avoid eating heart, while the Mua family has no specific taboos.

The Khmu people share a similar diet to the Thai, primarily consisting of sticky rice.





Bamboo shoots and grilled fish specialties of people in Mai Son district, Son La

The dietary practices in Mai Son District reflect a rich tapestry of cultural traditions, nutritional needs, and evolving social influences. While there is a strong emphasis on nutritious foods for children and pregnant women, traditional beliefs significantly impact food choices, leading to favored and forbidden foods across different age groups. Understanding these practices can inform future interventions to improve the region's nutrition and food security.

Sociocultural behavioral norms (expectations) and attitudes

Most decisions related to the selection and preparation of food within a family, as well as the slaughtering of small livestock, such as poultry (chickens, ducks, geese—referred to as "two-legged animals") and eggs, are made by the women in the family (typically the wife, mother, or grandmother). For larger livestock ("four-legged animals"), the decision to slaughter them generally falls to the head of the family, which is usually the man (husband or father), although these decisions are discussed and agreed upon with the women in the family.

The women in the family are primarily responsible for purchasing and preparing food. As noted in the discussions: "Whoever does the cooking decides what to buy (usually the mothers and daughters-in-law)" (Male FGD, Chieng Luong). Additionally, the eating habits and preferences within a family influence how food is prepared and cooked: "If it's not to their taste, they won't eat it" (Female FGD Hat Lot). Decisions regarding which foods to consume within a family typically prioritize the elderly and children, as they are considered the most important groups in terms of food consumption. In terms of slaughtering and harvesting times, the man of the house usually plays a decisive role: "The head of the family makes the big decisions, but there is consultation with other family members" (FGD with men, Hat Lot). This pattern was consistent across all the surveyed communes. Additionally, when it comes to purchasing food, it depends on who is available: "Whoever is available buys the food." And in terms of cooking: "Whoever cooks better, cooks." In our survey, the role of children was not mentioned in the FGDs.

This pattern was consistent across all the surveyed communes.

Water, sanitation, and hygiene

Water supply

The water supply for Mai Son district primarily comes from rivers and streams, including the Da River, which flows through the district for 24 kilometers. Mai Son also has a network of streams within the Da and Ma River basins, such as Nam Pan, Nam Khieng, Nam Po, Ta Voc, Huoi Ham, and others, totaling approximately 250 kilometers in length, along with many smaller streams. Natural water sources for production and daily activities are mainly provided by dams on these rivers and streams, which supply water to crops. The drinking water for the local population is primarily sourced through a gravity-fed water supply system and natural springs ("mó nước"). According to the 2024 plan of the local People's Committees, 90% of poor and near-poor households have access to safe drinking water. However, there was a severe water shortage in April 2024. Currently, efforts are underway in Mai Son district to clear land for the Na San Irrigation System Project, which spans the communes of Hat Lot and Chieng Mung.

Documents detailing the characteristics of the Thai ethnic group also indicate that, for the Thai people, wet rice, especially sticky rice, is the staple food in their lives. The Thai people have a long tradition of wet rice agriculture, which is why they have extensive experience in techniques such as damming, canal digging, and constructing water wheels. The Thai people have developed an intricate irrigation system known as the "mương - phai - lái - lịn," which they use to irrigate their rice fields.

Table 4: Water sources for households in four communes, Mai Son district

	Dug well	Drilled well	Self-Flowing Trough	Rainwater Harvesting Tank	Tap water	Total
Chieng Luong	472	386	1.200	62	0	2.120
Chieng Chung	0	62	1.274	0	0	1336
Muong Bon	159	399	405	462	171	1596
Hat Lot	315	560	220	216	1205	2516

Self-Flowing Trough water are the two most used water sources by people in Chieng Luong and Chieng Chung communes. Meanwhile, rainwater stored in tanks and tap water are the two main water sources in Muong Bon and Hat Lot. This depends on the geographical location, terrain and traffic connections of the communes. Hat Lot and Muong Bon communes are two communes located close to the center of Mai Son district and have more favorable terrain than the other communes. Although there is tap water, people in Muong Bon commune still mainly use other water sources such as rainwater tanks, troughs, self-flowing water and drilled wells.

According to the results of water source inspection in communes, among the water sources for households, drilled wells (100% in Hat Lot and 92.5% in Chieng Luong) and tap water are the water sources with the highest hygiene standards (100% in Hat Lot), followed by dug wells with a hygiene rate of 84.8% in Hat Lot and 75.0% in Chieng Luong. Water sources from Self-Flowing Through streams have a hygiene rate of 84.5% in Chieng Luong.

Chieng Luong commune

The majority of water sources in Chieng Luong commune are natural water, from gutters, and self-flowing; these water sources account for more than half of the total water sources in the area (1,200/2,120). The water source that meets hygiene standards in the commune accounts for 94.5% of the number of water sources tested. The communes and communes above have domestic water sources from water sources through the system of rural clean water works. People in Chieng Luong commune are supported with scattered domestic water (according to the National Target Program for Ethnic Minorities): 30 households are supported with water storage tanks with a value of no more than 3 million VND/household; (Keo Lom 6; Buom Khoang 6; Tham Phang 04; Lung Tra 06; Phu Luong 03; Chi 05 households; The Ethnic Affairs Department is the investor).

Chieng Chung commune

In Chieng Chung commune, the primary water source is self-flowing troughs, which account for 95.4% of usage, while drilled wells represent only 4.6%.

Muong Bon commune

Residents of Muong Bon commune utilize three main water sources: Self-Flowing Troughtroughs (25.4%), rainwater (28.9%), and drilled wells (25.0%). Hat Lot commune

In the four communes, recommended treatment measures for unsanitary household water supply include selecting cleaner water sources, such as dug or drilled wells, and for those using ponds or streams, collecting water as far from the shore as possible. Water purification can be achieved using alum or a clean cloth. For disinfection,

households should use chloramine B tablets, while larger collective supplies can be treated with chloramine B powder. Boiling water is essential for drinking; it should be used immediately after boiling and boiled regularly each day. Additionally, employing water filtration equipment like sedimentation tanks, filter tanks, or filtration machines is advised to enhance water quality.

The water supply in Mai Son District utilizes a mix of natural and groundwater sources, with varying reliance in each commune. Hygiene standards are generally high, but challenges such as water shortages persist. Community programs aim to improve access to clean water, especially for vulnerable households. The emphasis on water treatment and hygiene reflects a proactive approach to ensure safe drinking water for residents.

Toilets

The main types of latrines used by people are (1) Septic tanks, (2) Semi-septic tanks, (3) Two-compartment latrines, (4) Ventilated sunken latrines and some other types. Chieng Chung and Hat Lot are two communes with a relatively high rate of households with hygienic latrines (85.7% and 86.7%) and higher than the other two communes, Chieng Luong and Muong Bon (60.5 % and 61.65%, respectively). In Chieng Luong and Chieng Chung communes, the number of poor households with hygienic latrines is very low, only 11.6% and 2.3%.

Table 5: Toilet indicators in 4 communes, Mai Son district

Indicator		Chieng Luong	Chieng Chung	Muong Bon	Hat Lot
Total households		2.156	1.336	1596	2516
Number of households with toilets		1.949	1.272	1596	100%
Percentage of households with toilets (%)		67%	90%	100%	2182
Number of households with hygienic latrines (HVS)		1.306	1.145	984	2182
Percentage of households with hygienic latrines (Number of households with hygienic latrines/Total number of households) (%)		60,5%	85,7%	61,65 %	86,7 %
Total number of poor households		250	102		
Number of poor households with hygienic latrines (HVS)		09	31		
Percentage of poor households with hygienic latrines (Number of households with hygienic latrines/Total number of households) (%)		11,6%	2,3%		
Number of households with new hygienic latrines built or renovated in the month		0	1	0	19
Septic tank	Total number of toilets	695	775	694	1054
	Number of HVS toilets	695	775	694	1054
	HVS Rate % (Number of households with septic tanks/Total number of households) (%)	32,2%	58,0%	43,48 %	41,89
	Number of households with newly built and renovated hygienic latrines per month	0	1	06	19
	Number of households with hygienic latrines degraded to non-hygienic latrines during the reporting period	0	0	0	0

Indicator		Chieng Luong	Chieng Chung	Muong Bon	Hat Lot
Semi-septic tank	Total number of toilets	523	0	120	535
	Number of HVS toilets	523	0	120	535
	HVS rate (Number of households with flush toilets/Total number of households) (%)	24,2%	0	7,51 %	21,26 %
	Number of households with newly built or renovated hygienic latrines	0	0	0	0
Two compartment toilet	Total number of toilets	57	0	64	377
	Number of HVS toilets	57	0	64	377
	HVS rate (Number of households with two-compartment toilets/Total number of households) (%)	2,6%	0	4,01 %	14,98 %
	Number of households with new hygienic latrines built or renovated during the year	0	0	0	0
Vented toilet	Total number of toilets	31	336	106	216
	Number of HVS toilets	31	336	6,64%	216
	HVS Rate % (Number of households with septic tanks/Total number of households) (%)	1,4%	25,1%	0	8,59
	Number of households with newly built or renovated hygienic latrines	0	0	0	0
Other	Number of toilets	601	127	612	334
	Percentage (of total households) (%)	27,8%	9,5%	38,34 %	13,27

General comments: Households have actively taken steps to construct hygienic latrines. Regarding environmental sanitation efforts, the communes have conducted training sessions to improve the knowledge of specialized staff and organized campaigns to educate residents on the use and maintenance of safe water sources and hygienic household latrines.

Households have actively constructed hygienic latrines, and environmental sanitation initiatives have included training for specialized staff and campaigns to educate residents on maintaining safe water sources and latrines. Various activities promote sanitation across the communes, notably the "Clean House, Beautiful Garden" model by the Central Vietnam Women's Union, which supports the "Join Hands to Sort, Collect, and Treat Household Waste at the Source" campaign, aiming for the "5 No's, 3 Clean's" standards—clean kitchen, clean house, and clean alley [12]. In Chieng Luong Commune, financial support for latrine construction was provided under this initiative, promoting criteria such as no poverty and no malnutrition. In Hat Lot Commune, the waste management campaign reinforces these standards, with the Women's Union collaborating with village management to raise awareness about economic development. This has led to 68 out of 132 households relocating livestock, creating cleaner living spaces.

The initiatives undertaken in Mai Son District reflect a comprehensive approach to improving environmental sanitation and hygiene. The involvement of community organizations, especially women's unions, has been crucial

[12] *In 2021, the campaign "Building a family of 5 no's and 3 clean's" and the content of cultivating Vietnamese family values were included in the content of the National Target Program on new rural construction for the period 2021 - 2025. The model "Family of 5 yes, 3 clean" with the criteria of 5 yes: Having a safe house, having a sustainable livelihood, having health, having knowledge, having a cultural lifestyle and 3 clean: clean house, clean kitchen, clean alley.*

in promoting awareness and facilitating infrastructure improvements. These efforts not only enhance public health but also contribute to the broader goals of rural development and community well-being. Chieng Chung and Hat Lot communes demonstrate higher rates of hygienic latrine usage compared to Chieng Luong and Muong Bon. However, the prevalence of hygienic latrines among poor households remains low across all communes, indicating a need for targeted interventions to improve sanitation standards for vulnerable populations.

Water and sanitation related diseases

Information related to water and sanitation was collected through interviews with key informants and environmental sanitation reports from the communes. Water and sanitation-related diseases are closely linked to food safety issues, such as food contamination due to customs that lead to a shortage of food, reluctance to waste food, inadequate preservation methods, and economic limitations (e.g., lack of refrigeration, living in makeshift shelters without electricity, etc.). Additionally, food poisoning often occurs due to improper preparation and storage (leading to spoilage), the unknown origin of toxic foods (e.g., poisonous mushrooms, toad meat, stink bugs, cicadas), and pesticide contamination. This issue is particularly concerning for poor households in the commune, where the percentage of households with hygienic latrines is very low.

To address food safety issues, the commune authorities have established a Food Safety Steering Committee, which regularly conducts inspections and organizes training sessions to provide knowledge and practical guidance to residents and vendors. The committee also inspects production facilities, retail shops, and food sources to ensure compliance with food safety standards, including checking expiration dates, ensuring that tofu production meets safety standards, and confirming that all stages of the food supply chain are under control. According to feedback, it is crucial not only to focus on certain stages of the supply chain but also to "control the entire process, with the retail stage being the most important because thorough inspection is necessary before selling to the public." Regular inspection and quality control are needed at popular sales points such as markets, grocery stores, and shops. A significant concern in markets and food sales points is that vendors do not always follow regulations, with a "free-for-all" mentality, disregarding safety protocols.

According to reports from the commune health stations, there are currently five main types of food-related businesses in the communes: food production facilities, food retail outlets, food service providers, street food vendors, and collective kitchens. Muong Bon Commune and Chieng Chung Commune are the two out of four communes without food production facilities or street food vendors. Hat Lot Commune has the highest number of food-related businesses compared to the other three communes, with a total of 116 establishments (significantly higher than the other three communes), including 35 food production facilities (including those that both produce and sell food), 61 food retail outlets, 11 food service providers (excluding collective kitchens), 8 street food vendors, and 1 collective kitchen at an educational institution. There is no data available regarding establishments that have obtained food safety certification.

In Chieng Luong Commune, the health station reports 55 food-related establishments, including 48 food retail outlets, 2 food service providers, 3 street food vendors, and 2 collective kitchens at educational institutions. Muong Bon Commune has a total of 47 food-related establishments, including 27 food retail outlets, 17 food service providers (excluding collective kitchens), and 3 collective kitchens at educational institutions. However, only 3 out of 47 establishments have obtained food safety certification, and these are all food service providers. A notable concern is that even the collective kitchens at educational institutions do not yet meet the criteria for food safety certification. Chieng Chung Commune has the fewest food-related establishments (43 establishments), with 35 food retail outlets, 7 food service providers, and 1 collective kitchen at an educational institution.

Table 6: List of food-related business in four communes

No.	Content	*Hat Lot*	*Muong Bon*	*Chieng Chung*	*Chieng Luong*
1	Food production facilities (including facilities that both produce and trade)	35	0	0	0
2	Food business	61	27	35	48

No.	Content	*Hat Lot*	*Muong Bon*	*Chieng Chung*	*Chieng Luong*
3	Food service establishments (excluding collective kitchens)	11	17	7	2
4	Street food business	08	0	0	3
5	Facilities in the communal kitchen (at educational institutions)	01	03	1	2
	Total	116	47	43	55

The street food business is challenging to manage due to the lack of fixed locations. Some establishments still have inadequate sanitary conditions, such as clogged drainage systems and untidy, disorganized preparation areas (Food Safety Report, Hat Lot Commune). The scattered nature of food and beverage establishments across the commune makes it difficult to conduct thorough inspections. Moreover, some businesses do not meet the necessary hygiene standards, and compliance with regulations regarding equipment and facility conditions remains low among certain production and business entities (Food Safety Report, Muong Bon Commune).

Each commune has established a Food Safety Steering Committee responsible for inspecting production and business establishments within the commune. These inspections focus on preventing the circulation of counterfeit, low-quality, and unidentified food products in the market, particularly during the festive seasons when food consumption increases. The committees coordinate with various local agencies to implement food safety measures, which facilitates communication and management efforts. As a result, no food poisoning incidents were reported in any commune during the month. Most businesses are aware of and comply with government regulations regarding food safety, ensuring that products are of known origin and meet quality standards. Additionally, food vendors increasingly recognize the importance of food safety for their customers, and consumer awareness of food safety has improved, with a growing concern about contaminated or unidentified food products (Food Safety Report, Muong Bon Commune).

Community awareness and concern about sanitation issues

Food purchasing decisions are influenced by the community's awareness of food cleanliness and the reputation of vendors. Washing food is a common practice due to concerns about food safety. Information from key informants indicates that while the rate of handwashing before food preparation and consumption is relatively high, the use of soap is still limited, often depending on whether raw food is being handled. For instance, in some highland villages of the Mong community, healthcare workers must educate and provide soap to residents to encourage proper hand hygiene.

The FGDs revealed that residents "100% wash with water" before food preparation and meals. The choice of whether to use soap depends on the type of food being prepared; for example, soap is used when handling raw food (Female FGD, Chieng Luong commune). Participants also noted the importance of cleaning up after cooking (Female FGD, Hat Lot commune).

Food safety is a significant concern for the community. One male participant suggested that the government should "strengthen management across all levels regarding food safety, including better oversight of the origins of food products. Periodic inspections by officials at the communal, district, and provincial levels should be increased, especially for ready-to-eat foods and their expiration dates."

When choosing where to purchase food and selecting types of food, residents are concerned about cleanliness, although there is a general lack of knowledge. For instance, people often pay attention mainly to expiration dates (Male FGD, Chieng Luong commune). There is a strong emphasis on washing and soaking purchased foods in salt water, particularly when bought from markets (Female FGD, Hat Lot commune).

The importance of washing and cleaning food before preparation or consumption is emphasized, mainly due to "fear of food poisoning" (Male FGD, Chieng Luong commune). Female participants in Hat Lot reported that they "remind everyone to wash their hands before every meal."

Clean eating environments are also valued. Dining areas are typically set up in the kitchen or the middle of the house, which is cleaned to ensure a bright and clean space. In homes with stilt houses, meals are often eaten in the kitchen area, which is spacious enough for family members to sit on chairs for small gatherings or on mats when there are more people. According to participants, "over 90% of homes now are stilt houses, which is an improvement over the past (Female FGD, Chieng Luong commune). People pay more attention to food hygiene: cover the food, keep the kitchen airy to guarantee eating and drinking safely; clean the space so that there are no flies or mosquitoes; take out the food and eat it right away; find out which restaurant is clean (Male FGD, Hat Lot commune). The top factor is "fresh meat, clean vegetables (buy vegetables grown by local people, buy from relatives, mostly self-sufficient), avoid food poisoning (Female respondent, Hat Lot). Similarly, practical feedback related to the cleanliness of the dining environment was also given. The ideal of eating in a clean place is often expressed, placing the tray in the kitchen or in the middle of the house for light and brightness. The place where households often eat is the kitchen in the stilt house, because it is spacious, you can sit on chairs when there are few people (only one family) or sit on mats when there are many people. The results from the FGDs also showed that currently "over 90% of the stilt houses are higher than in the past, and pets are not kept under the stilt house, so hygiene is guaranteed compared to before". In fact, most communes do not organize communication activities on food safety in April 2024, and there are no delegations to supervise inspection, examination and post-inspection work (according to the Report of the Commune Health Station on Food Safety and Hygiene Work in April 2024).

Since livestock are no longer kept under the house, hygiene has significantly improved". Most communes do not organize activities related to food safety awareness. For example, in April 2024, there were no monitoring visits or inspections related to food safety (as per reports from the Health Stations of the communes on Food Safety in April 2024). Food safety concerns are shared not only by consumers but also by vendors, who desire "support for a safe and clear supply chain" (KII with a vendor, Hat Lot commune). Additionally, information from key informants suggests that healthcare services for various population groups in the area are insufficient. This is due in part to a lack of understanding among households regarding available healthcare services, low insurance coverage, and a tendency to only seek medical care when illness occurs.

RMIT Classification: Trusted

Table 7: Level of people's concern about food hygiene and safety in 4 communes, Mai Son district

	Content	Choose where to buy food and what type of food is based on cleanliness	Wash/clean food before preparing or consuming	Wash hands before preparing food and eating	Eat in a clean place
Male group	Are people concerned about this? (Yes or no) Why?	Concern about freshness to ensure health at a very high level	Concern is taken to ensure hygiene is at a very high level.	Concern is taken to ensure hygiene is at a very high level.	Concerns regarding food safety and hygiene include ensuring that kitchens are well-ventilated and airy, maintaining cleanliness to prevent the presence of flies or mosquitoes, and consuming food immediately after it is prepared. Additionally, it is important to assess the cleanliness of restaurants before dining.
Female group	Top factors: fresh meat, clean vegetables (buy from local vegetable growers, buy from relatives, mostly self-sufficient) Avoid food poisoning	Must be washed and soaked in salt (things bought from the market) and cared for daily	Remind everyone to wash their hands before eating every day.	Always clean up after cooking.	

The information presented is based on the results of focus group discussions

Information sources on food and nutrition issues

There is a consensus in FGDs that "word of mouth" and experience are the two most important sources of information for purchasing and preparing food. When it comes to information about food production, nutrition, and food safety, healthcare workers at local health stations are considered reliable sources by the community. Specifically, regarding food safety, district-level authorities conduct inspections, and veterinary officers are viewed as trustworthy sources of information for residents. Other sources of information include social media platforms (such as Facebook and YouTube), radio broadcasts, and especially the village/hamlet Zalo groups. These Zalo groups, managed by village leaders, are particularly useful for residents to exchange food items with each other. Information on food preservation and preparation is still widely shared through "word of mouth." Traditional methods of preserving food, such as smoking meat over the kitchen fire, salting, storing in jars, or bamboo tubes, were common in the past (FGD, Hat Lot). However, nowadays, most people use refrigerators for food preservation.

Governance and support

Information about governance and support was gathered from key informants and documents related to policies implemented in the province, district, and communes, focusing on nutrition and agriculture. These include various categories of governance and policy groups, such as general agricultural policies, child support policies, national target programs, community support activities, and other intervention programs.

Agricultural policies

Resolution 75/2023/NQ-HDND establishes policies to support large-scale livestock farming in Region III communes, particularly in disadvantaged villages, during 2024-2025 in Son La Province. The policy targets organizations with herds of 30 or more animals and individuals or households with at least 10 animals. Support includes 240,000 VND/m² (9.55 USD/ m² at exchange rate 25,135) for purchasing grass seeds, with a cap of 180 million VND (5,968USD) per organization (150,000 m²) and 60 million VND (2,387USD) per household (50,000 m²). Additional funding for materials like rice bran and feed processing mirrors this structure. However, most households engage in small-scale farming, limiting the impact of this support.

Households classified as poor, or near-poor receive food support (such as rice) during the pre-Tet lean period and benefit from social assistance programs including low-interest loans from the Vietnam Bank for Social Policies with a loan amount of 50 million VND per household at an interest rate of 5% to purchase cattle and buffaloes. However, a loan of 50 million VND per year is only sufficient for small-scale livestock farming (1-2 cattle) and is not adequate for cultivating cash crops (such as coffee) due to the relatively high costs of fertilizers and pesticides. Farmers often purchase these inputs on credit and pay off the debt once they receive the loan or support from the bank. Regarding livestock loan policies, in-depth interviews with representatives from the Farmers' Association in Chieng Chung reveal that to qualify for a livestock loan, farmers must have enough land for grass cultivation. However, in the current situation, grassland areas have been reduced because farmers have switched to growing more profitable cash crops like coffee and macadamia. Moreover, beef prices have hit a record low due to decreased demand, partly because exports to the Chinese market have declined (due to higher taxes imposed by China). Traditionally, farmers often let their cattle graze in the forest, so the land they own is minimal and insufficient to qualify for a loan. Despite these efforts, governance and support services remain inadequate for households with fewer than 10 livestock units, highlighting a gap between available support and actual needs.

The local government promotes the planting of commercial grass to enhance large-scale livestock farming, maintaining 33.48 hectares with plans for an additional 4.5 hectares. There are also initiatives to develop eco-tourism and agricultural value chains, including investment in high-tech, organic farming and certification efforts for raw material areas, particularly in Na Cang village. These strategies aim to attract investment and enhance local agricultural productivity and tourism.

Child support administration

The child support administration ensures that all children under 6 years old are provided with health insurance cards and access to healthcare services as per regulations. Monthly allowances is granted to children under 3 years old from poor households in disadvantaged areas, in line with Decree 20/ND-CP, which also entitles individuals aged 75-80 from poor or near-poor households in ethnic minority and mountainous regions to social welfare benefits. Additionally, in Chieng Luong, a Region III commune, the government supports preschool children by providing a daily meal allowance of 17,000 VND, covering two meals—one main meal and one snack. This funding comes from the local government budget, as outlined in Resolution No. 140/2020/NQ-HĐND, which aims to support meal organization for public preschool and boarding school students.

National target programs

Across the four communes, the local government implements three national target programs: (1) The New Rural Development Program, (2) The National Target Program on Sustainable Poverty Reduction, and (3) The National Target Program on Socioeconomic Development in Ethnic Minority and Mountainous Areas. These initiatives aim to reduce multidimensional poverty by addressing employment, healthcare, education, housing, and water supply deficits. The goal is to ensure that poor and near-poor households receive adequate housing support, providing

safe and stable homes that can withstand natural disasters. In 2023, 173 households in Chieng Luong were identified as living in temporary or dilapidated housing, with 8 households—comprising elderly, single parents, and disabled individuals—unable to improve their situations independently. By November 30, 2023, 30 of these temporary houses had been replaced, and a social mobilization campaign by the Vietnam Fatherland Front (VFF) in March 2024 contributed 5 million VND each to three poor households for new housing construction. Despite efforts to eliminate temporary housing, 123 households remain in such conditions, with 19 planning to build new homes in 2024. The VFF also completed and handed over two new solidarity houses in March 2024. Additionally, the National Target Program for Socioeconomic Development in Ethnic Minority and Mountainous Areas aligns with local movements like "Farmers Achieving Excellence in Production and Business" and "Women Helping Each Other Develop Economically," supporting initiatives such as pen-raised cattle. However, challenges persist in the implementation of these programs, including delays in support due to complex procedures, and while the nutritional component of the Sustainable Poverty Reduction program exists, its activities are poorly defined.

Other intervention programs

Li-chăn Project: he Li-chan project is funded by the Consultative Group on International Agricultural Research (CGIAR), the International Livestock Research Institute (ILRI), and the International Center for Tropical Agriculture (CIAT). It operates in Khoa, Xam Ta (Chieng Chung), and the villages of Mon 1, Mon 2, Oi, and Buom Khoang (Chieng Luong). The project will be implemented over two years, from 2020 to 2021, and includes five components: genetics, animal health, feed and forage, livelihoods, and the environment. The project has organized training courses on biosafety, disease management, and animal feed techniques for nearly 450 farmers and village veterinarians. Additionally, it has conducted surveys and assessments of the status of livestock production, the impact of livestock on the environment, and the effects of the COVID-19 pandemic on production activities. Plans have also been implemented to improve grass varieties and animal feed, increase access to grass seeds and planting materials, enhance the use and preservation of feed for buffaloes and cows, and manage livestock waste.".

SAPLING (Chăn -hênh) Project: This project focuses on cattle breeding, providing guidance on preserving cattle breeds and improving human nutrition. It established interest clubs (predecessors to cooperatives) and assisted in finding markets for cattle.

Charitable Support: Charitable organizations have provided essential goods to poor households, including two rounds of support in 2023, with each household receiving approximately 20 kg of rice, fish sauce, salt, instant noodles, and clothes, totaling around 1 million VND per household.

Social Support and Welfare Activities of Local Government

The local government has implemented a policy assigning each Party member to support and monitor a poor or near-poor household. In Mai Sơn District, the District Party Committee's Standing Committee (Task Force 818) has launched the initiative "Enterprises Collaborating with Party Committees and Local Governments to Help Region III Communes Overcome Special Difficulties." In Hat Lot Commune, the "Wealthy Households Helping Poor Households" policy encourages families to maintain at least one green, clean, organic crop or livestock for commercial purposes. The goal is for every village, hamlet, or residential area to have an organic farm or livestock area, and for each commune or town to establish an organic production association, coordinated with a district-wide association for organic product production and use (Task Force 821).

The government has mobilized companies, businesses, fertilizer agencies, and philanthropists to provide livestock (calves, goats, pigs, chickens) and fertilizers to the community. They have also identified economically successful individuals within villages to assist poor and near-poor households with production and farming methods. Additionally, participation in health insurance has been promoted, and support for vulnerable families—such as the disabled, orphans, and elderly individuals living alone—has been facilitated through state budgets, district charitable organizations, and contributions from businesses.

Community support activities

In the local communities, support during funerals, celebrations, and times of scarcity is organized collectively. Each household contributes a portion of rice or a bundle of firewood according to the traditional rules of each village. For weddings, guests give monetary gifts, and community members contribute their labor, so there is no need to hire external services. Men typically take the lead in preparing meals and offering support during traditional funerals.

Compared to other communes, Chieng Luong is the most disadvantaged (classified as a particularly difficult commune in Region III according to government regulations). Therefore, residents across all age groups and demographics benefit significantly from various policies and support programs, including funding, technical assistance, housing, supplies, and gender-based access initiatives. These efforts have led to noticeable progress in various aspects of life, including agriculture and nutrition. However, nutritional interventions are less prominent compared to agricultural initiatives. Additionally, some support policies do not fully align with the needs of the local population.

Summary of the evidence on food systems and food environments

Na Si market is the main food shopping spot for people in the communes of Chieng Luong, Muong Bon, and Hat Lot. People in Chieng Chung and Muong Bon tend to purchase food at Son La market (in the city) more frequently due to its closer proximity to the city compared to other markets. Residents of Hat Lot and Muong Bon communes also purchase food in Hat Lot market. In Hat Lot commune, due to its proximity to the center of Mai Son district and more convenient transportation, the residents' food purchasing points are more diverse. Markets and grocery stores exhibit several key differences. While both locations offer similar quality and pricing, grocery stores are generally cleaner and subject to formal inspections, making them more hygienic; markets are often perceived as "dirtier" due to street sales. Most food sold in markets is raw, and while grocery stores sell items like eggs in larger quantities at higher prices, markets typically offer a wider variety of goods at lower prices, usually 5,000 to 10,000 dong VND less. Markets are also easier to access with more shops available. Although prices may be comparable, grocery stores provide formal documentation and regular quality checks, which enhances their trustworthiness. Additionally, items purchased at markets, such as fish and shellfish, cannot be returned, whereas grocery store products can be returned if they are unsatisfactory. The dynamics between markets and grocery stores in Mai Son District illustrate a complex interplay of variety, hygiene, pricing, and convenience. While markets provide a wider selection of goods, concerns regarding hygiene and accessibility may lead consumers to favor grocery stores for their everyday purchases. This duality highlights the community's desire for fresh and diverse food options, alongside the need for safe and convenient shopping experiences.

For livestock products, the prices of meats (pork, beef, buffalo) fluctuate more than other items, while egg prices remain relatively stable. Although these are locally raised livestock, residents are still more affected by market price fluctuations since most supply comes from purchases (as households primarily raise livestock for sale to increase income). The livestock value chains in Mai Son District show a mix of potential and challenges. While opportunities exist for collective action and specialty product development, transportation costs, market access, and the need for cooperative effectiveness remain significant hurdles. Addressing these challenges could enhance local farmers' livelihoods and improve the livestock sector's overall efficiency. For staple foods, some self-supplied food items are more affected by seasonal fluctuations, as the yield of these agricultural products is heavily dependent on the weather. Vegetables, however, are mostly unaffected by price fluctuations since they are primarily self-supplied.

In the four communes studied, most residents cultivate various food crops and raise various types of livestock, but these activities are mostly spontaneous and not aligned with local planning. While most communes have cooperatives, these generally operate on a small scale and are not the primary buyers in the area. Most agricultural and livestock products are used to meet the needs of household members and are sold to traders, who then sell them to processing and production facilities in Mai Son district. A reliance on traditional practices, limited market access, and significant external challenges, including weather and market fluctuations, mark the livestock and agricultural sectors in Mai Son District. While initiatives exist to enhance productivity and support farmers, the effectiveness of cooperatives and the stability of market prices remain critical areas for improvement. Addressing these challenges is essential for improving the local population's livelihoods and ensuring sustainable agricultural practices.

Residents believe that the best solution to improve production is to stabilize market prices. Traders who come to purchase agricultural products or livestock base their prices on the market and typically pay the farmers after selling the goods. As a result, farmers lack control and cannot negotiate prices with buyers. Production is also heavily affected by weather conditions (drought).

Eating habits and preferences significantly influence food preparation and processing. The elderly and children are prioritized in food consumption decisions, reflecting cultural norms. Men typically take a decisive role during slaughtering and harvesting times, particularly for larger livestock. While men make the final decisions, these discussions often involve women, highlighting a collaborative approach. The roles in food purchasing and preparation are flexible; decisions may shift based on convenience, such as who is available to buy or cook. The findings indicate a clear division of responsibilities in food purchasing and processing among family members, with women predominantly in charge. The collaborative nature of decision-making, especially involving men during key moments like slaughtering, showcases a blend of traditional roles and practical flexibility. This dynamic is consistent across the surveyed communes, reflecting shared cultural values and practices.

WATER AND SANITATION SUMMARY

The water supply in Mai Son District utilizes a mix of natural and groundwater sources, with varying reliance in each commune. Hygiene standards are generally high, but challenges such as water shortages persist. Community programs aim to improve access to clean water, especially for vulnerable households. The emphasis on water treatment and hygiene reflects a proactive approach to ensure safe drinking water for residents. Self-flowing trough water are the two most used water sources by people in Chieng Luong and Chieng Chung communes. Meanwhile, rainwater stored in tanks and tap water are the two main water sources in Muong Bon and Hat Lot. This depends on the geographical location, terrain and traffic connections of the communes. Hat Lot and Muong Bon communes are two communes located close to the center of Mai Son district and have more favorable terrain than the other communes. Although there is tap water, people in Muong Bon commune still mainly use other water sources such as rainwater tanks, troughs, self-flowing water and drilled wells.

The collection of information regarding water and sanitation was conducted through interviews and environmental reports. Water and sanitation-related diseases are linked to food safety issues, including food contamination and inadequate preservation methods, which are exacerbated by economic limitations. Poor households in the commune face significant challenges, with a low percentage of hygienic latrines. To combat food safety concerns, local authorities have established a Food Safety Steering Committee that conducts inspections and provides training to residents and vendors. The committee ensures compliance with safety standards across the food supply chain, emphasizing the importance of thorough inspections, especially at retail points.

Food purchasing decisions in the community are influenced by awareness of food cleanliness and vendor reputation. Focus Group Discussions revealed that all participants wash food with water, using soap primarily for raw items. Food safety is a major concern, with calls for increased government oversight and periodic inspections of food origins, especially for ready-to-eat items. Residents generally prioritize cleanliness and expiration dates when choosing food, with a strong emphasis on washing and soaking foods in salt water, particularly those purchased at markets. The fear of food poisoning drives the community's emphasis on washing and cleaning food. Clean dining environments are valued, with families typically eating in cleaned kitchen areas. The transition to stilt houses has improved hygiene, with over 90% of homes now elevated, and livestock are no longer kept underneath, enhancing sanitary conditions. Chieng Chung and Hat Lot communes demonstrate higher rates of hygienic latrine usage compared to Chieng Luong and Muong Bon. However, the prevalence of hygienic latrines among poor households remains low across all communes, indicating a need for targeted interventions to improve sanitation standards for vulnerable populations. Healthcare workers are needed to educate residents about proper hand hygiene, especially in highland villages

The governance and support initiatives in Son La Province highlight several important findings. Resolution 75/2023/NQ-HDND prioritizes large-scale livestock farming, benefiting larger organizations and households while leaving small-scale farmers with limited assistance, indicating a need for more inclusive policies. The Child Support Administration ensures that all children under 6 receive health insurance and healthcare, along with monthly allowances for vulnerable families, though ongoing funding is essential for the meal support provided to preschoolers. National Target Programs aim to reduce multidimensional poverty but struggle with housing assistance and implementing nutritional components, particularly for those in temporary housing. Projects like Chăn-hênh and SAPLING seek to integrate nutrition and agriculture but face challenges due to funding and participant engagement. Additionally, community initiatives foster collaboration between wealthier and poorer

households, emphasizing the importance of shared responsibility during funerals and celebrations. Overall, while these initiatives demonstrate a commitment to improving conditions for vulnerable populations, significant gaps remain, especially for small-scale farmers and those living in inadequate housing, necessitating a more inclusive and efficient approach for effective poverty reduction and socio-economic development.

Stakeholder workshop evaluation

The FoodSENSE framework and associated results from its pilot as described above were presented to stakeholders for feedback and validation. There was broad agreement regarding the findings. In conclusion, the factors driving poor nutrition and food insecurity are complex and interrelated, encompassing knowledge deficits, economic challenges, cultural practices, environmental issues, and health-related concerns. To tackle these challenges effectively, comprehensive strategies that incorporate education, economic support, cultural sensitivity, and technological advancement are necessary. By addressing the root causes of poor nutrition and food insecurity, communities can work towards achieving better health outcomes, improved food security, and overall well-being for their populations. Collaborative efforts among governments, NGOs, and local communities will be essential to create sustainable solutions that enhance nutrition and food availability for all.

Synthesis of the main bottlenecks in the food system and food environment

Integrating the analysis of the primary and secondary data with the evaluation and verification step of the expert workshops, the following section synthesizes the main bottlenecks in the food system and food environment as shown in Table 8.

Markets & value chains: Market access, along with prices and price fluctuations, is generally not seen as problematic for food and nutrition security in Mai Son. However, cash shortages remain a concern. Additionally, the value chains related to storage, processing, and pasteurization are underdeveloped, which poses risks to food quality and safety, and ultimately to nutrition. The poor development of value chains in Mai Son acts as a significant barrier to generating sustainable livelihoods, which is essential for enhancing food and nutrition security in the region.

Socio-cultural context: While there are no severe hindrances to food and nutrition security in Mai Son, concerns have emerged regarding nutritional knowledge, equitable policies, and the influence of media and advertising. These factors may impact dietary choices and access to nutritious foods, highlighting the need for improved education and policy development to support better health outcomes in the community.

Governance: Governance in Mai Son is particularly strong in food and environmental management, effectively supporting initiatives that promote food security and sustainable practices. While public infrastructure remains notably poor and in need of improvement, governance benefits from state or NGO-subsidized support and aid across various domains. Access to financial services, including credit and savings, is available, along with effective healthcare, social care, health communication, and water, sanitation, and hygiene services.

Agro potential & farm production: Mai Son has significant agro potential, with favorable agricultural and livestock productivity supported by strong governance. However, the region faces challenges from climate and weather-related risks, as well as natural disasters and conflicts, which can negatively impact farm production. Despite these threats, effective governance facilitates resource management and support initiatives, helping to sustain productivity. Addressing environmental challenges will be essential for enhancing and maintaining agricultural output in the area.

Table 8: Summary score card assessing the main bottlenecks to food and nutrition security in Mai Son. Colors indicate the level of hindrance to food and nutrition insecurity, with red indicating the highest level of hindrance, yellow as of middle hindrance, and green as of low or no hindrance. Numbers represent the count of votes for green, yellow and red, and the color of the boxes represents to color with the most votes (the modal average).

Category	**Are the below issues helping or hindering food and nutrition security?**				
	Green = Helping – Yellow = Mild Hindrance – Red = Severe Hindrance				
Markets & value chains	Market access	Prices and price fluctuations	Value chain (storage, processing, pasteurization)	Assurance of food quality	Shortages of cash
score	8/5/4	8/6/3	1/1/11	2/0/8	3/7/6
Socio-cultural context	Nutritional knowledge	Socio-cultural food norms	Equitable policies	Media and advertising influences	
score	5/6/5	9/2/1	5/5/3	4/4/1	
Governance	State or NGO subsidized support / aid	Access to financial services (credit, savings etc.)	Healthcare, social care, health communication	Public infrastructure	Water, sanitation, hygiene
score	9/2/3	14/0/0	6/3/1	5/7/7	8/5/6
Agro potential & farm production	Agricultural and livestock productivity	Climate and weather-related risks	Natural disasters & conflicts		
score	9/6/3	6/3/6	4/1/12		

RMIT Classification: Trusted

Food consumption

This section provides an overview of food consumption patterns in the four communes of Mai Sơn district, highlighting seasonal variations.

Food Groups Consumed at site level

Figures 1 and 2 with data from a household survey carried out during the Li-Chan project in 2020 (Hammond et al 2021) show the food groups consumed during the lean and flush seasons. Starches, leafy and other vegetables, and meat are widely consumed throughout the year. Consumption gaps appear to be for nuts, legumes, fruits and vegetables rich in vitamin A, eggs, and milk. Milk tends to be consumed more in Muong Bon and Hat Lot during the lean season, but the opposite trend occurs during the flush season. There is also evidence of seasonal effects.

Figure 5: Food groups consumed during the lean season

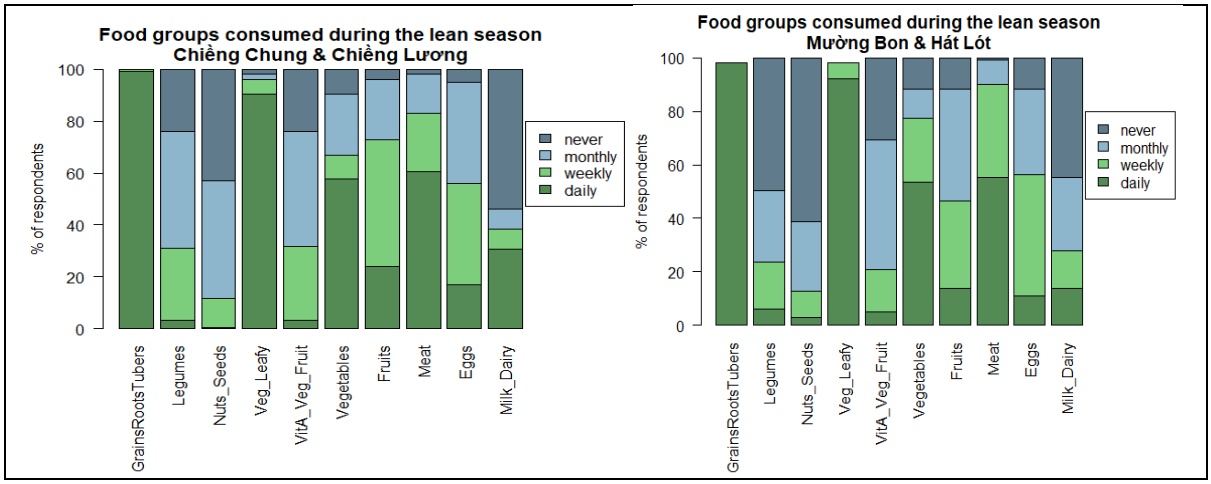
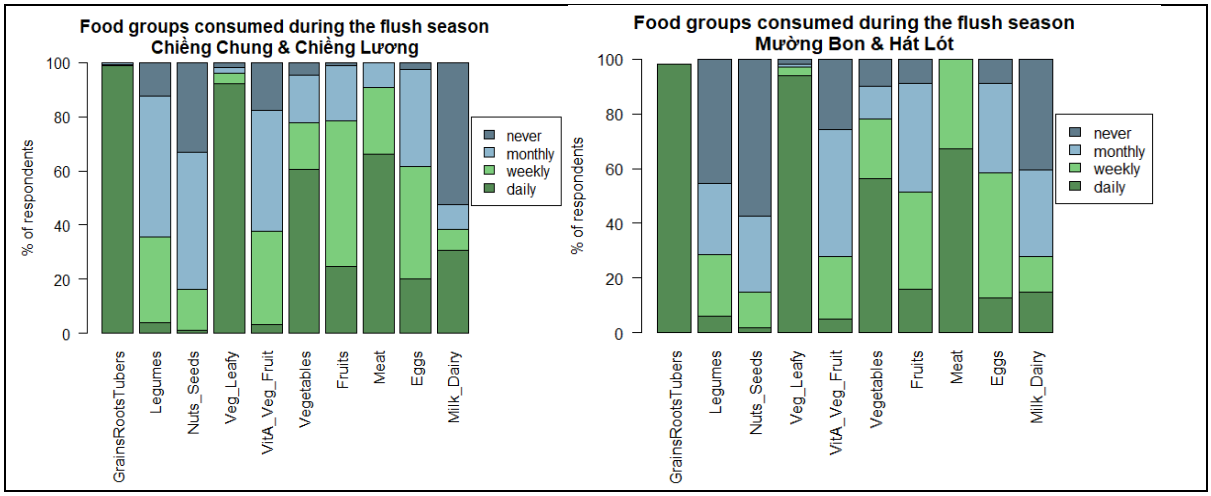


Figure 6: Food groups consumed during the flush season



Specific foods consumed: FGDs

The local population harvests various wild vegetables, insects like cicadas, larvae, bees, stink bugs, grasshoppers, and wild fruits like bitter eggplant and sweet eggplant from the forest. Consumption habits reflect concerns about unclear origins and unhygienic products sold in markets. Most participants prefer ice cream, soy milk, and orange juice. The Black Thai people in Muong Bon commune also consume unique foods, including cicadas, stink bugs, and crickets, which are often dried due to the lack of refrigeration. Black Thai people frequently eat sticky rice, "chẩm chéo" (a dipping sauce), smoked meat, dried fish, fish salad, "lạp" (a dish made from raw meat), grilled fish, and bamboo-tube rice. They prefer sticky rice because of tradition, its filling nature, and its long-established place in their diet (FGD Muong Bon).

The Thai people have a traditional dish called "lạp" (beef salad). They often forage for vegetables in the forest. The people in this area mainly grow sugarcane because there is an assured market, which is the Son La sugar factory. They also grow longan and mango because these two crops do not require much water. This area is known for its fermented soybean dish, which is a traditional family specialty. They also have a dish made from raw fish, peanuts, and raw meat from cattle or goats. In the Mong hamlets, meals mainly consist of rice with water because of the highland's difficulties in farming and livestock, leading to limited self-sufficiency, in addition, this is also a long-standing custom of the Mong people. (FGD Chieng Luong).

Overall, the food lists provided by both male and female groups are quite similar, but a few foods were mentioned by men that were not listed by women, such as "đậu tương thối" (a type of dipping sauce made from fermented soybeans) and various wild vegetables, possibly reflecting different consumption preferences. "Đậu tương thối" is considered a favorite food by the men's group because "it tastes good" (Male FGD Chieng Luong). Common Foods Consumed in Mai Sơn District according to the female FGD are primarily locally produced foods.

The strong flavor of "đậu tương thối" and the raw nature of "lạp" have led to a decline in their consumption compared to the past. These dishes are consumed by residents across the four communes in Mai Sơn district.

Food consumption patterns

The food consumption patterns in the four communes of Mai Son District are characterized by the habits of the Thai and Mong ethnic groups, the two predominant ethnic groups in the study area. Thai people make up the majority, while the Mong people primarily reside in higher-altitude villages, which are economically disadvantaged. The Mong in Muong Bon appear to have better economic conditions compared to the Mong in the other communes, with the Mong villages in Chieng Luong facing the most difficulties within the study area.

In general, people in the four communes consume a relatively diverse range of foods, with most consuming from at least 13 food groups that were surveyed. Within each of these food groups, people consume at least two different types of food. The least consumed food group is nuts, which was only mentioned by the male group in Chieng Chung. Dairy products and dairy-based foods are mainly consumed by local children, including products made from cow's milk like powdered milk, fresh milk, Milo, and Susu milk, as well as soy-based products like Fami soy milk. Animal-sourced foods such as pork, chicken, duck, fish, and goose are regularly consumed, particularly fish (due to the mountainous area with rivers and streams, and the presence of households with fishponds). Grilled fish or fish salad are popular dishes, especially among the Thai people.

Most FGD participants were of the Thai ethnicity, with fewer Mong people. As a result, sticky rice is considered a staple food frequently consumed by both genders across all four communes in the study area. Sticky rice, corn, sweet potatoes, and potatoes are the staples commonly consumed, especially sticky rice, which is present in daily meals according to Thai customs. Due to local conditions promoting the growth of fruit and vegetable in the region, people consume a wide variety of vegetables, including green leafy vegetables, vitamin A-rich vegetables and fruits, and other vegetables and fruits. The vegetables and fruits consumed are usually grown locally and are seasonal. Wild vegetables are also commonly consumed, particularly mentioned by male groups, such as "rau tàu bay" (Okinawan spinach) (used when hungover), "rau ngựa," (Horseradish) "rau bợ," (Marsilea quadrifolia L) etc. Bitter bamboo shoots harvested from the community forest are a specialty of Chieng Chung Commune and a well-known specialty in all four communes, while sweet bamboo shoots are cultivated at home. Oranges are a crop promoted for development in certain communes within Mai Son District, including Hat Lot Commune (due to their availability and accessibility). Typically, they "eat the fruit in season" (female FGD, Chieng Chung).

Insects were mentioned by the male group (Hat Lot Commune). Men tend to consume certain traditional dishes like "fermented soybeans," raw dishes, and insects (such as cicadas, ant eggs [fried crispy], "bọ xít" (Pentatomidae) (fried crispy or soaked in wine) more than women.

It is noteworthy that processed foods like sweet and savory snacks and beverages are also frequently consumed, primarily by children and teenagers (e.g., chips, milk tea, soft drinks), except for certain beverages like beer, alcohol, and energy drinks, which are consumed by men. Soft drinks are popular among teenagers (e.g., Coca-Cola, winter melon tea, passion fruit juice, green tea). Additionally, sugarcane juice was mentioned in the male group discussion in Chieng Chung. Some snacks are not industrially packaged foods but are made by local people, such as shrimp crackers, sweet potato cakes, and fried cakes.

The list of foods mentioned is largely similar between men and women.

Overall, the food consumption patterns of people in the four communes of Mai Son District are diverse, ensuring that there is no food shortage. The foods frequently consumed are those that are favored and readily available in the market.

Table 9: Food consumption patterns in the four communes

Food group		**Commonly consumed by women**	**Commonly consumed by men**
Cereals, roots and tubers	Chieng Luong	Potatoes, cassava, corn, rice	Sticky rice
	Chieng Chung	Sweet potatoes, sticky rice	Sticky rice
	Muong Bon	Sticky rice, rice, cassava, sweet potato	Sticky rice, rice
	Hat Lot	Rice, sticky rice, Corn, Sweet potato	Corn, rice, potatoes (simmered with bones)
Bean	Chieng Luong	Soybeans	Stinky soybeans (70% of the population eat them) because this is an ancient tradition of the Thai people)
	Chieng Chung	Tofu, green beans	
	Muong Bon	Soybeans	
	Hat Lot	Black beans	Black beans (eaten regularly in hot season), soybeans (simmered with bones),
Nuts and seeds	Chieng Luong		
	Chieng Chung		Peanuts (FGD Chieng Chung)
	Muong Bon		
	Hat Lot		
Dairy products	Chieng Luong	Yogurt, Fami milk, soy milk	Powdered milk + fresh milk (80-90% of children use)

Food group		Commonly consumed by women	Commonly consumed by men
	Chieng Chung	Yogurt	Soy milk, powdered milk, Moc Chau milk
	Muong Bon	Fresh milk, yogurt	Fresh milk (Fami, Moc Chau), powdered milk
	Hat Lot	Fresh milk, milo milk or SuSu (depending on children's taste, drink every day)	
Meat, poultry, fish	Chieng Luong	Pork, chicken, duck, fish, goose	Pork, Chicken, Fish
	Chieng Chung	Pork, chicken, fish, goose, duck	Pig
	Muong Bon	Pork, chicken, fish, duck	Children legs
	Hat Lot	Chicken Pork	Pork, beef or chicken/duck fish
Egg	Chieng Luong	Chicken and duck eggs	Chicken and duck eggs (Children eat most)
	Chieng Chung	Duck and chicken eggs	Chicken eggs
	Muong Bon	Chicken eggs	Chicken eggs
	Hat Lot	Chicken eggs (both domestic and industrial chickens)	Chicken and duck eggs
Dark green leafy vegetables	Chieng Luong	Malabar spinach, water spinach, mustard greens, chayote, squash, sweet potato leaves, coriander, lettuce	Watercress (eaten when drunk) Malabar spinach, Chinese cabbage, water spinach, squash, lettuce, wild vegetables, horsetail
	Chieng Chung	Mustard greens, Malabar spinach, amaranthchayote shoots, water spinach, squash shoots	Sweet potato, Chinese cabbage,Malabar spinach, squash
	Muong Bon	Malabar spinach, Chinese cabbage, Chinese broccoli, chayote, water spinach	Pumpkin, cabbage, spinach
	Hat Lot	Mustard greens, Chinese cabbage, water spinach, Malabar spinach, susu shoots	Malabar spinach, water spinach, mustard greens, jute mallow, red amaranth

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Food group		Commonly consumed by women	Commonly consumed by men
Vegetables and fruits rich in vitamin A	Chieng Luong	Red amaranth, carrots, tomatoes, pumpkin, papaya, watermelon	Orange, ripe papaya, mango Eat seasonally
	Chieng Chung	Carrots, tomatoes, pumpkin (seasonal), hot peppers.	Carrots, pumpkin, tomatoes, red peppers
	Muong Bon	Papaya, carrot, tomato, watermelon	Pumpkin, carrots (upper area)
	Hat Lot	Tomato	Carrots, pumpkin, red beets, oranges
Other vegetables	Chieng Luong	Cabbage	Cucumber, Chayote, Zucchini
	Chieng Chung	Cabbage, cauliflower, chayote (fruit)	Amaranth, chayote, bitter bamboo shoots, white radish, Malabar spinach
	Muong Bon	Cabbage	Cabbage, kohlrabi, cauliflower
	Hat Lot	Green squash, chayote	Cabbage, chayote, green beans, cauliflower
Other fruits	Chieng Luong	Guava, banana, plum, mango,	Banana, watermelon, longan
	Chieng Chung	Guava, orange, mango, plum, longan, banana	Plum, orange, tangerine, banana, mango, papaya, lemon
	Muong Bon	Grapefruit, longan, mango, plum, guava, apple, lemon	Mango, longan, strawberry, plum
	Hat Lot	Bananas, oranges, tangerines, watermelons and seasonal fruits like longan are eaten a lot during longan season.	Grapefruit, guava, mango, longan, avocado, white/red dragon fruit, jackfruit, plum, strawberry, lychee, apricot, watermelon, banana
Sweet Snacks	Chieng Luong	Sugarcane, ice cream	Children love sweets
	Chieng Chung	Tea, honey (with lemon), milk tea, coffee, ice cream	Honey
	Muong Bon	Rice cakes, sweet bread	Rice cakes, sweet bread
	Hat Lot	Bread, cakes, donuts	Ice cream (hot season)
Fried/Salty Snacks	Chieng Luong		Children like many things like chips and sausages.

Food group		Commonly consumed by women	Commonly consumed by men
Th	Chieng Chung	Sausage	Snacks, sausages
	Muong Bon		
	Hat Lot	Hot dogs, spicy sticks, kids instant noodles, donuts	Instant noodle
Beverage	Chieng Luong	Milk tea, passion fruit soft drink	
	Chieng Chung		Milk tea, beer, iced sugarcane juice
	Muong Bon	Coca, coffee, orange juice, squash	
	Hat Lot	Zero-degree green tea, orange juice, various teas	Coca
Insects (Hat Lot commune)			Cicadas, ant eggs (fried until crispy), stink bugs (fried until crispy) or soaked in alcohol

"In Muong Bon Commune, certain dietary restrictions apply based on the Mong clan, such as Giàng clan men avoiding eating hearts, while the Mùa clan does not. TAgricultural practices are divided by area: the upper area grows wet rice and gardens (fruit trees, snap beans), while the lower area primarily grows corn, sugarcane, cassava, and fruit trees because they lack access to the water supply from the Tien Phong lake in the upper area. Poultry farming, particularly chickens, in Mong villages faces challenges due to frequent outbreaks of disease. Many households are poor or near-poor and receive substantial government support." (Male Group Discussion, Muong Bon).

Female group

"The prices of goods have increased slightly compared to previous years. The food that people commonly purchase include pork (sourced from farms, primarily from large pig farms like Minh Thuy, the largest in Sơn La), fish (caught from streams), and vegetables and fruits (self-produced) because they are affordable and always available. Sales peak during the harvest season in June, July, and August, such as with mangoes, and pork is primarily sold. Since people are largely self-sufficient, during festivals or when there is a significant event, they usually pool together to slaughter pigs or cows. If they haven't harvested, they tend to spend more frugally, especially in the summer when the harvest season ends and there are no crop yields. Occasionally, people consume wild vegetables, such as ferns, butterfly leaves, bitter greens, nightshade, ground cherries, and dandelion greens. Many people enjoy coffee." (Female FGD, Muong Bon).

The types of food that people can grow or produce at home include: grains (sticky rice, regular rice, corn, sweet potatoes, cassava), beans (soybeans, green beans, black beans), poultry, fish (chicken, fish, pigs, geese, cows), eggs (chicken, duck, goose eggs), dark green leafy vegetables (such as mustard greens, chrysanthemum greens, and spinach), vitamin A-rich vegetables (such as tomatoes, amaranth, and pumpkins), and other vegetables and fruits (such as cabbage, bitter melon, Chinese cabbage, kohlrabi, bananas, mangoes, plums, longans, guavas, and apples). (Female Group Discussion, Muong Bon).

Most of the food items across different food groups are home-grown or produced through farming and livestock rearing. However, industrially processed food products such as dairy products, sweet and salty snacks, fried foods,

and beverages are purchased from outside. Despite this, not all home-produced food items are consumed regularly. This depends on the economic value of the food (beef is expensive), food preferences, and some vegetables and fruits are only seasonal and are grown in small quantities." (Female Group Discussion, Muong Bon).

Male group

Some livestock-derived foods from large animals, such as buffalo meat, beef, and certain types like goat meat and seafood, are more expensive and thus less frequently included in daily meals. Despite being able to raise these animals themselves, they are often reserved for sale to earn money or are slaughtered during significant events like ancestral worship or Tet. According to some, pork is consumed excessively for two main reasons: pigs are smaller livestock with more affordable prices and can be prepared in various dishes, making them less tiresome than other meats." (Male Group Discussion, Hat Lot).

Similarly, some livestock-derived foods from large animals, such as buffalo meat, beef, and certain types like goat meat and seafood, are more expensive and thus less frequently included in daily meals. Despite being able to raise these animals themselves, they are often reserved for sale to earn money or are slaughtered during significant events like ancestral worship or Tet. According to some, pork is consumed excessively for two main reasons: pigs are smaller livestock with more affordable prices and can be prepared in various dishes, making them less tiresome than other meats." (Male Group Discussion, Chieng Chung).

The limiting factors affecting food consumption include individual taste preferences, which vary from person to person. People often become bored with foods they can produce themselves due to overconsumption. Additionally, the limited availability of land restricts the ability to raise livestock, as there isn't enough space to build barns. An intermediate factor is that local people do not have the habit or preference for eating buffalo and beef. However, supporting factors in food consumption include individuals' ability to produce their food, which allows them to save money and eat more of those items. Furthermore, poultry, particularly chickens, are easy to raise and require minimal care, leading to widespread cultivation in the community.

Animal-source foods consumption

From interviews with vendors, it was found that commonly consumed animal source foods were "pork, chicken, fish" because they are cheap and affordable".

Table 10: Animal -sourced foods consumption by KII

	Consumption of animal-sourced foods	Consumed by many subjects	Animal-sourced foods consumption prioritization mong Damily Members"
KII Chieng Luong	Often eat pork, chicken, fish because they are cheap and affordable.	Children: they buy chicken for children because they like it and it's easy to eat. Pregnant women: pork and fish because it's good for their health. Elderly people: tofu and vegetables because the elderly often limit meat, they are mainly vegetarians, have weak teeth, and have weaker digestion.	Children are given priority to eat pork and beef because they are more nutritious than vegetables. The elderly give priority to vegetables because their dietary needs decrease, they lose their appetite, and do not want to eat.
KII Chieng Chung	Eat pork and chicken the most.	Middle-aged people eat more because they are at working age and need to eat more. Children will eat less because their needs are	

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	Locally there are only those items, not diverse.	less, or because they do not like to eat.	
KII Muong Bon	Often eat pork, chicken, fish because they are cheap and affordable.	Children: pork because it is easy to prepare, easy to eat, delicious. Pregnant women: pork, chicken, fish because they are self-sufficient, nutritious, know how to preserve and take care of. Elderly: like family, eat whatever is available such as pork, chicken, duck.	Children are prioritized according to their preferences, whatever they want to eat is bought, beef is bought for children because it is nutritious, and children like it. Elderly people like to eat boiled meat and are prioritized according to their preferences.

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Table 11: Results of FGD on food preferences in 04 communes, Mai Son district

Missing the Food group		**Favorite Food**		**Consumed but not liked**	
		Women	Men	Women	Men
Cereals, roots and tubers	Chieng Luong	Corn, sweet potatoes	Sticky rice because of the tradition of the nation, familiar to eat, full for a long time	Cassava,	
	Chieng Chung	Sticky rice	Rice + Sticky rice	Nothing	Nothing
	Muong Bon	Sticky rice, white rice	Rice + sticky rice Potato , cassava, corn	Potato	
	Hat Lot	Sweet potato	Rice	Cassava	
Bean	Chieng Luong	Green beans, soybeans (tofu)	Soybeans stink because they are delicious	Red bean	Tofu Bean
	Chieng Chung	Tofu, green beans, black beans		Black beans (rarely eaten)	
	Muong Bon	Soybeans (tofu)		Green bean	
	Hat Lot	Black beans, red beans	Black beans, soybeans, green beans		Cassava
Nuts and seeds	Chieng Luong		Sunflower, pumpkin, peanut, sesame		
	Chieng Chung		peanuts		
	Muong Bon		Sunflower, pumpkin, peanut, sesame		
	Hat Lot		sesame		
Dairy products	Chieng Luong	Fami yogurt and milk	Mostly Moc Chau milk (80%) Children like	Longevity milk	
	Chieng Chung	Yogurt		Nut milk	

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Missing the Food group		**Favorite Food**		**Consumed but not liked**	
		Women	Men	Women	Men
	Muong Bon	Fresh milk	Children like	Cheese	
	Hat Lot	Fresh milk		Yogurt	
Meat, poultry, fish	Chieng Luong	Chicken, fish	Pork does not cause a feeling of boredom and can be processed into many dishes.	Goose (dry) duck (many bones)	Chicken and fish can be eaten for 1-2 meals and then become boring.
	Chieng Chung	Chicken, fish	Pig, fish, rotten skin, pia (specialty)	Dog and goat meat	
	Muong Bon	Pork, chicken, fish	Like it all	Horses, dogs, goats	
	Hat Lot	Pork, chicken	Fish, Chicken, Pork, Beef	Beef, fish	
Egg	Chieng Luong	Duck eggs	Prefer	Chicken and quail eggs	
	Chieng Chung	Chicken and duck eggs	Chicken eggs	Goose egg	
	Muong Bon	Chicken eggs	Eggs – save for incubation (Pine Forest) -> about 6 months to hatch Children: white, yolk	Goose eggs	Porpoise
	Hat Lot	Chicken eggs	Chicken and duck eggs	Duck eggs	
Dark green leafy vegetables	Chieng Luong	chayote, rot vegetable, malabar spinach	Cabbage Malabar spinach Like because it is easy to grow and does not waste water	Cabbage, squash	

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Missing the Food group		**Favorite Food**		**Consumed but not liked**	
		Women	Men	Women	Men
	Chieng Chung	Cabbage, spinach, chayote,		Amaranth	
	Muong Bon	vegetables (ngot, rơn, butterfly, sang, tam po, ma, khuc)		Amaranth, water spinach	
	Hat Lot	Brassica juncea L	Like all	Malabar spinach	
Vegetables rich in vitamin A	Chieng Luong	Red amaranth, squash, watermelon	Like to eat all and eat seasonally Mango because it smells good, love the smell of it Orange because it is good wine	Pumpkin	
	Chieng Chung	Hot peppers, tomatoes, watermelon	Chili	Carrot	
	Muong Bon	Watermelon, tomato, carrot		Red Amaranth	Carrots – cannot be grown
	Hat Lot	Tomato	Like it all	Carrots, pumpkin	Tomato
Other vegetables	Chieng Luong	Cabbage,		Kohlrabi,	
	Chieng Chung	Cauliflower, chayote (fruit),		White radish	
	Muong Bon	Cabbage		Bitter melon	
	Hat Lot	Susu	Cabbage, chayote, green beans, cauliflower	Cauliflower, cabbage	
Other fruits	Chieng Luong	Guava, plum, mango, pear, jicama, cucumber		Apricot,	
	Chieng Chung	Orange, mango, plum		Jackfruit, tamarind	

RMIT Classification: Trusted

Missing the Food group		Favorite Food		Consumed but not liked	
		Women	Men	Women	Men
	Muong Bon	Grapes, Plums		Banana	
	Hat Lot	Chicken egg	Like it all	Every house has mango trees, longan trees, banana trees.	
Sweet snacks	Chieng Luong	Tea, ice cream, snacks		cream	
	Chieng Chung	Sugarcane juice, milk tea	Honey – personal habits (mixed with warm water)	Milk Tea	
	Muong Bon	Rice cakes, bread		Are not	
	Hat Lot	Tea		Cakes, candies	
Fried/Salty Snacks	Chieng Luong	Shrimp crackers, chips		Sausages, skewers	
	Chieng Chung	Fried Banh Chung		Sausage	
	Muong Bon	Fried breadsticks potato cakes			
	Hat Lot	Donuts		Sausage	
Beverage	Chieng Luong	Milk tea, fruit milk, natural orange juice		Milk tea, coca	
	Chieng Chung	Soy milk, orange juice		Carbonated drinks	
	Muong Bon	Winter melon, orange juice, coca			
	Hat Lot	Milk tea		Coca Cola	

From Table 9 and Table 11, it is evident that most of the foods frequently consumed are also those preferred by the local population. On the other hand, men generally do not have many foods they consume but do not like, which is less common than with women. Some foods listed as disliked but still consumed by men include tofu, beans, cassava, chicken, and fish, as they feel "chicken and fish become tiresome after 1-2 meals" (FGD in Chieng Luong), as well as pork, carrots—due to not being able to grow them locally—and tomatoes. There are noticeable differences in food preferences between men and women. Chicken and fish are popular with women but are not favored by men. Some foods that are both preferred and frequently consumed by men include "sticky rice," because it keeps them full longer, "fermented tofu," pork, fish, rotten skin, and “pịa” (a type of soup from the Northwest region that is slow cooked with internal organs, cartilage, meat, blood, and distinctive mountain spices).

The rate of feeding children with formula milk is high (over 80% use powdered milk). Children are given priority, ensuring they have a diet that includes meat, fish, chicken, and eggs. Most people prefer to buy these products from familiar vendors or places where they know the source of production (Female FGD, Hat Lot).

Characteristics of Food Consumption by Ethnic Groups in the Four Communes of Mai Sơn District

There are differences in eating habits between the Kinh, Thái, and Mong people: Kinh people or those working in government offices tend to eat more plain rice compared to sticky rice, which is more commonly consumed by Thái and other ethnic groups, while the Mong people maintain the tradition of always having a bowl of water with their meal, passed down from previous generations (KII, Hat Lot Commune)."

Hat Lot Commune is home to various ethnic groups, including the Black Thai, White Thai, Mong, Kho Mu, and Muong. The people of Hat Lot are generally less restrictive about their diet compared to the Kinh, and they only consume food that they consider "safe to eat." The Mong are perceived to have cleaner eating habits compared to the Kho Mu.

Black Thái and White Thái people have similar eating habits. They typically consume dishes such as sticky rice, "thố ô," raw fish salad, wild vegetables, grilled foods, smoked and dried meat, fermented skin, and "pịa" (Female FGD Hat Lot). They particularly enjoy sticky rice because it is filling and a long-standing tradition. (Female FGD Muong Bon).

Mong people often eat plain rice soaked in water or "mèn mén" (a traditional Mong dish made from cornmeal). Their soups are typically plain, without much seasoning. During certain times, they only eat egg soup with a lot of pepper. They prefer plain rice.

Khơ Mú people have a diet similar to the Thái, mainly consuming sticky rice with little plain rice.

Muong people have similar eating habits to the Thái.

In general, the dietary habits of different ethnic groups have become more similar. The main differences are found in the highland areas where food production is challenging, there is a lack of water during the dry season, and the variety of food and goods is limited due to transportation difficulties. *(Female FGD, Hat Lot).*

However, people's eating habits have also changed. Recently, people have paid more attention to food safety issues. They eat less sausage and salad; they only eat when they know the origin of the product. *(Male FGD Hat Lot commune)*

Households in Hat Lot Commune mainly grow mangoes and longans to sell to traders. This is also the main source of income for these households. However, in 2024, there has been less rain, leading to a poor mango harvest. Before the Lunar New Year, there was a chicken disease outbreak, resulting in most households losing nearly all their chickens (Male FGD, Hat Lot Commune). Households face difficulties in obtaining funds to improve their crops, as the trees only remain productive for 2-3 years. Once the soil becomes degraded, it becomes difficult for the trees to bear fruit. Notably, 'The residents of this area lack awareness of public sanitation. During outbreaks, they tend to dispose of waste indiscriminately, which affects other households and indirectly spreads diseases' (Male FGD, Hat Lot Commune).

The residents face many challenges in farming due to drought and low rainfall. The main crops are mangoes, longans, and cassava; livestock includes a small number of pigs due to disease. Water shortages have been an issue in 2024. Poor households receive various forms of government support: cattle, housing assistance, school

fees, electricity bills, health insurance, etc. These households often eat better than average when they receive support, but they lack knowledge of labor division. Since the establishment of the market, food scarcity has decreased. However, for households involved in farming and animal husbandry, poor households can only borrow up to 100 million VND, which is insufficient and often mismanaged.

There is a noticeable difference in food preferences for children, as the best parts are reserved for them, and market purchases are based on the child's preferences—whatever the child likes and can eat is considered good. In this area, most people have smartphones, so they often look up information like where to buy things, nutritional information, and food safety through the internet. Additionally, experiences and advice from those who have gone before are also ways residents learn about where to buy, which products are good for health, and how to prepare food.

Eggs are a frequently consumed and favored food, especially used in preparing meals for young children; however, most households primarily keep chicken eggs for hatching and then sell the chicks at a higher price. (Male FGD, Hat Lot Commune).

Data collected from key informants indicate that certain foods are perceived to be overconsumed, including sticky rice, pork, and alcoholic beverages, while others are under consumed.

Beef and pork consumption is limited because people do not raise these animals in large quantities, and there is no steady supply. Fruits and vegetables are not available in diverse varieties year-round; instead, they are mainly seasonal and homegrown. If people want more variety, they must go to the Co Noi market. Although goats are raised, they are typically sold rather than consumed, except during special occasions or Tet, when they might be slaughtered for sale. However, there is a belief that no food is under-consumed because "the market is convenient, and people can self-supply many foods, which improves their meals" (FGD, Chieng Luong).

In poorer households, animal-sourced foods are considered under-consumed because they cannot afford to buy or invest in livestock and animal feed to raise the animals. These households often lack essential nutritional knowledge. Even when these families do have livestock, the amount is so small that it is insufficient for the family's needs (FGD Chieng Luong).

Overall, the Key Informants agreed that food consumption patterns have significantly changed compared to five years ago: "In the past, we only had meat once a week; now it's much more common." Even in struggling households, "they might lack some types of food, but it's not to the point of having nothing to eat." Buffalo and beef are consumed less frequently, which keeps their prices higher.

Infant feeding

Key informants indicated that infants are often introduced to nutritionally poor foods too early, such as thin rice porridge. This practice was also commonly reported in FGD. Participants explained that exclusive breastfeeding typically lasts about 6 to 8 months, although the introduction of supplementary foods can occur earlier, with infants receiving their first solid foods at around 5 to 6 months. Partial breastfeeding often continues until the child is between 13 to 15 months old. The first complementary foods usually consist of sticky rice porridge (cooked with meat and vegetables, without oil or fat). The supplemental meals are relatively similar to those given to children in other areas, except that the porridge commonly used by the Kinh ethnic group is often made from regular rice rather than sticky rice. Substitutes for breast milk, such as formula (cow's milk), are also reported to be used.

According to the 2018 study by Nguyễn Lân and Nguyễn Thị Thu Liễu, the diets of children under 24 months old in Chieng Mung and Muong Bon communes, Mai Sơn district, Sơn La province, included all the necessary food groups for a balanced and reasonable diet. The protein content in the diets of children aged 12-23 months, both male and female, exceeded the recommended levels according to the 2016 guidelines by the National Institute of Nutrition. Specifically, the proportion of animal protein to total protein and the proportion of plant-based lipids to total lipids were higher than the recommended levels. The lipid and carbohydrate content in the diets of children aged 6-11 months and 12-23 months were below the recommended levels. However, the diets of children in these age groups did not meet the recommended energy intake, as well as the recommended levels of vitamin A, vitamin C, and calcium.

Nutrition for preschool children in the commune

Preschool children are given special priority within the community. The best foods are reserved for them, including easy-to-eat and favorite foods like powdered milk and sausages. "Food for children must be nutritious (including fish, chicken, eggs…), while adults can eat anything" (FGD Hat Lot Commune).

The diet for children differs from that of adults, with children receiving more and higher-nutrition portions. However, not all children have access to substitutes for breast milk, as these are primarily sold near the commune center, with non-available in more remote areas (Chieng Luong Commune).

Organizing cooking at kindergarten

Preschools in the four communes all provide on-site meals for students. Generally, each preschool has one central school site and several satellite sites, so not all children attending preschool will receive on-site meals. The organization of school meals is conducted at the central site, and the meals are distributed to some of the satellite sites.

The preschool meal programs across the four communes demonstrate notable variation in structure, enrollment, and meal provision methods. Hat Lot Commune operates six sites and serves 76 nursery-age and 441 kindergarten-age children, predominantly from the Thái ethnic group. Meals for 386 children are either centrally prepared or provided by parents. Chieng Luong Commune, classified as a particularly difficult Region III area, has one central site and 13 satellites, serving 679 children mainly from the Thái and Mong groups, with centralized meal service recently introduced for only 109 children (16.1% of the total). Chieng Chung provides boarding meals for 256 children (62.4% of the total) across one central site and five satellites, supplemented by locally grown vegetables. Mường Bon serves 281 children (82.4% of the total) at three sites, charging 20,000 VND per child daily and offering government support for low-income families. While Hat Lot and Chieng Luong charge 17,000 VND per child, Hat Lot serves two meals daily for preschoolers and three for nursery children, with a meal cost breakdown of 16,000 VND for food and 1,000 VND for gas. Each commune prioritizes food safety and nutritional support, though they face various challenges. Chieng Luong struggles with inadequate kitchen facilities and logistical difficulties due to its distance from the town, complicating food sourcing and communication between teachers and parents, especially when many parents work far from home and rely on grandparents for childcare.

Based on information from kindergarten representatives, concerns about food safety have arisen in Chieng Chung Commune due to the prevalence of products containing preservatives, stimulants, and non-hygienic items. Significant funding shortfalls hinder support for children's meals, kitchen equipment, and suitable sleeping arrangements. The lack of budget for hiring kitchen staff and sufficient teachers complicates the organization of centralized meal programs. To enhance nutrition, it is essential to contract reputable food suppliers, ensuring transparency and high quality at reasonable prices. Schools should create balanced menus that cater to children's preferences and adjust weekly offerings based on local food availability. Additionally, kitchen utensils must meet hygiene standards, using separate tools for raw and cooked foods, with all equipment regularly cleaned. Food preparation should also align with children's tastes, as noted in Muong Bon Commune. According to key informants at the preschool, the government should provide more financial and infrastructural support, especially in ethnic minority areas, to better ensure the quality of boarding meals for children *(Muong Bon commune).*

Table 12: School meals for kindergarten in four communes

Commune	School Points	Number of children who eat in boarding (%)	Forms of cooking organization	Cost per day	Number of meals
Chieng Luong	1 center point + 13 odd points	109 (16%)	In the 2023-2024 school year, the school will organize a centralized boarding program (Central Point)	17,000 VND/day/child Fully supported by the state	2 children's meals: main meal (Lunch) and an afternoon snack
Chieng Chung	6 points (1 central point + 5 odd points)	256 (62.4%)	The school organizes boarding meals. The school grows vegetables to add food to children's meals.		Children under 36 months eat 2 meals/day including a main meal and a snack, children from 36 – 72 months eat 3 meals/day including 2 main meals and 1 snack.
Mường Bon	8 points	281 (82%)	The school organizes boarding meals at 3 school sites.	20,000 VND/day. Children from poor and near-poor households are supported by the government with 160,000 VND/child/month, the rest are contributed by their families.	Children under 36 months eat 2 meals/day including 1 main meal and 1 snack, children from 36 – 72 months eat 3 meals/day including 2 main meals and 1 snack.
Hát Lót	6 points (1 main school and 5 odd points)	386 (XX%)	Semi-boarding focused on cooking at the school in 16 class groups, 386 children (Kindergarten: 49 children, kindergarten: 337 children) (accounting for 74.7%)		Organize 2 meals a day for children. 100% of children can drink clean water and use hygienic domestic water.

In schools located in more remote areas, there is no provision for school-organized boarding meals, so **parents** are responsible for providing their children's meals, which can differ widely based on ethnicity and the family's financial situation. Common foods that parents typically bring for their children include boiled eggs, grilled or boiled pork, boiled vegetables, and sticky rice (Chieng Chung). The dishes brought to school vary among different ethnic groups: "Each ethnic group has different typical dishes. Usually, the children's meals include sticky rice, dried meat, fried eggs, grilled fish…" (KII Muong Bon).

"There are differences in the meals between families. Families with better economic conditions can provide meals with items like meat and fish, while those with fewer resources may only be able to provide rice with chấm chéo. Typically, the children's meals include items like meat, fish, vegetables, and soup" (KII Hat Lot)

Assessment of nutrition status in the school:

Children’s weight and height are measured every three months. For children who are malnourished or overweight, these measurements are taken once a month. The homeroom teachers are responsible for weighing and measuring the children since the school does not have a dedicated healthcare staff. Parents are advised about their children's nutritional status by the principal and teachers three times a year. The school receives strong support from teachers, staff, and parents for the care and nurturing of children. The school regularly enhances parental awareness by providing information, communication, and advice on child nutrition and caregiving. Parents and students receive nutritional guidance from the homeroom teachers, with advice provided during parent meetings at the start, middle, and end of the school year, as well as during daily drop-off and pick-up times.

Nutritious Food for Children according to the information of representatives of kindergarten school

The dietary habits of children are influenced by various factors, including individual appetites and ethnic backgrounds such as Thái, Kinh, and Mong, with each group reflecting unique dietary preferences and cultural practices. In Muong Bon Commune, food consumption patterns align with local contexts, where nutritious foods are defined as fresh and clean, including locally sourced options like fish, chicken, beef, pork, eggs, vegetables, rice, and produce free from industrial farming practices and harmful additives. Key informants highlight that nutritious options also encompass lean meats, poultry, seafood, legumes, whole grains, dairy products, and fresh fruits and vegetables, essential for children's health. In Chieng Chung Commune, meals typically consist of hot rice and soup, with plans varying seasonally to ensure adequate calories and nutrients. However, there are no significant differences in diets among various groups; overconsumption of sticky rice and cold foods contrasts with the underconsumption of rice, fresh foods, and milk. This imbalance is largely due to the absence of centralized meal preparation, inadequate facilities, limited budgets, and a reliance on fast or traditional ethnic foods.

Livestock Products consumption of school children

In Chieng Chung Commune, the consumption of livestock-derived foods such as beef, pork, chicken, fish, and eggs among students remains limited, failing to meet their nutritional needs. Barriers to consuming these foods include the small quantities produced by households that raise animals and grow food meeting safety standards, coupled with high market prices that render them unaffordable for many families. Consequently, these households often sell their products to generate income for other uses rather than consume them. The low purchase of fresh local foods contributes to a reliance on external products brought in by traders, many of which contain preservatives and growth hormones. Furthermore, limited financial resources hinder adequate investment in clean, nutritious meals, exacerbating the nutritional challenges faced by students.

Summary of food consumption

Stakeholder Assessment

The food consumption patterns in Mai Son reflect a complex interplay between traditional practices, local resources, and emerging dietary preferences. While processed foods, fried items, and sugar-sweetened beverages are increasingly popular, particularly among children and teenagers, there is an urgent need to address their consumption in relation to the four pillars of food security. In contrast, grains, roots, and tubers demonstrate high levels of availability and access, which aligns with the traditional dietary staples of the Thai and Mong ethnic groups in the region.

The local population also engages in harvesting wild vegetables and insects, showcasing a reliance on natural resources. However, there are concerns regarding the hygiene and origins of these products, which echoes the issues surrounding the consumption of processed foods. The emphasis on traditional dishes, such as "lạp" and "đậu tương thối," highlights the cultural significance of certain foods, although their consumption has declined due to changing tastes and concerns over food safety.

Table 13 presents a summary score card assessing the gaps in the consumption of food groups in Mai Son by food and nutrition security pillar. The assessment of food groups consumed by season indicated Starches, leafy and other vegetables, and meat are widely consumed. Consumption gaps appear to be for nuts, legumes, fruits and vegetables rich in vitamin A, eggs, and milk. The data indicated important differences between the lean and flush seasons.

Table 13: Summary score card assessing the gaps in the consumption of food groups in Mai Son by food and nutrition security pillar. Colors indicate the level of concern to food and nutrition security, with red indicating the highest level of concern, yellow as of middle concern, and green as of less concern

Green = Good for FNS	Yellow = Concerning	Red = Bad for FNS		
	Availability	**Access**	**Utilization**	**Stability**
Grains, roots, and tubers	13/0/1	10/2/1	8/3/1	11/1/10
Pulses, nuts, and seeds	7/1/1	9/1/2	2/8/1	1/5/4
Animal sourced foods	8/0/0	7/1/3	5/4/0	2/4/2
Vegetables and Fruits	7/2/1	5/4/0	5/6/0	3/4/3
Processed Foods / Fried	0/0/10	0/1/9	0/1/9	0/0/7
Sugar-sweetened beverages and alcohol	0/0/11	0/0/12	0/1/10	0/0/10

Food groups are under-consumed

Both genders experience underconsumption of specific food groups due to economic constraints and cultural practices. Both face limited availability of certain foods, though the groups affected differ slightly. Males show a clear preference for meat and processed foods, while females lean more towards vegetables and have different cultural eating habits. Males generally consume more alcoholic beverages, while females show less interest. Cultural practices significantly influence food choices and consumption patterns, impacting males and females differently based on traditional roles and preferences.

In conclusion, the under-consumption of various food groups across different demographics reflects a complex interplay of cultural habits, economic factors, and availability. Males tend to under-consume dairy, fruits, and legumes, while both sexes face challenges with animal-sourced foods due to high prices and limited supply. The Mong ethnic group is particularly affected by the availability of cereals and legumes, while economic difficulties hinder access to processed foods.

Food groups that are over-consumed

In conclusion, the overconsumption of specific food groups is influenced by a combination of cultural practices, economic factors, and social dynamics. Alcoholic beverages, offal, and comfort foods are especially prominent in male diets, while children and the elderly show a preference for snacks and sweets. Understanding these patterns is crucial for developing effective public health strategies aimed at promoting healthier eating habits. By addressing the underlying reasons for overconsumption—such as social influences, cultural significance, and economic accessibility—interventions can be better tailored to encourage moderation and improved dietary choices across different demographic groups.

RMIT Classification: Trusted

Summary of food consumption and food sourcing

In Mai Son, the consumption of processed foods, fried and sugar-sweetened beverages, and alcohol is a growing concern, highlighting the urgency of addressing the four pillars of food security. In contrast, grains, roots, and tubers demonstrate high levels of availability, access, utilization, and stability. However, pulses, nuts, seeds, and vegetables and fruits experience fluctuations due to seasonal production and preferences that do not align with local cultural norms and ethnic practices. While specialty animal-sourced foods are readily available and well-utilized, their stability is affected by market fluctuations and special events. Moreover, the fluctuation in the availability of pulses, nuts, seeds, vegetables, and fruits due to seasonal production reflects the challenges faced by households in maintaining dietary diversity. The preference for sticky rice among the Thai people further illustrates how cultural norms shape food choices, often at the expense of exploring other nutritious options.

While specialty animal-sourced foods are readily available and utilized, their stability is compromised by market fluctuations and seasonal events. The strong governance in Mai Son could play a crucial role in addressing these challenges by promoting education on nutritional diversity and improving food safety standards.

Food consumption patterns show diverse preferences influenced by cultural practices, ethnicity, local agriculture and economic factors. The least consumed food group is nuts (peanuts). The dairy food group, milk products are consumed mainly by children, including cow's milk products and soy products. Consumption of animal-based foods: such as pork, chicken, duck, fish, and goose are frequently consumed foods, especially fish. Fish is especially popular due to its availability in rivers and lakes, of which grilled fish and fish salad are traditional dishes. Eggs are commonly consumed, especially by young children. However, many households prefer to hatch chicken eggs for resale rather than direct consumption. Men tend to limit their favorite foods, often avoiding items such as tofu and beans, with preferences leaning towards sticky rice, pork and traditional dishes. Women prioritize nutritious meals for children and often purchase meat and dairy products from trusted sources.

Children from 2 to 5 years old often eat porridge, milk, fruit, snacks, eggs, pork, chicken, and fish. For older children (from 6 to 10 years old), some of the foods consumed are porridge, sticky rice, milk, chicken, pork, beef, fish, chicken thighs, eggs/fried eggs, sausages, tomato sauce beans, candy, vegetables, fruit, candy, chips, zero-degree green tea, soft drinks, orange juice, milk tea. Instant noodles, spicy noodles, and milk tea are typical foods frequently consumed by adolescents (11-17 years old). Preferences differ between males and females, with chicken and fish being the preferred foods for females but not consumed by males. In addition, some local specialties such as insects are consumed by male.

FOOD SOURCING

The food purchasing points in the four communes are diverse, including retail outlets (grocery stores), stalls, gardens, village markets, and markets both within and outside the communes. In Chieng Chung commune, residents also utilize small local slaughterhouses, while Hat Lot commune features a dedicated market in the area. Retail outlets in each commune are mostly concentrated in the central area, where people can easily travel to by motorbike in a few minutes. The main foods sold are pork, beef, chicken, vegetables, tofu and prepackaged foods (candy, instant noodles, snacks, soft drinks). Fish is also sold but less. The market is appreciated for its variety of products and affordable prices, although hygiene can be a concern.

Nutritional outcomes

Food security and nutrition outcomes

Food security

In the Mong villages, economic hardship leads to pronounced food insecurity, contrasting with other areas that do not face significant shortages, although remote villages experience greater difficulties. The Mong people tend to consume bland meals, often consisting solely of rice—sometimes just rice with plain water—due to their traditions. Livestock farming is challenging in the highlands because of a lack of feed, infertile soil, and low productivity, while access to markets is limited. They have little arable land for farming and primarily grow rice, making them heavily dependent on weather conditions, resulting in a way of life and eating habits that differ significantly from those in lower regions Mong People.

In Muong Bon and Hat Lot communes 12% of households were unable to meet their basic energy needs while only 3% of households in Chieng Luong and Chieng Chung communes were unable to meet their basic energy needs. The average household experienced food shortages for about 1.3 - 1.4 months a year with 19% and 26% of households experiencing food shortages for more than two months a year in Chieng Luong and Chieng Chung communes compared to Muong Bon and Hat Lot communes. Acceptable average dietary diversity scores were observed in both the flush season (mean scores of 6.1 and 5.5) and the non-flush season (mean scores of 5.6 and 5.2) as shown in Table 14. However, in the lean season, the number of households scoring below 5 was higher than in the flush season, which may indicate inadequate dietary intake. In more remote areas, the proportion of households with an acceptable diversity score was lower than in well-connected areas. Comparing locations, during the flush season households consumed a higher diversity of foods in more remote areas than in well-connected areas. This suggests that seasonality is a geographical issue for about a third of households.

There is equality in food distribution between men and women but there are geographical differences: well-connected areas had higher proportion of households with a lower diversity score than more remoted areas. In terms of gender, men have a lower diversity score in their diet in well-connected areas than men in more-remote?? areas (4.5 and 5.2, respectively). Similarly, women in these two areas have a consumption rate with a diversity score of 4.3 and 5.2 respectively.

The average dietary diversity score during the high and lean seasons was less than 1.5 food groups per week, and nearly one-third of households ate three or fewer food groups per week.

In general, considering the 4 communes, although having different economic status, all groups believe that currently there is no situation of people going hungry, or not having enough food to have 1 or 2 meals a day, "not missing meals", but only difficulty in having enough food for 3 meals a day. The lack here is not about the quantity of food but about the number of types of food, some food groups are lacking, or not available.

These data are taken from household surveys conducted under the Li-Chan project in 2020. Responses from four communes were grouped into two groups: remote communes (Chieng Chung and Chieng Luong) and more connected (Muong Bon and Hat Lot). The overall picture is one of mild food insecurity, with around a third of households in moderate food insecurity. Consumption of animal-based foods is high, with over 90% of respondents having eaten them in the 24 hours prior to interview. On a monthly basis, most respondents ate animal-based foods at least once a week. The other most consumed food groups were cereals (mainly rice), dark green leafy vegetables, other vegetables and fruits. Notably, vitamin A-rich fruits and vegetables, as well as legumes, were consumed significantly less.

Nutritionally vulnerable or disadvantaged groups:

The population with the lowest food security is in Chieng Luong, where 11.56% of households are classified as "poor" by the government. This is followed by approximately 7.11%, 3.7%, and 3.63% in Chieng Chung, Muong Bon, and Hat Lot, respectively.

Results from KIIs and FGDs show that households with lower incomes, fewer sustainable livelihood opportunities and fewer assets, are at higher risk of food and nutrition insecurity than other households. However, participants' assessments indicate that the level of food insecurity is moderate, as these households do not experience hunger ("skipping meals"). This situation is attributed to various government support policies across multiple areas, including food assistance during the Lunar New Year, provision of rice during lean seasons, livelihood support (low-

interest loans for production and provision of livestock), educational support (reduced tuition fees and meal allowances for children from poor households in region III), technical assistance (each party member is responsible for monitoring and assisting one poor household in economic and technical development), and housing support (temporary housing elimination programs). Food-insecure households are in a state of persistent poverty, indicating that, in addition to economic support, there is a need for greater technical assistance and guidance to ensure sustainable livelihoods for these families.

Table 14: Summary of food security and nutrition indicators

Indicator	Commune type	Mean	SD	Acceptable score (threshold)	% worse than threshold
Potential food availability (if all income was used to buy rice) (kcal/pers/day)	Remote	19,845	15509	>=2500	3%
	Connected	18,296	29663	>=2500	12%
Months food shortage	Remote	1.3	1.6	<=2	19%
	Connected	1.4	1.5	<=2	26%
FIES (0-8)	Remote	1.76	2.0	<=2	35%
	Connected	1.68	1.9	<=2	24%
HDDS (lean) (1-10)	Remote	5.6	2.0	>=5	29%
	Connected	5.2	2.0	>=5	43%
HDDS (flush) (1-10)	Remote	6.1	2.0	>=5	23%
	Connected	5.5	2.1	>=5	37%
Diff in HDDS flush vs lean	Remote	0.4	1.0	<=2	5%
	Connected	0.3	1.0	<=2	5%
Male IDDS 24hr	Remote	5.2	1.8	>=5	41%
	Connected	4.5	1.6	>=5	57%
Female IDDS 24hr	Remote	5.2	1.6	>=5	35%
	Connected	4.3	1.5	>=5	59%
% animal-source foods consumed in the past 24h	Remote	91%	-	-	-
	Connected	94%			

Nutrition

Stunting among children under five years old remains a widespread and concerning issue in Mai Sơn district. Although the stunting rates in Chieng Luong, Chieng Chung, Muong Bon, and Hat Lot communes are 24.9%, 23.4%, 28.5%, and 23.8%, respectively, which are lower than the provincial average of 28.6%, these rates are still high compared to the World Health Organization's classification thresholds (Table 15). According to the 2020 nutritional statistics of Sơn La province, the overall prevalence of underweight children in the province is 17.4%,

stunting is 28.6%, and wasting is 5.0%.[13] There are no available data on the nutritional status of adults in the four communes.

There is no reported data on overweight, obesity, or non-communicable diseases. However, the total number of people diagnosed with hypertension is 450 out of 10,513, and diabetes is 98 out of 10,513 in Chieng Luong (KII Chieng Luong).

Table 15: Outcome indicators on nutritional status (according to the report of the Commune Health Station, first quarter of 2024)

Index	Chieng Luong	Chieng Chung	Muong Bon	Hat Lot
Stunting (height for age) (%)	24.9	23.4	28.5	23.8
Underweight (weight for age) (%)	15.9	19.2	14.0	14.9
Wasting (weight for height) (%)	11.4	7.5	5.5	8.1%

Stakeholder assessment of food security and nutrition situation

The participants in the evaluation workshop concurred with the survey report on local nutrition and food security indicators, which indicated a consensus regarding the absence of meal shortages. Nevertheless, they recognized that food insecurity remains a significant issue among poor households, mainly due to a lack of dietary diversity. Overall, the nutritional status of both males and females has not received adequate attention, with women being disproportionately affected by the demands of childbirth, childcare, agricultural responsibilities, and economic constraints that can lead to inadequate nutrition. Consequently, women often experience nutrient deficiencies and may prioritize the needs of others within multigenerational households.

Gender disparities are apparent in food utilization, decision-making, caregiving, and food knowledge. Specifically, males demonstrate higher food utilization and knowledge levels, while females exhibit strengths in decision-making and caregiving. Participants noted that there is equity in food access among genders; however, these disparities in food management and nutritional status underscore the necessity for targeted interventions to address the specific challenges women face and enhance overall nutrition within the community.."

Food and nutrition situation summary

The examination of food security within the Mai Sơn district indicates that Chieng Luong exhibits the highest poverty rate, with 11.56% of households classified as "poor." Households across this and other communes face considerable food and nutrition insecurity, largely due to low incomes and insufficient livelihood opportunities. Although government support programs have provided some relief by ensuring that households do not experience hunger, the sustainability of these initiatives remains uncertain. The low poverty escape rate and instances of families returning to poverty underscore the necessity for more robust and enduring solutions. To effectively address food insecurity, it is imperative to enhance not only economic assistance but also technical support and guidance, thereby enabling families to establish sustainable livelihoods and break the cycle of poverty.

Stunting among children under five in the Mai Sơn district communes remains a pressing issue, with rates still concerning despite being below the provincial average. The high prevalence of underweight children further underscores the need for improved nutritional management and intervention strategies.

[13]Malnutrition rate of children under 5 years old by level, by ecological region in 2020. Institute of Nutrition (http://chuyentrang.viendinhduong.vn/FileUpload/Documents/Nam%202022/(2020)%20TL%20suy%20dinh%20duong%20TE%20duoi%205%20tuoi%20theo%20muc%20do,%20vung%20sinh%20thai.pdf)

Identify target group

This section aims to identify and describe vulnerable groups.

Food Security and Nutrition Layer

Focus groups respondents were asked about the populations they consider to be food insecure, lacking enough food to eat. Across the four communes, despite different economic conditions, all groups indicated that there is currently no situation where people are starving or unable to secure one or two meals a day. They noted that the issue lies not in the quantity of food but in the diversity of food types—some food groups are missing or unavailable. For poor or struggling households, state support policies help prevent hunger, particularly when they receive financial aid. When the aid runs out, people tend to borrow food and repay later when they have money. Additionally, “Food is not lacking because people exchange goods with each other. They swap meals, sell four or five items, and then buy different food" (Chieng Luong).

RMIT Classification: Trusted

Table 16: Qualitative characteristics of food security strata from FGD results in Chieng Luong commune

	Chieng Luong	Chieng Chung	Muong Bon	Hát Lót
Poverty rate	11.56	7.11	3.7[14]	3.63
Characteristics of food insecure groups	Poorer households, according to State Standards, are those with fewer members or lacking sufficient labor force. Also, households where children or parents are frequently ill or disabled often find their earnings drained by medical expenses. Households lacking land do not have ponds for fish farming or land for cultivation. People in these households often drop out of school or have limited education due to the lack of funds to continue their studies. They are often unaware of how to manage finances or run a business effectively. "If they receive aid, they tend to just consume it and spend it on alcohol without working." Wealthier households tend to eat at home, while poorer households eat out more frequently.	Poorer households, according to State Standards, are those with fewer members or living in remote, highland areas. Poor households tend to have poorer health. They also tend to grow crops that have low market value and lack the knowledge to choose and cultivate higher-value crops. Households lacking land or effort (laziness) or agricultural skills	There are 42 poor households and 54 near-poor households in the commune. These households typically live in dilapidated homes and do not own a motorbike. Many of these households include vulnerable individuals who are elderly, ill, or living alone. Households lacking sufficient farmland for cultivation or having recently split from larger households (they have reduced average landholdings). All households have enough food for three meals a day, and there are no cases of food scarcity. After receiving financial assistance, they often celebrate by consuming more meat and other foods. They may rely on credit or temporary loans until the next round of assistance is received.	Households with surplus labor, despite having members of working age, there is often an excess of labor in the household with many staying at home and not knowing how to allocate work effectively.
Challenges faced	Not dietary diversity. Still eating enough for three meals, but less meat and fish.	Households still have enough food (quantity), but food is not diverse.	Enough for three meals; lacking water and meat. Food is not diverse.	On normal days, meals are not complete (may lack money to buy fish sauce, salt, meat; may lack clothes and some daily

[14] https://baosonla.org.vn/vi/bai-viet/khoi-sac-muong-bon-28040.

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	Often, poor households, because they receive financial support from the government or charitable organizations (100-200k per time), eat as well as or better than others, buy more expensive rice, and “The children are better cared for, they can buy milk every day.”	Some meals have meat, some have vegetables, and they eat rice with plain water. Meals are lacking in meat more often. The quality of meals in single-person households and poor households is inconsistent.		necessities). However, when receiving support, they "eat better." Lacking rice, so they have to borrow, and repay when they receive support. Many households have enough to eat but lack nutritious food (near-poor, poor) because they have not harvested yet, so they don't have money to buy enough food (lacking meat, savory foods). Without support, they have to wait until the season.
Are there any safety nets or support services available? If so, what are they?	The local government organizes the implementation where each Party member monitors and supports one poor household. The state provides support with rice, instant noodles, and white salt. Electricity bills are subsidized every three months. There is low-interest loan support from the state, as well as support with livestock for raising. Children attending school receive support through reduced tuition fees and monthly meal allowances.	Households receive support with Tet gifts, electricity bills (for poor households), and there are loan policies to support money (for people with disabilities, orphans).	Multidimensional poor households receive more policies and attention from the state.	Support for poor households: can only borrow up to 100 million VND, but it is not enough because these poor households have high expenses, and the purpose of use may not be appropriate. The state provides free breeding cattle, housing support, 50% tuition fee support, monthly electricity bill support, free health insurance. During Tet, they are given rice, meat, leaves, sweets, money, etc.
	Free healthcare is provided through insurance. Clothes are given by volunteers. Villages do not give any additional support.			

According to the results from the FGD, all communes have poor and near-poor households, but "There are no cases of food shortage leading to insufficient food for three meals, but poor and near-poor households generally face more difficulties" (FGD Muong Bon commune). A few notable points include that even though these individuals receive support for making a living, they do not utilize the capital effectively because they do not know how to calculate and manage their businesses properly, which is the result of low education levels and laziness. In some cases, "They are given livestock but do not breed them, only raising a few". When the goverment classifies them as poor, they receive support, but financial assistance disappears once they are no longer considered poor. That is why some even stop working entirely when their income increases. "They are given a house but then sell it to eat; they keep selling or pawning gradually, so they lose it." (FGD Chieng Luong Commune).

"The diet is similar or even better because they receive financial support, depending on the charity (100,000 VND - 200,000 VND per time). They eat less meat due to a lack of resources at home. When they receive support, they only eat, then drink alcohol, and do not work" (FGD Hat Lot Commune).

"The Mong people do not starve; they still have enough for three meals but lack food variety (many children, in highland areas, do not know how to choose high-economic crops, lack land, are lazy, lack farming techniques, have difficulty accessing food; only when they slaughter chickens or ducks at home do they have enough food)" (FGD Chieng Chung Commune).

Currently, very few families skip a meal or lack food. In the Co Chai hamlet (Zone 3) of Kho Mu people in Hat Lot Commune, 10% of households (poor, near-poor, sick and unable to work, single-person households) suffer from insufficient food due to poor harvests. These households are supported by state policies, including subsidies for electricity, production capital, health insurance, and educational support for children. In addition, local people also receive support from charitable organizations.

According to information providers, certain groups affected by food insecurity in Chieng Chung Commune include children aged 0-5, residents of two difficult hamlets, It Ho and Sam Tai, and those in poor households (Chieng Chung Commune Health Interview). "Because poor households do not have enough daily food or capital for livestock and crop production, they face food shortages. Also, women after childbirth, due to unstable economic conditions, cannot meet the high food and nutritional needs of mothers and babies, leading to a high risk of child malnutrition."

From both qualitative analysis and FGD, households with lower incomes (poor households), fewer sustainable livelihood opportunities, and fewer assets are at higher risk of food and nutrition insecurity than other households. However, according to participants, the level of food insecurity is moderate because these households are not hungry ("skipping meals"), thanks to many state support policies in various aspects, such as food support ("Tet gifts" or rice provision during lean periods), livelihood support (low-interest loans for production, livestock provision), education support (tuition fee reduction, meal provision for school-aged children from poor households, Zone III communes), technical support (each Party member monitors a poor household in the area), and housing support (temporary house eradication program). However, the results of poverty reduction are not yet sustainable (the poverty reduction rate in Chieng Chung Commune is 1.29%, 15 households have had temporary houses eradicated, and 2 households fell back into poverty in 2023). These food-insecure households are in a state of persistent poverty, indicating that in addition to economic support, more technical support and guidance are needed to ensure sustainable livelihoods for them.

Food insecurity varies based on characteristics such as multidimensional poverty classification and regional differences within a commune, particularly between remote and well-connected areas. Some highland villages with challenging terrain, many of which are inhabited by the Mong community, experience higher levels of food insecurity compared to other villages. Muong Bon commune exhibits notable disparities based on geographical areas, specifically between the upper and lower regions.

In terms of cultivation, the area is divided into upper and lower zones. The upper zone grows wet rice and gardens (fruit trees, snap beans); the lower zone primarily grows corn, sugarcane, cassava, and fruit trees because there is no water supply from the Tien Phong Lake in the upper zone. Poultry farming in the Mong hamlets faces many difficulties due to frequent outbreaks of disease. There are many poor and near-poor households, receiving numerous state support policies." (Male FGD Muong Bon commune).

According to state policies, the National Target Program for Sustainable Poverty Reduction and the New Rural Development Program have been implemented across the locality. The intervention programs in the four communes have been implemented according to the 19 general new rural development criteria, including Planning, Irrigation and Disaster Prevention, Electricity, Education, Rural Commercial Infrastructure, Information and

Communication, Labor, Multidimensional Poverty, Income, Production Organization and Rural Economic Development, Residential Housing, Public Administration, Environment, Defense, and Security. An important observation from this is that there are two types of households needing food support - very poor households and stable poor households. They may require different measures.

Additionally, "Only the Mong hamlets and remote areas face difficulties" as the Mong hamlets struggle and have less access to chicken, goose, and duck meat compared to other hamlets in the locality. The results regarding the availability, accessibility, pricing, and affordability of healthy foods in Chieng Luong Commune (Chieng Luong Health Interview). Generally, foods are considered available because it is either available at the market or at home (self-sufficient), and no food was found to be unavailable. Additionally, foods are considered accessible, including pork, chicken/goose/duck meat, various types of eggs (chicken, duck), and especially bamboo shoots (available in the forest). Regarding poultry meat, "Only the Mong hamlets and remote areas face difficulties," and prices follow the market, not expensive, and affordable for people. Foods that are harder to access include fish, beef, various beans, and nuts due to higher prices, "market prices are expensive; if they buy beef in the hamlet, it's cheaper."

Foods particularly important for the nutrition of the most vulnerable groups are chicken, fish, goose, duck, various vegetables, and wild bamboo shoots available locally are important because they are home-grown, non-industrial, and not sprayed with chemicals, so they are safe.

Additionally, according to some people, the foods important for the nutrition of the most vulnerable groups (poor households, women of childbearing age, children, the elderly...) are protein-rich foods. However, the barrier to consuming these foods is said to be "not having the means to buy, not having the means to invest in breeding stock, animal feed."

Intra-household food security and nutrition

Apart from the differences in food security and nutrition at the household level, the differences in food security and nutrition among different individual groups within the family were not evident in the four communes. Children under 5 years old remain at high risk of malnutrition, particularly stunting. It is unclear whether there is inequality in power and access to food; differences in food consumption are mostly based on individual preferences and tastes.

Generally, in the study area, households usually consist of 2-3 generations living together, with children, parents, and grandparents living in the same house, so there is no difference in meals, as most meals are shared at the same table and in the same house. However, food consumption varies among family members due to different nutritional needs according to age (elderly, children) and individual preferences within the family.

According to information from one interviewee, dietary habits vary significantly among different income families. High-income families typically have children consuming snacks like chips, candy, milk, soft drinks, and fried skewers, while adults often eat sticky rice, vegetables, fruits, and bamboo shoots, occasionally supplementing their diet with savory dishes made from animal sources. Middle-income families see children enjoying similar snacks, although these tend to be cheaper and of unclear origin, while adults consume sticky rice, vegetables, fruits, and bamboo shoots, sometimes including a bit of savory food. In low-income families, the diet is relatively simple, with children eating plain porridge, occasionally with eggs or meat, and parents primarily consuming plain or mixed rice with rare inclusion of savory dishes.

There are certain foods that children eat that parents do not, and foods that are prioritized for children/pregnant women/breastfeeding mothers are always those rich in nutrients. However, it is noteworthy that, despite being in poor or near-poor households, according to some male group discussion participants, these families, because of the support they receive, "still have money at home," so they "eat as well or better than us, buying more expensive rice," and "the children are better cared for, with milk available every day." In general, their living standards are even higher than well-off households, but they do not build permanent houses, living in stilt houses or temporary houses. They also do not make efforts to escape poverty, "not diligent: lazy to work" (Male FGD Chieng Luong Commune), "poor due to disability, laziness" (Female FGD). Poor households with state support and aid from charitable organizations and individuals were also mentioned.

Results from KII show that "Poor households produce very little and rarely engage in trading, only buying spices like fish sauce, salt, and MSG. Middle-income households sometimes engage in trading, but the food variety and quality are not good. Wealthier households regularly engage in trading, with a diverse variety of high-quality food." Results from KII show that the groups with poor nutrition and food security are the poor, farmers, women with

young children, the elderly, ethnic minorities, and people with chronic illnesses. These individuals often consume insufficient and non-diverse foods, and the food is often not hygienically safe.

The consensus from FGDs and KIIs indicates that groups particularly affected by food insecurity are poor households (about 250 households) and farmers during droughts, floods, and crop failures. The period from April to May is the lean season, but they do not experience hunger because of "skipping meals."

Food consumption is mainly self-sufficient through livestock farming, cultivation, and use. The food consumed that is purchased may come from Co Noi market (in a neighboring commune). A variety of food is available, but due to the different economic conditions of the hamlets, there are groups who do not have the means to buy enough food to supplement their diet with all the necessary food groups.

This situation has partially changed compared to previous years because highland hamlets now have access to the national electricity grid (to use refrigerators) and have phone signal coverage, allowing people to receive direct communication and access information through mass media such as television, books, and newspapers. They have learned how to farm and raise livestock more effectively, and they have also learned how to process and preserve food (KII health).

Fish, beef, and various beans and nuts are considered good nutritious foods that play an important role for the local population; however, they are not accessed frequently. The foods that are particularly important for the nutrition of the most vulnerable groups include chicken, fish, goose, duck, various vegetables, and wild bamboo shoots available locally because they are home-grown, non-industrial, and not sprayed with chemicals, making them safe.

Food security and nutrition status in Mai Son District are influenced by household income, cultural practices, and access to resources. While some households provide better nutrition despite economic challenges, significant barriers remain for the most vulnerable groups. Addressing these disparities will require targeted interventions to enhance food access, improve agricultural practices, and support economic development within the community.

Stakeholder evaluation of vulnerable groups

In addition to the vulnerable groups listed, it was indicated that Mong group, poor or near-poor households, and children under 5 should also be considered as important target segments of society to improve food and nutrition security. Remote communes, remote villages, pregnant women and mothers, and even population average were also earmarked as a segment of society particularly susceptible to food and nutrition insecurity.

Synthesis of the main vulnerable groups

This summary scores aims to provide a comprehensive summary of the food and nutrition situation in Mai Sơn, using a scorecard or index to visually represent gaps in food consumption among different food groups based on food security and nutrition pillars. The scorecard uses color coding to indicate levels of concern: Red is the highest level of concern, indicating severe issues with food security or nutrition in certain food groups; Yellow is medium level of concern, suggesting moderate issues that require attention but are not as critical; Green is low level of concern, indicating areas where food security and nutrition are relatively stable.

Table 17: Summary score card assessing the vulnerability of different population segments in Masaka. Colours indicate the level of vulnerability to food and nutrition insecurity, with red indicating the highest level of vulnerability, yellow as of middle vulnerability, and green as of less vulnerability.

Population segmentation	**Overall Nutritional Outcomes**
Population Average	5/10/0
Remote Communes (e.g. Chieng Luong, Chieng Cheung)	6/9/0
Well-connected Communes (e.g. Muong bon, Hat Lot)	12/1/0

Population segmentation	Overall Nutritional Outcomes
Remote Villages	0/9/4
Well-connected Villages	9/4/0
Thai	10/6/1
Mong	0/4/12
Normal wealth households	7/8/0
Poor or near-poor households	0/2/13
Pregnant women and mothers	0/8/7
Children under 5	0/8/8

Linking challenges and solutions

Based on the information and assessments above, priority challenges were identified. These were Food Value Chains, Nutritional Knowledge, and Food Quality.

The excel-based Intervention Recommendation Tool (see Sections 2.1.3.5 and 6.) was used identify a long list of potential activities to address those priority challenges. The long-list of innovations was used as a starting point for discussions among stakeholders, and after sense-checking and feasibility assessment, a short list was derived as shown in Figure 18. Participants were also free to suggest new and alternative innovations. Finally, stakeholders discussed and agreed upon several next steps that should complement the proposed prioritized activities.

Figure 7: Traffic light posters



Challenges

Several challenges within the food value chain have been identified. Key issues include poor quality of produce, which leads to reduced yields, along with low skills and inadequate production techniques. Additionally, limited access to markets hampers sales opportunities, forcing many individuals to independently contact supermarkets in Hanoi to sell their products.

Nutritional knowledge is another significant concern. Challenges highlighted include dietary habits during pregnancy and the need for proper supplementary feeding for children and family members. Many women face difficulties in utilizing locally available food and lack awareness regarding food safety. Illness among individuals and economic hardship further complicate the situation, particularly within the Hmong community, where the impact is most acutely felt among the poor.

In the context of crop cultivation and livestock raising, numerous areas require attention. Participants noted the need for better access to sources of seeds, care techniques, fertilizers, pesticides, and herbicides. Effective

harvesting and storage practices for agricultural products are essential. Participants emphasized the importance of guidelines for food processing—such as drying, dehydrating, packaging, and ensuring food safety—as well as training on the proper use of food after processing. Finally, protecting water sources emerged as a critical concern that needs to be addressed to support sustainable agricultural practices.

Linking challenges to solutions

The workshop participants short-listed as below from the identified solutions:

Improvement of Local Breeds: Utilize hybridization and artificial insemination techniques to enhance local livestock breeds.

Utilization of By-Products: Leverage by-products from livestock and crop production to maximize resource efficiency.

Training Programs: Conduct training sessions to enhance skills, promote the use of local by-products, and reduce costs.

Establishing Cooperatives and Enhancing Production.

Nutritional Technical Communication for Pregnant Women, Women of Childbearing Age, Breastfeeding Mothers, and Child Caregivers.

Adopting comprehensive guidelines for crop cultivation, livestock raising, safe food processing, and water source protection is essential for enhancing agricultural productivity, food safety, and sustainability.

Food value chains

The challenge is that poor-quality produce significantly reduces agricultural yields. To address this issue, improving local livestock breeds through hybridization and artificial insemination can enhance genetic quality and adaptability. This results in healthier animals that produce higher-quality outputs. These breeding techniques not only foster resilience but also ensure that livestock can thrive in local conditions while keeping costs manageable. Additionally, leveraging by-products from both livestock and crop production can significantly maximize resource efficiency. By integrating by-products into the production process—whether as feed, fertilizers, or other uses—farmers can minimize waste and enhance overall productivity. This approach aligns with the principles of closed-system farming, which emphasizes a circular economy within agricultural practices. Implementing a closed-loop system enables farmers to recycle nutrients and resources, further promoting sustainability and reducing the environmental impact of farming.

Low skills and inadequate production techniques present significant challenges in agriculture. To address this, implementing training programs can enhance farmers' skills, promote the effective use of local by-products, and help reduce operational costs. Furthermore, achieving product standards through certifications such as VietGAP and organic labels can significantly increase market prices and enhance the perceived value of agricultural products. Engaging stakeholders such as cooperatives, agricultural service centers, and veterinary services will further support these initiatives, leading to more sustainable agricultural practices and higher quality outputs.

Limited access to markets poses a significant challenge for producers, as many individuals independently reach out to supermarkets in Hanoi for sales. Establishing cooperatives can address this issue by providing legal status and facilitating certification processes, enabling easier operations for groups of farmers. By forming cooperatives with a minimum of seven members, farmers can enhance their bargaining power and streamline production. Focusing on advanced processing techniques, such as producing dried and chilled pork, can add value to their products. Establishing contractual agreements and utilizing digital platforms like websites and social media can further improve marketing efficiency and reach. Trademark registration will also help protect and promote these products, enhancing their market presence. By fostering collaboration, enhancing product value, and utilizing modern marketing methods, cooperatives can significantly increase income levels and generate working capital for further business expansion. These initiatives not only benefit local communities but also contribute to a more sustainable and structured agricultural market.

Nutritional Knowledge

Dietary habits during pregnancy are crucial for the health of both the mother and the developing child. Engaging in direct group communication with community members, such as women's associations and farmers' groups, can effectively address this issue. By conducting community meetings, health educators can share vital information about nutrition and its impact on pregnancy.

Awareness and behavior change initiatives are essential in promoting healthier dietary practices. Sharing experiences and success stories can motivate community members to alter their eating habits. Additionally, integrating various activities—such as cooking demonstrations, nutrition workshops, and discussions—can save time and make the learning process more accessible for mothers, encouraging them to adopt new cooking methods and healthier dietary choices.

By engaging with local groups and providing integrated activities, health educators can enhance understanding and encourage positive behavior changes. These efforts are vital for promoting maternal and child health and ensuring that pregnant women receive the necessary nutrition for a healthy pregnancy.

Adequate supplementary feeding for children and family members is essential for promoting health and well-being. Providing practical nutrition guidance tailored to various target groups can empower mothers to change their feeding behaviors and learn effective food preparation techniques. Utilizing locally available foods, such as eggs, frogs, toads, shrimp, crabs, fish, and vegetables, can reduce costs for families while ensuring nutritional adequacy.

Addressing the lack of food safety knowledge is crucial. Promoting diverse farming practices, alongside raising awareness about the risks of consuming meat and food from unknown sources, can enhance food safety. Hygiene education, particularly emphasizing handwashing practices within the Mong ethnic group, will improve overall health by increasing knowledge of safe food handling.

Additionally, advocating for dietary guidelines suitable for individuals with high blood pressure and diabetes can help manage illnesses. Educating communities on safe practices for selecting mushrooms and honey, as well as the importance of clean water and sanitation, will reduce incidents of poisoning.

Economic hardship further complicates these issues, particularly within the Hmong community. Promoting awareness of livelihood support policies and providing hands-on training can empower individuals to implement practical solutions. Engaging influential community members, especially women, to disseminate information is vital for effective outreach. Finally, advocating for maternity leave policies that support recovery for new mothers is essential, as many return to work shortly after childbirth.

By focusing on local food utilization and engaging community members in education and training, these initiatives can lead to better nutrition, reduced illness, and improved economic stability. Furthermore, advocating for supportive maternity policies will ensure that new mothers receive the necessary care and recovery time, ultimately benefiting both mothers and their children.

Food Quality

The integration of effective crop cultivation and livestock raising practices—encompassing seed sourcing, safe animal feed, timely harvesting, proper storage, and food processing—is vital for enhancing productivity and food quality. By engaging stakeholders such as agricultural service centers and targeting key audiences like workers and women of childbearing age, these initiatives can be effectively implemented. Additionally, training on the proper use of food post-processing and guidelines for protecting water sources will contribute to improved food safety and environmental health. Collectively, these efforts will promote sustainable agricultural practices, ensuring high economic benefits and community well-being.

RMIT Classification: Trusted

Table 18: Priority activities to address the food and nutrition security challenges in Mai Son

Group	Challenges	Intervention	Expected Outcome
Food value chain	Poor quality of produce (by-products), leading to reduced yields.	**Improvement of Local** Breeds: Utilize hybridization and artificial insemination techniques to enhance local livestock breeds. **Utilization of By-Products**: Leverage by-products from livestock and crop production to maximize resource efficiency.	**Enhancing Breeding Quality**: Improve the quality of livestock by utilizing available breeds that possess adaptive traits, while maintaining low costs. **Closed-System Farming**: Implement a closed-loop system in farming practices to maximize resource efficiency and sustainability.
	Low skills and production techniques.	**Training Programs**: Conduct training sessions to enhance skills, promote the use of local by-products, and reduce costs.	**Standards and** Certification **in Agriculture and Livestock** **Product Standards**: Achieving certifications such as VietGAP and organic standards leads to increased prices. **Certification Value Addition**: Certification enhances the perceived value of products. **Target Audience**: Producers and livestock farmers. **Stakeholders**: Cooperatives, groups/teams, Agricultural Service Centers, veterinary services. Outputs: VietGAP certification (agricultural products, Resolution 128 certification), Department of Agriculture, Quality Centers for certification issuance. **Frequency**: Dependent on the respective organization.

RMIT Classification: Trusted

Group	Challenges	Intervention	Expected Outcome
	Limited access to markets (many individuals independently contact supermarkets in Hanoi for sales).	**Establishing Cooperatives and Enhancing Production** **Establishment of Cooperatives**: Form a cooperative (with legal status and official seal for easier operations—minimum of 7 members) or a group (with 3 or more members) to facilitate certification. **Advanced Processing**: Focus on specialized processing of products such as dried pork and chilled pork. **Contractual Agreements**: Establish linkage contracts, plan production effectively, and enhance marketing efficiency through platforms such as websites, Zalo, Facebook, etc. **Trademark Registration**: Register trademarks to protect and promote products.	Goals **and Management in Agricultural Production** **Product Sales**: Sell a wide range of products. Increase **Income**: Enhance overall income levels. **Working Capital**: Generate revolving capital for production and business expansion. **Target Audience**: Local villages and communities. **Management**: Governed by cooperatives and agricultural extension services at the commune level. Outputs: Participation in trade fairs and agricultural product exhibitions. Binding linkage contracts. Establish connections for project coordination.
Nutritional Knowledge	Dietary habits during pregnancy.	**Direct Group Communication**: Engage in direct communication with community groups. **Community Meetings**: Conduct meetings with women's associations and farmers' groups.	Awareness **and Behavior Change Initiatives** **Enhancing Awareness**: Share experiences to promote behavior change among community members. **Integrated Activities**: Combine various activities to save time and increase accessibility, encouraging mothers to adopt new behaviors and learn cooking methods.
	Proper supplementary feeding for children and other family members.	**Nutritional Practice**: Provide practical nutrition guidance for various target groups.	To enable mothers to change their behavior and learn how to prepare food properly
	Utilization of locally available food.	**Cooking Education**: Share knowledge on preparing available foods such as eggs, frogs, toads, shrimp, crabs, fish, and vegetables.	**Cost Reduction**: Aim to reduce costs for families.

RMIT Classification: Trusted

Group	Challenges	Intervention	Expected Outcome
	Lack of food safety knowledge.	**Diverse Farming Practices**: Promote diverse food production through livestock and crop cultivation. Food **Safety Awareness**: Raise awareness about the risks associated with selling meat and food from unknown sources. **Hygiene Education**: Promote handwashing practices, particularly among the Mong ethnic group.	**Knowledge Improvement**: Increase the knowledge of vendors and consumers regarding safe food practices.
	Illness among individuals.	**Dietary Guidelines**: Advocate for dietary practices suitable for individuals with high blood pressure and diabetes. **Mushroom and Honey** Selection: Educate on safe practices for selecting mushrooms and honey. Clean **Water and Environmental Awareness**: Communicate the importance of clean water, sanitation, and hygiene facilities.	**Poisoning Prevention**: Reduce incidents of mushroom and honey poisoning.
	Economic hardship.	**Livelihood Support** Policies: Promote awareness of livelihood financing policies.	
	The Hmong community, particularly among the poor.	**Hands-On Training**: Provide direct, hands-on training to enable practical implementation.	**Direct Engagement**: Conduct initiatives directly within villages.
	The Hmong community.	**Influential Community Members**: Engage respected individuals in the community to disseminate information, particularly targeting women. Maternity **Awareness**: Promote awareness regarding maternity leave, emphasizing the need for support as women may return to work just 10 days after childbirth.	Maternity **Leave Policies**: Advocate for policies that support maternal rest and recovery during maternity leave.
	Activities**: Nutritional Technical Communication for Pregnant Women, Women of Childbearing Age, Breastfeeding Mothers, and Child Caregivers** **Methods**: Nutritional practice sessions. Direct communication at local villages; printing and posting guidelines at community centers. Village meetings and women's associations (conducted in a friendly manner, avoiding excessive formality).		

RMIT Classification: Trusted

Group	Challenges	Intervention	Expected Outcome
	Short videos presented during meetings. **Frequency**: Twice a year, in conjunction with child weighing activities (limited resources prevent more frequent implementation). **Challenges**: Funding, gifts, and food for each participant, such as pots, pans, cooking oil, etc.		
Food Quality	**Crop cultivation and livestock raising:** (sources of seeds, care techniques, fertilizers, pesticides, herbicides).	Productivity and food quality.	**New seeds and care** techniques**.** **Safe and reliable animal feed.** **Crop cultivation:** legumes and pumpkins. Livestock **raising** pigs, chickens, fish, and aquatic products. Stakeholders**:** Agricultural service centers (district level); agricultural extension services and veterinary care (commune level). **Target audience:** Workers and women of childbearing age. **Frequency:** Twice a year (March and April).
	Harvesting **and storage of agricultural products.**	Timely harvesting, with adequate time for pesticide and veterinary drug withdrawal. Proper storage methods.	Clean products. Maintaining quality and yield in crop and livestock production to ensure high economic benefits and efficiency.
	Guidelines for proper processing: drying, dehydrating, packaging, and identifying safe food (food selection).	Free from pests, mold, and moisture. Preserving nutrient content.	Ensuring nutritional value after processing. **Frequency:** Twice a year. **Note:** Combine with activity 1 to save on costs, time, and resources.
	Training on the proper **use of food after processing.**	Preventing food poisoning. Avoiding the use of spoiled or expired food. Purchasing food with clear origins and remaining shelf life.	Prevent **food poisoning.**
	Guidelines for protecting water sources.	Collecting pesticide containers, manure, and animal waste.	**Improve water quality and the environment.**

Conclusion

Several bottlenecks to improved food and nutrition security exist in Mai Son. The analysis of Mai Son's food system highlights several interconnected bottlenecks, including favorable market access and price stability overshadowed by cash shortages and underdeveloped value chains in storage and processing, which threaten food quality and nutritional health. Emerging concerns about nutritional knowledge and equitable policies hinder access to nutritious foods, while strong governance, despite poor public infrastructure, provides crucial support through state and NGO initiatives for financial services and healthcare. Additionally, while the region demonstrates significant agricultural productivity, climate-related risks and natural disasters pose challenges to sustained farm production. To improve food security and health outcomes, it is essential to prioritize infrastructure development, educational initiatives, equitable policies, and effective resource management, fostering a more resilient and sustainable food system that benefits the entire community.

To address these issues, a comprehensive approach is necessary. Solutions include improving local livestock breeds through hybridization, leveraging by-products for resource efficiency, and conducting training programs that enhance production skills. Establishing cooperatives can improve market access and bargaining power, while nutritional education targeting pregnant women and caregivers can promote healthier dietary practices.

Overall, by integrating effective agricultural practices with community engagement and education, stakeholders can foster sustainable development, improve food quality, and enhance the well-being of vulnerable populations, particularly within the Mong ethnic group.

Collaborative efforts, including training programs, the establishment of cooperatives, and comprehensive awareness initiatives, will not only empower farmers and families but also foster a more structured and sustainable agricultural market. Ultimately, these strategies will enhance food security, improve economic stability, and promote the overall well-being of local communities, creating a healthier and more resilient future.

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Appendices

Appendix 1: Summary documents presented at the participatory evaluation workshop

The key findings of the report were summarized into posters and brief information notes, which were provided to the workshop participants. Additionally, one of the report's authors was available to explain and discuss the findings with stakeholders. The feedback from stakeholders was collected and incorporated into the final draft of the report. This appendix includes summary posters, evaluation posters, and information notes.



Mai Son site evaluation

Nutritional outcomes, food consumption & sourcing

Nutritional outcomes

- High rates of stunting in children under five years old are a common and worrying problem.
- The rate of stunting ranges from 23.4% to 28.5%.

Nutritional indicators

- Equal distribution of food by gender, with differences by area.
- There is no "meal break". Food insecurity is mild, with one-third of households being moderately food insecure.

Foods consumed and sourcing

- Cereals, roots, starchy tubers, leafy vegetables and other vegetables, meat are widely consumed.
- Nuts, beans, fruits and vegetables rich in vitamin A, eggs and milk consume less.
- Consumption trends change seasonally.
- Men consume more insects and traditional dishes than women.
- Practicing NCBSM and taking supplements is not reasonable.
- Boarding meals 2 meals/day.
- Parents send rice (rice, eggs/barbecue, cross occipital) if they do not eat at the boarding house.

Vulnerable (target) groups

- Poor and near-poor households, few sustainable livelihood opportunities, few assets, and indiverse food consumption.
- Children, pregnant women, mothers with small children.

The Food Environment

Markets and value chains

- Difficulties in output and distribution.
- Food retail outlets are diverse, easily accessible to people.
- The market is highly appreciated for its diversity and affordable prices, but there are still concerns about food safety.
- Prices fluctuate seasonally and according to special events.
- Fish and eggs are less volatile, pork and beef have the most volatility.

Governance

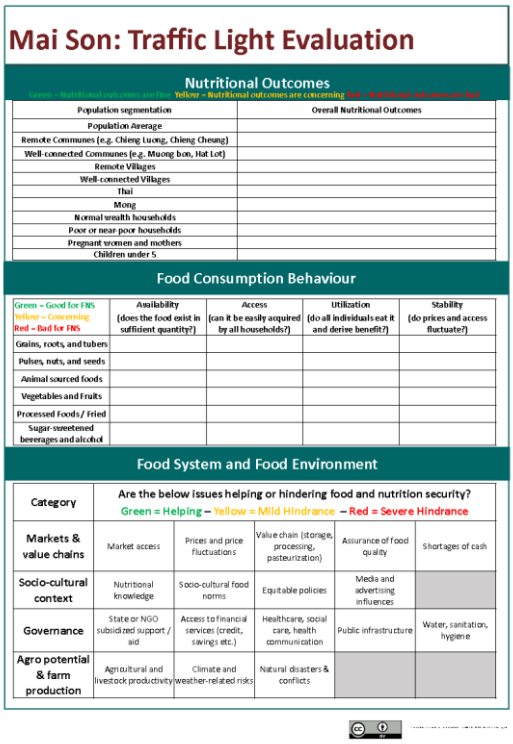
- Support policies for poor households, near-poor households, children and farm households.
- Support for food, livelihoods, education, technology, housing.
- Supporting the development of large cattle breeding.
- Wash your hands with soap infrequently, wash your hands after processing raw food.
- Pay attention to food safety, limit eating raw food.

Socio-cultural context

- Some foods are contraindicated for pregnant women, postpartum mothers, and children.
- Priority is given to children, pregnant women, and breastfeeding mothers.
- Women decide to consume small "two-legged" pets and eggs. Men decide on "four-legged" large pets.

Agro potential and farm production

- The potential for large production, cultivation, livestock and a portion of food supply for daily needs.
- Farm-scale livestock.
- Crop conversion reduces livestock and lacks diverse food sources.
- The main source of income is from the sale of agricultural products.



Mai Son: Traffic Light Evaluation

Nutritional Outcomes

Green = Nutritional outcomes are fine Yellow = Nutritional outcomes are concerning Red = Nutritional outcomes are bad

Population segmentation	Overall Nutritional Outcomes
Population Average	
Remote Communes (e.g. Chieng Luong, Chieng Cheung)	
Well-connected Communes (e.g. Muong bon, Hat Lot)	
Remote Villages	
Well-connected Villages	
Thai	
Mong	
Normal wealth households	
Poor or near-poor households	
Pregnant women and mothers	
Children under 5	

Food Consumption Behaviour

Green = Good for FNS Yellow = Concerning Red = Bad for FNS	Availability (does the food exist in sufficient quantity?)	Access (can it be easily acquired by all households?)	Utilization (do all individuals eat it and derive benefit?)	Stability (do prices and access fluctuate?)
Grains, roots, and tubers				
Pulses, nuts, and seeds				
Animal sourced foods				
Vegetables and Fruits				
Processed Foods / Fried				
Sugar-sweetened beverages and alcohol				

Food System and Food Environment

Category	Are the below issues helping or hindering food and nutrition security? Green = Helping – Yellow = Mild Hindrance – Red = Severe Hindrance				
Markets & value chains	Market access	Prices and price fluctuations	Value chain (storage, processing, pasteurization)	Assurance of food quality	Shortages of cash
Socio-cultural context	Nutritional knowledge	Socio-cultural food norms	Equitable policies	Media and advertising influences	
Governance	State or NGO subsidized support / aid	Access to financial services (credit, savings etc.)	Healthcare, social care, health communication	Public infrastructure	Water, sanitation, hygiene
Agro potential & farm production	Agricultural and livestock productivity	Climate and weather-related risks	Natural disasters & conflicts		

Food systems, environment and nutrition: A structured evidence framework (FoodSENSE)

Mai Son – 2024

Introduction

This is a summary of the key findings from a study of the local Food System, Food Environment, and Nutrition situation in Mai Son Mai Son District, Son La, Vietnam. The study was led by the National Institute of Nutrition (NIN) and supported by the International Livestock Research Institute (ILRI), as part of the CGIAR SAPLING initiative. The aim of this study is to identify and prioritize interventions to improve nutritional outcomes in Mai Son, based on an evidence-based assessment of the entire food system and food environment.

This brief summarizes the key findings from the full report to prepare stakeholders for the discussion workshop where the challenges and opportunities within the food system will be evaluated and prioritized. The study was conducted in four communes in Mai Son district (Son La province, Northwest region of Vietnam): Chieng Luong, Chieng Chung, Muong Bon and Hat Lot, selected to represent both well-connected and remote communes, as well as a diversity of agricultural activities. It is expected that the findings from these communes will be representative of Mai Son district. Mai Son District is a key economic district located in the economic triangle cluster of Son La City - Mai Son - Muong La, but the poverty rate of the whole district is up to 18.5%. Chieng Luong commune is particularly difficult a commune in region III, inhabited by ethnic minorities in mountainous area with a poverty rate of 11.56% of households. In the other communes, the Thai and Mong ethnic groups make up the majority. Data were collected from focus group discussions (FGDs) with members of the public, key informant interviews (KIIs) with local and national experts, as well as local traders, literature reviews, and analysis of household survey data.

The findings are summarized according to the themes covered in the Food Security, Environments, and Nutrition Structured Evidence framework (FoodSENSE). These findings describe the context in which food is supplied and decisions are made (“food systems and food environments”); describe the foods people choose to eat (“food consumption behaviours”); and describe food security and nutrition outcomes for the population, identifying any sub-populations that are experiencing significantly worse outcomes than others (“Nutrition outcomes and equity issues”). During the workshop, we will invite all attendees to an assessment of each of the topics under a traffic light “red/yellow/green” system; and to prioritize potential solutions to the identified challenges. All feedback will be recorded and used to complete the final report.

Theme 1: Food systems and food environments

2.1 Market and value chain

2.1.1 Market access

The main food purchasing points of the people in the four communes are quite diverse, including retail outlets (grocery stores), stalls, gardens, village markets and markets in and outside the commune. In Chieng Chung commune, the purchasing points of the people are also small slaughterhouses in the area. Hat Lot commune has a market in the area.

Imported goods come from 3 main sources including: products raised and grown in households mainly and some caught (shrimp, fish...), imported goods from other provinces (industrial chicken eggs...) and harvested from the forest (wild vegetables and bamboo shoots).

Retail outlets in each commune are mostly concentrated in the central area, where people can easily travel to by motorbike in a few minutes. The main foods sold are pork, beef, chicken, vegetables, tofu and prepackaged foods (candy, instant noodles, snacks, soft drinks). Fish is also sold but less. The market is appreciated for its variety of products and affordable prices, although hygiene can be a concern.

Product prices and fluctuations

Food prices fluctuate seasonally and according to special events. Food prices usually increase during the dry season and decrease during the flush season (e.g. sticky rice in August and September). Prices of staple foods, especially rice and animal-based foods (pork, beef, chicken), often increase during traditional festivals such as Lunar New Year and the Thai Xen Ban Festival.

Fish and eggs have minimal price fluctuations due to local self-sufficiency from ponds and streams.

Pork and beef prices are more volatile, increasing significantly during holidays (Vietnam National Day, Lunar New Year). Beef is the most expensive and most volatile food; prices typically range from VND150,000 to VND270,000/kg, often exceeding VND240,000/kg during peak season. Low consumption due to high prices, reserved for special occasions.

Value chain

Livestock cooperatives are composed of inefficient, small-scale producers with weak linkages between stakeholders, difficulties in securing stable output markets, and volatile product prices. Transport and distribution difficulties persist, especially in remote Hmong villages where poor road conditions impede access.

In the 4 communes, people grow many types of food crops, fruit trees and raise many types of livestock, however, most of them do not follow the official land use planning guidance. Most of the communes have cooperatives, but most of them operate on a small scale, are ineffective, and are not the main source of purchasing in the area. Most of the agricultural products and livestock products of the people are used for the needs of family members and sold to traders; then the traders will sell to processing and production facilities in Mai Son district.

There is currently no closed livestock value chain, although large-scale livestock farms are developing in the province. There are 7 large-scale pig farms located in the communes of Co Noi, Chieng Mung, Chieng Chung, Hat Lot and Muong Bon. Notably, Chieng Luong has no livestock farms or slaughterhouses.

Ensure food safety

Food-related illnesses are closely linked to hygiene issues: unsanitary practices (due to customs, lack of food, or hoarding), inadequate conditions for food preparation and storage leading to spoiled food (such as insufficient economic means to purchase a refrigerator, living in a hut without electricity, etc.), and toxic food of unclear origin (such as poisonous mushrooms, toad meat, bedbugs, cicadas, etc., as well as food contaminated with pesticides).

Food purchases are influenced by perceptions of the cleanliness of food and vendors. Food washing is widely practiced due to concerns about food safety. Hand washing rates before preparing and consuming food are relatively high, however, hand washing with soap is low, especially in some highland Mong villages, depending on food preparation, “if raw, use soap”.

Food safety is a concern not only for consumers but also for vendors (related to the supply of food), which was commonly mentioned in KIIs and FGDs. Community awareness of food safety and hygiene significantly influences food purchasing decisions and practices. Food purchases are greatly influenced by the perceived cleanliness of food and vendors. Focus group participants expressed concerns about food safety, many said they washed and soaked food bought at the market in salt for fear of poisoning. Consumers pay close attention to expiration dates when choosing food, reflecting a high level of concern for food safety. People in the four communes have progressive views and are conscious of food safety issues such as not eating raw food, salads, and lap (traditional dishes), especially for vulnerable groups such as children, pregnant women, and breastfeeding mothers.

Socio-cultural context

Many ethnic groups have specific foods that are considered taboo for certain groups, such as:

For children: Spicy foods, blood pudding, alcohol, certain types of fish and beef due to perceived toughness or choking hazard.

For pregnant women: Alcohol, carbonated drinks, certain vegetables (e.g. spinach, bitter melon) and fruits (e.g. longan, lychee) are said to cause miscarriage or other health problems.

For postpartum mothers: Beef, alcohol and raw foods are often avoided, reflecting fears about recovery and health.

Nutritional knowledge

The FGDs revealed that “word of mouth” and personal experience were the two main sources of information regarding food purchase and preparation. Health workers (from health stations) were a reliable source of information on food production, nutrition and food safety. Local veterinarians were also valuable for information on food safety. Other sources included social media (Facebook, YouTube), community radio and especially Zalo groups managed by village leaders, which facilitated food exchange among people. Training for community leaders is important to educate people on effective food preservation and preparation techniques. The role of health workers and nutritionists should be emphasized in nutrition communication activities.

Food Standards and Expectations

There is no male bias in the consumption of animal-based foods, on the contrary, these foods are preferentially consumed by children, pregnant women, and nursing mothers.

Differences in food preparation and consumption are shaped by local customs, with families prioritizing children's preferences at mealtimes. Sticky rice consumption reflects cultural traditions, particularly among the Thai community, while the Kinh and Mong communities have distinct eating habits, such as preferring white rice over sticky rice.

Most decisions regarding the selection and preparation of food in the family and the slaughter of small domestic animals, such as poultry (chickens, geese, ducks, etc.) and eggs, are made by the women in the family (wife, mother, or grandmother). With “four-legged” animals, the decision to slaughter depends on the head of the family, the man in the family (husband, father), however, these decisions are discussed and approved with the women in the family. In addition, "Whoever is convenient buys, who makes better food, cooks". This decision and role transfer is relatively flexible among family members.

Administration

Locally, there are support policies for poor and near-poor households, children and farming households. Agricultural policies in Son La province, especially resolutions supporting the development of large-scale livestock farming, have shown significant attention to improving the lives of people in particularly difficult communes. Although current programs mainly focus on large-scale livestock farming households, expanding support for small-scale farming households is essential, as this is the group that needs the most assistance. In the social context, policies and programs to support children and poor households also demonstrate the efforts of local authorities to improve people's lives. The provision of health insurance cards for children under six years of age by the government and local authorities, along with support for school meals in kindergartens, are important steps toward ensuring the health and nutrition of future generations. Community participation in supporting each other in difficult times also reflects the deep spirit of solidarity and mutual assistance in society. These efforts not only help reduce poverty but also promote sustainable development and improve the quality of life for people in disadvantaged communes. In short, current policies and programs need to be adjusted and expanded to better meet the actual needs of the community, thereby creating a solid foundation for long-term development.

Formal social support

Financial Services

People from poor and near-poor households are supported with food (rice) during the lean season (before Tet) and receive subsidies according to state regulations; in addition, they also enjoy preferential loan policies from the social policy bank with a loan of 50 million VND/household and an interest rate of 5%. However, a loan of 50 million VND/year will only be enough for small-scale livestock farming (1-2 cows), not enough for growing agricultural products (such as coffee) due to the relatively high cost of fertilizers and pesticides. Usually, farmers often buy these items in advance (buy on credit), then pay when receiving a loan or support from the bank. Regarding loan policies for livestock farming, KIIs with representatives of the farmers' association in Chieng Chung showed that to be eligible for loans for livestock farming, farmers must ensure grass growing areas, while in the current situation, grass growing areas have been narrowed because farmers have converted their models to growing some agricultural products such as coffee and macadamia which have higher profits, and beef products have a record low price compared to previous years due to reduced demand because they cannot export to the Chinese market.

Public infrastructure

Water, sanitation and hygiene practices

The water supply for Mai Son district is generally from rivers and streams. There was a serious water shortage in April 2024 in Mai Son. Hat Lot Commune and Chieng Chung Commune are served by the Na San irrigation canal system. Communes have different water sources: Dug wells, drilled wells, Troughs, self-flowing, Rainwater tanks, Tap water. Sanitation standards are generally high, but challenges such as water shortages still exist. Troughs and self-flowing are the most used water sources by people in Chieng Luong commune (accounting for 94.5%) and Chieng Chung commune (95.4%). Meanwhile, rainwater stored in tanks are the two main water sources in Muong Bon (28.9%) and tap water in Hat Lot (47.9%). This depends on the geographical location and terrain and traffic connections of the communes. Hat Lot and Muong Bon communes are two communes located close to the centre of Mai Son district and have more favorable terrain than the remaining communes. Although there is tap water, people in Muong Bon commune still mainly use other water sources such as rainwater tanks, gutters, self-flowing and drilled wells.

People of Chieng Luong commune are supported with scattered domestic water (according to the National Target Program for Ethnic Minorities): 30 households are supported with water tanks with a value of no more than 3 million VND/household.

The main types of latrines used by people are (1) Septic tanks, (2) Semi-septic tanks, (3) Two-compartment latrines, (4) Ventilated sunken latrines and some other types. Chieng Chung and Hat Lot are two communes with a relatively high rate of households with hygienic latrines (85.7% and 86.7%) and higher than the other two communes, Chieng Luong and Muong Bon (60.5% and 61.65%, respectively). However, hygienic toilet use among poor households remained low in all communes, suggesting the need for targeted interventions to improve sanitation standards for vulnerable populations.

Agricultural production

The agricultural economy in the district continues to shift in a positive direction, gradually adapting to climate change and market demand, maintaining and developing a number of concentrated production areas of the district's products (coffee, mango, longan, custard-apple, etc.); the area of high-tech application is expanded, creating a premise to increase productivity and quality of agricultural products in the process of restructuring the agricultural sector. Gradually converting from inefficient corn, upland rice, and mixed gardens to other crops with high economic efficiency combined with the application of new scientific and technological advances in production, contributing to increasing the production value on the land area used and raising the income level for rural people.

In the district, there are 10 communes with large cattle herds of over 2,000, including Chieng Luong commune and Hat Lot commune. According to statistics across the province, the average household size for large cattle farming is 2.49 animals/household. Households often face challenges in livestock farming due to disease outbreaks, especially in pigs and poultry.

Chieng Luong: Households have switched from growing corn, cassava, and upland rice to growing longan, mango, and coffee under the canopy. Sugarcane is also the main crop of the commune, ensuring stable output thanks to the Son La sugar factory. The conversion of crops has reduced livestock in the area, leading to a lack of diverse food sources.

Chieng Chung: Arabica coffee is the main crop in Chieng Chung commune, bringing high economic value to the local people.

Hat Lot: has advantages in climate and land conditions, has strongly developed citrus fruit growing areas into concentrated production areas. Main fruit trees include orange, custard apple, mango, longan, grapefruit. Main income the main source of income for the people comes from selling agricultural products such as longan and mango. Livestock is mainly raised to provide food for the family; the number of buffalo and cows is insignificant.

Muong Bon: forming enterprises and cooperatives, creating concentrated agricultural production areas with key crops such as longan, mango, and safe vegetables. In addition, the commune also develops two-crop rice production, sugarcane, vegetables and fruit trees. In the commune, Tien Phong Lake provides irrigation water for agricultural production, helping people mainly grow rice. Livestock and poultry are maintained stably with 04 breeding models: beef cattle, pigs, goats and chickens.

Risks related to climate and weather

Mai Son district has great potential in terms of land resources for agriculture, however, agricultural production in the area is being affected by climate change. This year's climate is recorded as drier than previous years, especially in March, April, and May, negatively affecting agricultural production, especially crops. Due to the complicated and erratic weather, hot and cold conditions are favorable for disease outbreaks and easy spread, so pigs often suffer from diseases.

Natural disasters, conflicts, or other shocks

With some livestock products, because China, the product's major output market, imposes higher taxes, selling the products is very difficult.

Theme 2: Food consumption behavior

Commonly consumed foods

Figures 1.2 show the food groups consumed by the food and nutrition security (FNS) tercile during the lean and flush seasons. Starches, leafy and other vegetables, and meat are widely consumed. Consumption gaps appear to be for nuts, legumes, fruits and vegetables rich in vitamin A, eggs, and milk. Milk tends to be consumed more in Muong Bon and Hat Lot during the lean season, but the opposite trend occurs during the flush season. There is also evidence of seasonal effects.

Figure 1: Food groups consumed during the lean season according to food and nutrition security

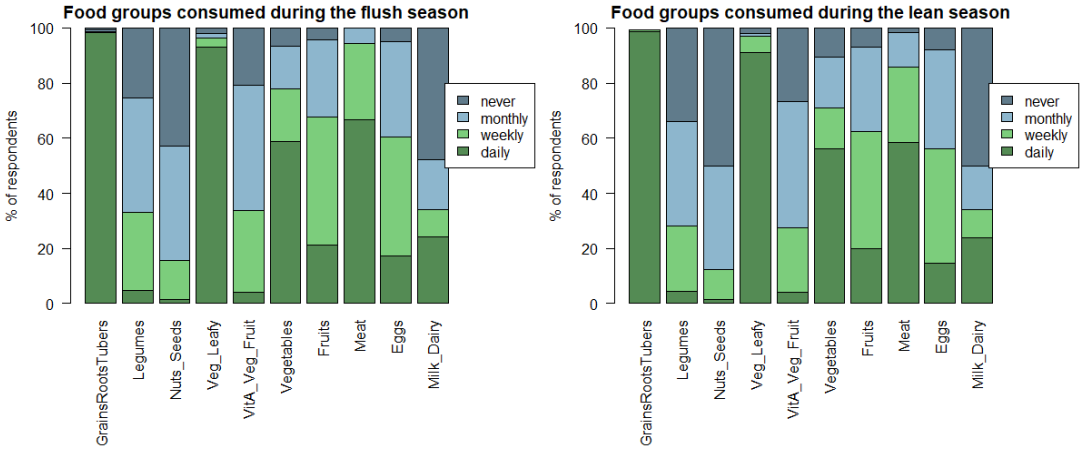
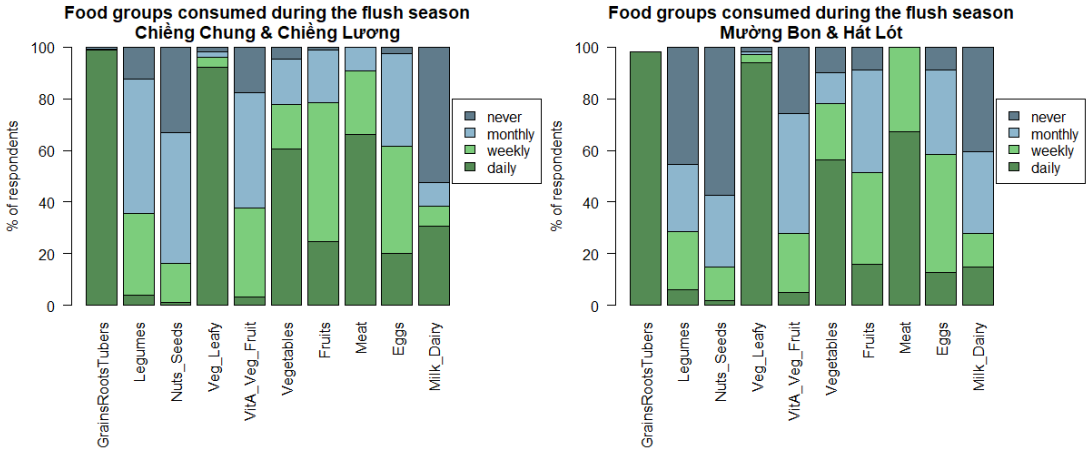


Figure 2: Food groups consumed during the flush season according to food and nutrition security



Consumption by food group

Food consumption patterns show diverse preferences influenced by cultural practices, ethnicity, local agriculture and economic factors. The least consumed food group is nuts (peanuts). The dairy food group, milk products are consumed mainly by children, including cow's milk products and soy products. Consumption of animal-based foods: such as pork, chicken, duck, fish, and goose are frequently consumed foods, especially fish. Fish is especially popular due to its availability in rivers and lakes, of which grilled fish and fish salad are traditional dishes. Eggs are commonly consumed, especially by young children. However, many households prefer to hatch chicken eggs for resale rather than direct consumption. Men tend to limit their favorite foods, often avoiding items such as tofu and beans, with preferences leaning towards sticky rice, pork and traditional dishes. Women prioritize nutritious meals for children and often purchase meat and dairy products from trusted sources.

Foods consumed by age or gender group.

Children from 2 to 5 years old often eat porridge, milk, fruit, snacks, eggs, pork, chicken, and fish. For older children (from 6 to 10 years old), some of the foods consumed are porridge, sticky rice, milk, chicken, pork, beef, fish, chicken thighs, eggs/fried eggs, sausages, tomato sauce beans, candy, vegetables, fruit, candy, chips, zero-degree green tea, soft drinks, orange juice, milk tea. Instant noodles, spicy noodles, and milk tea are typical foods frequently consumed by adolescents (11-17 years old). Preferences differ between males and females, with chicken and fish being the preferred foods for females but not consumed by males. In addition, there are some local specialties such as insects.

Food consumed too much or too little

According to KIIs, foods that are over-consumed are sticky rice, pork and alcohol. Some foods are consumed more on special occasions such as pork and beef during holidays, Tet and the Thai Xen Ban festival. Some foods derived from livestock such as buffalo meat, beef and goat meat and seafood are more expensive, so they are less likely to be able to supplement daily meals. Consumption of foods derived from livestock is under-consumption for poor households. The supporting factors agreed by participants are that these foods are self-sufficient and available on the market.

There are five main barriers to food consumption including (1) Cultural beliefs and food taboos by many ethnic groups for children, pregnant women or nursing mothers; (2) Economy (shortages of supply, especially for poor households with affordability problems, influencing the level of household food diversity) ; (3) Dietary preferences (related to taste and preparation); (4) Nutrition knowledge and education; and (5) Social norms and practices.

Specific barriers to the consumption of livestock-derived foods include high prices (except for poultry-derived products), the large size of certain livestock, limited availability, and food preferences that render these foods unpalatable, difficult to consume, or challenging to prepare. Pork is more commonly consumed due to its lower price, flavor and versatility in preparation compared to beef or buffalo. Traditional dishes and eating habits favor certain meats during festivals or special occasions, but many animal products are reserved for celebrations, resulting in infrequent consumption in everyday life and reinforcing the perception that these foods are special rather than everyday staples. Limited awareness of the nutritional benefits of livestock-derived foods can also lead

to underconsumption. The beliefs and practices of older adults can also influence food choices, impacting the eating habits of younger generations.

There is seasonal availability of fruits and vegetables, requiring grocery shopping for a varied diet.

Gender differences: Although there are no strict gender differences in animal consumption, the focus on food taboos primarily affects pregnant and lactating women, affecting household eating practices. Gender is not a barrier to animal food consumption.

Feeding the children

The KII highlighted that infants are often fed low-density foods such as porridge, and too early. This was also commonly reported in FGDs. Participants of FGDs explained that exclusive breastfeeding usually lasts for about 6-8 months, although complementary feeding can be introduced earlier, around 5-6 months of age when the first solid foods are introduced. Partial breastfeeding continues until the child is 13 to 15 months of age. The solid foods are mainly glutinous rice flour (cooked with meat + vegetables, no oil), the complementary meals are relatively similar to those of children in other areas, except that the type of flour commonly cooked with Kinh people is usually rice flour. Breast milk substitutes reported are powdered milk (cow's milk).

Children's diet and school meals

The nutritional status of children in Mai Son communes is an issue that needs attention. Despite efforts to organize meals at kindergartens, there are still many challenges in accessing nutritious food, especially in remote areas. Organizing meals at these communes plays an important role in ensuring that children are provided with adequate nutrition.

All four communes provide boarding meals for students, usually through a central school with other separate locations. Boarding meals are comprised of two daily offerings: a principal meal, which is lunch, and an afternoon snack. In individual schools without organized meals, parents often bring their own food for their children, which may include rice, eggs or grilled meat. There is considerable variation in the quality of meals between families based on economic status. Better-resourced families provide meals that include meat and fish, while less fortunate families may be served simpler dishes, such as rice with a local dipping sauce (cham cheo).

Theme 3: Nutrition outcomes and equity issues

Food security indicators:

In Muong Bon and Hat Lot communes 12% of households were unable to meet their basic energy needs while only 3% of households in Chieng Luong and Chieng Chung communes were unable to meet their basic energy needs (Table 2). The average household experienced food shortages for about 1.3 - 1.4 months a year with 19% and 26% of households experiencing food shortages for more than two months a year in Chieng Luong and Chieng Chung communes compared to Muong Bon and Hat Lot communes. Acceptable average dietary diversity scores were observed in both the flush season (mean scores of 6.1 and 5.5) and the non-flush season (mean scores of 5.6 and 5.2). However, in the lean season, the number of households scoring below 5 was higher than in the flush season, which may indicate inadequate dietary intake. In more remote areas, the proportion of households with an acceptable diversity score was lower than in well-connected areas. Comparing locations, during the flush season households consumed a higher diversity of foods in more remote areas than in well-connected areas. This suggests that seasonality is a geographical issue for about a third of households.

There is equality in food distribution between men and women but there are geographical differences: well-connected areas had higher proportion of households with a lower diversity score than more remoted areas. In terms of gender, men have a lower diversity score in their diet in well-connected areas than men in more-connected areas (4.5 and 5.2, respectively). Similarly, women in these two areas have a consumption rate with a diversity score of 4.3 and 5.2.

The average dietary diversity score during the high and lean seasons was less than 1.5 food groups per week, and nearly one-third of households ate three or fewer food groups per week.

In general, considering the 4 communes, although having different economic status, all groups believe that currently there is no situation of people going hungry, or not having enough food to have 1 or 2 meals a day, "not missing meals", but only difficulty in having enough food for 3 meals a day. The lack here is not about the quantity of food but about the number of types of food, some food groups are lacking, or not available.

These data are taken from household surveys conducted under the Li-Chan project in 2020. Responses from four communes were grouped into two groups: remote communes (Chieng Chung and Chieng Luong) and more connected (Muong Bon and Hat Lot). The overall picture is one of mild food insecurity, with around a third of households in moderate food insecurity. Consumption of animal-based foods is high, with over 90% of respondents having eaten them in the 24 hours prior to interview. On a monthly basis, most respondents ate animal-based foods at least once a week. The other most consumed food groups were cereals (mainly rice), dark green leafy vegetables, other vegetables and fruits. Notably, vitamin A-rich fruits and vegetables, as well as legumes, were consumed significantly less.

Table 1: Summary of food security and nutrition indicators

Indicator	Commune type	Mean	SD	Acceptable score (threshold)	% worse than threshold
Potential food availability (if all income was used to buy rice) (kcal/pers/day)	Remote	19,845	15509	>=2500	3%
	Connected	18,296	29663	>=2500	12%
Months food shortage	Remote	1.3	1.6	<=2	19%
	Connected	1.4	1.5	<=2	26%
FIES (0-8)	Remote	1.76	2.0	<=2	35%
	Connected	1.68	1.9	<=2	24%
HDDS (lean) (1-10)	Remote	5.6	2.0	>=5	29%
	Connected	5.2	2.0	>=5	43%
HDDS (flush) (1-10)	Remote	6.1	2.0	>=5	23%
	Connected	5.5	2.1	>=5	37%
Diff in HDDS flush vs lean	Remote	0.4	1.0	<=2	5%
	Connected	0.3	1.0	<=2	5%
Male IDDS 24hr	Remote	5.2	1.8	>=5	41%
	Connected	4.5	1.6	>=5	57%
Female IDDS 24hr	Remote	5.2	1.6	>=5	35%
	Connected	4.3	1.5	>=5	59%
% animal-source foods consumed in the past 24h	Remote	91%	-	-	-
	Connected	94%			

Nutritional outcomes for children

Stunting in children under 5 years of age is still a common and worrying problem in all communes. Muong Bon commune has the highest prevalence of stunting (28.5%) and is higher than the average province prevalence (27.1%, one of the highest in the country). The rate of stunting in the other communes is lower than that of the province (Chieng Luong 24.9%, Chieng Chung 23.4% and Hat Lot 23.8%). The rate of stunting in children is high compared to the World Health Organization threshold. Underweight prevalence in Son La province in 2023 was 17.9% and was higher for the more remote communes. Wasting prevalence was 7.3%, ranging from 5.5% in Muong Bon, to 11.4% in Chieng Luong.

Nutritionally vulnerable or disadvantaged groups:

The population with the lowest food security is in Chieng Luong, where 11.56% of households are classified as "poor" by the government. This is followed by approximately 7.11%, 3.7%, and 3.63% in Chieng Chung, Muong Bon, and Hat Lot, respectively.

Results from KIIs and FGDs show that households with lower incomes, fewer sustainable livelihood opportunities and fewer assets, are at higher risk of food and nutrition insecurity than other households. However, participants'

assessments indicate that the level of food insecurity is moderate, as these households do not experience hunger ("skipping meals"). This situation is attributed to various government support policies across multiple areas, including food assistance during the Lunar New Year, provision of rice during lean seasons, livelihood support (low-interest loans for production and provision of livestock), educational support (reduced tuition fees and meal allowances for children from poor households in region III), technical assistance (each party member is responsible for monitoring and assisting one poor household in economic and technical development), and housing support (temporary housing elimination programs). However, the results of poverty reduction are not sustainable, as evidenced by a poverty escape rate of 1.29% in Chieng Chung Commune, the elimination of temporary housing for 15 households, and the return of 2 households to poverty in 2023. Food-insecure households are in a state of persistent poverty, indicating that, in addition to economic support, there is a need for greater technical assistance and guidance to ensure sustainable livelihoods for these families.

Potential solutions

Addressing barriers such as cultural beliefs, dietary preferences, and affordability related to livestock food consumption among ethnic minorities in Vietnam necessitates a multifaceted approach. This approach should include enhancing nutrition knowledge, improving economic access, and fostering community engagement. By prioritizing education, cultural sensitivity, and practical support, we can encourage positive dietary changes and improve nutritional outcomes for mothers and children. Nutrition-sensitive livestock interventions have the potential to enhance nutrition for communities reliant on livestock for their livelihoods by increasing the availability and accessibility of animal-based foods. Furthermore, these interventions can boost household income, improve purchasing power for other food items, and enhance various determinants of health.

Potential interventions to ensure local FNS: Social behaviour change communication interventions should be implemented within a comprehensive set of agriculture and nutrition-sensitive interventions. These have been shown to increase consumption of animal-source foods and should aim to influence decision-making around retaining animal-source products for home consumption.

Education and awareness: Promote the nutritional benefits of animal-based foods while respecting traditional practices.

Community Engagement: Engage local leaders and influencers to support dietary change through culturally relevant messaging.

Training and support activities: Accompanying training programs should be implemented to ensure that households can produce livestock products for their own consumption.

Economic Support: Improve access to affordable animal-based foods through local agricultural initiatives and improved markets. SBCC efforts should be sustained over the longer term and include discussions of financial management and dietary choices within limited budgets.

Market interventions:

One way to improve the current production situation is to stabilize market prices. Traders who come to buy agricultural products or livestock products all rely on market prices to pay farmers, they buy first, pay later, and when they sell on the market, they will calculate how much they will pay farmers. Therefore, farmers do not have the right to be proactive and cannot negotiate prices with buyers.

Appendix 1: Short list of intervention

Group	Challenges	Intervention	Expected
Male – Food value chain	Poor quality of produce (by-products), leading to reduced yields.	Improvement of Local Breeds: Utilize hybridization and artificial insemination techniques to enhance local livestock breeds. Utilization of By-Products: Leverage by-products from livestock and crop production to maximize resource efficiency.	Enhancing Breeding Quality: Improve the quality of livestock by utilizing available breeds that possess adaptive traits, while maintaining low costs. Closed-System Farming: Implement a closed-loop system in farming practices to maximize resource efficiency and sustainability.
	Low skills and production techniques.	Training Programs: Conduct training sessions to enhance skills, promote the use of local by-products, and reduce costs.	Standards and Certification in Agriculture and Livestock Product Standards: Achieving certifications such as VietGAP and organic standards leads to increased prices. Certification Value Addition: Certification enhances the perceived value of products. Target Audience: Producers and livestock farmers. Stakeholders: Cooperatives, groups/teams, Agricultural Service Centers, veterinary services. Outputs: VietGAP certification (agricultural products, Resolution 128 certification), Department of Agriculture, Quality Centers for certification issuance. Frequency: Dependent on the respective organization.

Group	Challenges	Intervention	Expected
	Limited access to markets (many individuals independently contact supermarkets in Hanoi for sales).	Establishing Cooperatives and Enhancing Production Establishment of Cooperatives: Form a cooperative (with legal status and official seal for easier operations—minimum of 7 members) or a group (with 3 or more members) to facilitate certification. Advanced Processing: Focus on specialized processing of products such as dried pork and chilled pork. Contractual Agreements: Establish linkage contracts, plan production effectively, and enhance marketing efficiency through platforms such as websites, Zalo, Facebook, etc. Trademark Registration: Register trademarks to protect and promote products.	Goals and Management in Agricultural Production Product Sales: Sell a wide range of products. Increase Income: Enhance overall income levels. Working Capital: Generate revolving capital for production and business expansion. Target Audience: Local villages and communities. Management: Governed by cooperatives and agricultural extension services at the commune level. Outputs: Participation in trade fairs and agricultural product exhibitions. Binding linkage contracts. Establish connections for project coordination.
Female – Nutritional Knowledgle	Dietary habits during pregnancy.	Direct Group Communication: Engage in direct communication with community groups. Community Meetings: Conduct meetings with women's associations and farmers' groups.	Awareness and Behavior Change Initiatives Enhancing Awareness: Share experiences to promote behavior change among community members. Integrated Activities: Combine various activities to save time and increase accessibility, encouraging mothers to adopt new behaviors and learn cooking methods.
	Proper supplementary feeding for children and other family members.	Nutritional Practice: Provide practical nutrition guidance for various target groups.	To enable mothers to change their behavior and learn how to prepare food properly

Group	Challenges	Intervention	Expected
	Utilization of locally available food.	Cooking Education: Share knowledge on preparing available foods such as eggs, frogs, toads, shrimp, crabs, fish, and vegetables.	Cost Reduction: Aim to reduce costs for families.
	Lack of food safety knowledge.	Diverse Farming Practices: Promote diverse food production through livestock and crop cultivation. Food Safety Awareness: Raise awareness about the risks associated with selling meat and food from unknown sources. Hygiene Education: Promote handwashing practices, particularly among the Mong ethnic group.	Knowledge Improvement: Increase the knowledge of vendors and consumers regarding safe food practices.
	Illness among individuals.	Dietary Guidelines: Advocate for dietary practices suitable for individuals with high blood pressure and diabetes. Mushroom and Honey Selection: Educate on safe practices for selecting mushrooms and honey. Clean Water and Environmental Awareness: Communicate the importance of clean water, sanitation, and hygiene facilities.	Poisoning Prevention: Reduce incidents of mushroom and honey poisoning.
	Economic hardship.	Livelihood Support Policies: Promote awareness of livelihood financing policies.	
	The Hmong community, particularly among the poor.	Hands-On Training: Provide direct, hands-on training to enable practical implementation.	Direct Engagement: Conduct initiatives directly within villages.
	The Hmong community.	Influential Community Members: Engage respected individuals in the community to disseminate information, particularly targeting women.	Maternity Leave Policies: Advocate for policies that support maternal rest and recovery during maternity leave.

Group	Challenges	Intervention	Expected
		Maternity Awareness: Promote awareness regarding maternity leave, emphasizing the need for support as women may return to work just 10 days after childbirth.	
Male and Female _ Food Quality	Activities: Nutritional Technical Communication for Pregnant Women, Women of Childbearing Age, Breastfeeding Mothers, and Child Caregivers Methods: Nutritional practice sessions. Direct communication at local villages; printing and posting guidelines at community centers. Village meetings and women's associations (conducted in a friendly manner, avoiding excessive formality). Short videos presented during meetings. Frequency: Twice a year, in conjunction with child weighing activities (limited resources prevent more frequent implementation). Challenges: Funding, gifts, and food for each participant, such as pots, pans, cooking oil, etc.		
	Crop cultivation and livestock raising: (sources of seeds, care techniques, fertilizers, pesticides, herbicides).	Productivity and food quality.	New seeds and care techniques. Safe and reliable animal feed. Crop cultivation: legumes and pumpkins. Livestock raising: pigs, chickens, fish, and aquatic products. Stakeholders: Agricultural service centers (district level); agricultural extension services and veterinary care (commune level). Target audience: Workers and women of childbearing age. Frequency: Twice a year (March and April).

Group	Challenges	Intervention	Expected
	Harvesting and storage of agricultural products.	Timely harvesting, with adequate time for pesticide and veterinary drug withdrawal. Proper storage methods.	Clean products. Maintaining quality and yield in crop and livestock production to ensure high economic benefits and efficiency.
	Guidelines for proper processing: drying, dehydrating, packaging, and identifying safe food (food selection).	Free from pests, mold, and moisture. Preserving nutrient content.	Ensuring nutritional value after processing. Frequency: Twice a year. Note: Combine with activity 1 to save on costs, time, and resources.
	Training on the proper use of food after processing.	Preventing food poisoning. Avoiding the use of spoiled or expired food. Purchasing food with clear origins and remaining shelf life.	Prevent food poisoning.
	Guidelines for protecting water sources.	Collecting pesticide containers, manure, and animal waste.	**I**mprove water quality and the environment.

Appendix 2: List of local foods

In ethnic minority and mountainous regions in general, and the Northwest region in particular, each ethnic group has its own traditional dishes that strongly reflect their ethnic identity. For example, the Mong people have mèn mén made from corn and thắng cố made from horse meat; the Tay people have five-colored sticky rice, meat-stuffed bamboo shoots, and pork braised with trám fruit; the Thái people are well-known for their grilled dishes such as grilled fish, grilled chicken, and grilled pork; the Muong people have cỗ lá (leaf banquet) and buffalo meat with lồm leaves.Nameplate Ethnic name (Kinh name)	Characteristics
Món lạp 	It is a traditional dish of the Thái ethnic people in Northwest Vietnam and the Lao people in the Isan region of Northeast Thailand. This is a salad made with various types of meat (fish, beef, pork, etc.). The locals often consume it with alcohol, believing that alcohol can kill any bacteria or parasites that might be present and help prevent food poisoning or bacterial infections.
Nậm pịa/Nặm pịa 	Nậm pịa or nặm pịa is a traditional dish of the Thái ethnic people, a type of soup from the Northwest region that is slow cooked with internal organs, cartilage, meat, blood, and distinctive mountain spices such as mắc khén, hạt dổi, lime leaves, and fresh chili. In the Thái language, "nậm" means "water," and "pịa" refers to the thick liquid found in the small intestine of animals, also known as partially digested food. Northwest nậm pịa is made from the best pịa, taken from the section of the small intestine containing fluids from herbivorous animals such as buffalo, cow, and goat.
Pà pỉng tộp (grilled fish) 	The grilled fish dish, also known as "pa pỉnh tộp," involves selecting fish such as carp, mudfish, or tilapia, cutting open the back, leaving the internal organs intact, and removing the gallbladder. The stuffing for the fish includes mắc khén (a type of wild pepper), ginger, lemongrass, fresh chili, coriander, aromatic herbs, green onions, and mint. After the fish is stuffed and the seasoning is well absorbed, it is folded in half, clamped, and grilled over glowing charcoal. The person grilling carefully ensures that the fish doesn't become smoky, preserving its distinctive flavor.
Khảu lam (Bamboo rice) 	To make bamboo rice, the sticky rice, specifically from upland fields, is soaked overnight. It is then placed into bamboo tubes called may khâu (Lam Pa Ngà), with just enough water added, and sealed with banana leaves. The tubes are roasted over a fire until the outer bamboo shell is charred, releasing the fragrant aroma of the rice. The rice is considered cooked when the bamboo no longer contains water. The bamboo is then split open, leaving only a thin inner layer of bamboo tightly wrapping the soft, white rice inside. This thin layer has a slight saltiness and carries the scent of the forest and smoke, elevating the flavor of the sticky rice. Bamboo rice is usually eaten with salt or sesame depending on personal preference, though in some regions, it

	is enjoyed with chẳm chéo, a traditional dipping sauce of the Thái people. Chẳm chéo is made from salt, grilled fresh chili, coriander, and most importantly, mắc khén (a type of wild pepper), which is essential for making chẳm chéo. Without mắc khén, there is no chẳm chéo, and without chẳm chéo, the Bamboo rice meal is incomplete. Bamboo rice from Sơn La is usually sold in the winter because that's when the specific type of bamboo needed for making bamboo rice is available.
Chẳm chéo 	In Sơn La, local delicacies made from forest plants, garden ponds, and rice fields are crafted by the skillful hands of the native people into unforgettable dishes. Chẳm chéo is a traditional dipping sauce of the Thái people here. With its distinctive flavor from a variety of spices, the heat from grilled fresh chili, and the aromatic mắc khén (a type of wild pepper), it offers a unique taste experience. The Thái people not only use chẳm chéo in their daily meals but also to entertain guests. Thus, it is both a simple, rustic sauce and a specialty of the mountainous region. In the Thái language, "chẳm" means dipping sauce, and "chéo" refers to a mix of spices blended, hence the name "chéo." Chẳm chéo is made from salt, grilled fresh chili, garlic, MSG, and especially the indispensable mắc khén. All ingredients are finely pounded and mixed into a thick dipping sauce. Chẳm chéo is an essential part of the Sơn La Thái people's meals. The Thái consider chẳm chéo even more important than meat or fish; even if a meal lacks meat or fish, just having chẳm chéo makes it a delicious meal. When the host is present, chẳm chéo is always the first dish served.
Thúa Nau (Đậu tương thối) Soybean Paste (Stinky Soybean Paste) 	This is a type of dipping sauce made from fermented soybeans, which is highly favored and regularly used in daily meals by the Thái ethnic people. To make a delicious and authentic tương thối (fermented soy sauce), it's essential first to select the right type of "local" soybeans. This means soybeans grown in the mountains, where the air and water are clean and fresh. The preparation begins with drying and thoroughly cleaning sticky soybeans. The amount used depends on the desired quantity. The soybeans are soaked in water until they swell, then boiled until soft, and the skins are removed, allowing them to cool and drain. The people use clean, dried green banana leaves to wrap the boiled soybeans, which are then placed above the kitchen fire for 5-7 days to ferment, developing a distinctive aroma. The finished tương thối has a shiny brown-yellow color and a very distinctive smell. When eating, some people may choose to mix it with a bit of water or fresh herbs, depending on their preference. Tương thối is typically enjoyed with wild vegetables, boiled bamboo shoots, and sticky rice from upland fields.
Gỏi cá 	This is a Thai fish salad made with fresh fish and banana blossom. Clean and fillet the fish, then wrap it to absorb moisture and slice it thinly. Key ingredients include soaked banana blossom, herbs like coriander and mint, fresh chillies, garlic, roasted peanuts, and a sour liquid from fermented bamboo shoots. Mix cooled boiled water with the sour liquid, salt, and monosodium glutamate. Marinate the fish briefly or mix it directly with the other ingredients. Serve with a dipping sauce for extra tang and use the fish head and bones to make a fragrant broth.



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The CGIAR Science Program on Better Diets and Nutrition (BDN) identifies, co-designs and tests consumer-oriented solutions to ensure sustainable healthy diets for all while enhancing livelihoods, social equity, and environmental sustainability. Through evidence-based research and collaboration, BDN supports country-led food system transformation in low- and middle-income countries. To learn more about BDN, please visit https://www.cgiar.org/cgiar-research-porfolio-2025-2030/better-diets-and-nutrition/.

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