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## **Rapid survey of livestock feed resource availability and use in Mai Son district, Son La province, Vietnam, using the Gendered Feed Assessment Tool (G-FEAST)**

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## ABSTRACT

Livestock production is the second main livelihood source for farmers in the North-West highlands of Vietnam. Animal nutrition is a key factor in livestock production and, often times, challenges related to feed are widespread leading to low livestock productivity. Identifying context-specific feed issues and how gender influences feed practices prior to proposing measures to improve animal nutrition is a key step in addressing feed-related challenges. In this study, the Gendered Feed Assessment Tool (G-FEAST) was applied to assess the availability and use of local feed resources by characterizing gender aspects influencing feeding practices with the ultimate goal of designing site-specific livestock feed intervention strategies. The study was carried out in 6 villages in Chieng Chung and Chieng Luong communes, Mai Son district, Son La province, Vietnam. Data was collected through separate focus group discussions and individual interviews for women and men (67 women and 70 men). Main feed-related challenges identified included lack of winter feed, low-quality diets and low yielding forage varieties. The results of this study present key opportunities for feed interventions such as promoting improved forage varieties, knowledge on better utilization of crop residues, feed processing and preparation (e.g. silage) and improved diet proportions with high quality feed components.

## 1. INTRODUCTION

The Feed Assessment Tool (FEAST) was originally developed by International Livestock Research Institute (ILRI) and the International Centre for Tropical Agriculture (CIAT) (Duncan et al., 2012), and further improved under the CGIAR Research Program on Livestock (Livestock CRP). FEAST provides a rapid assessment of the availability and use of local feed resources which informs the design of site-specific intervention strategies for improved feed supply and utilization (ILRI, 2019).

FEAST was recently evolved further into the Gendered Feed Assessment Tool (G-FEAST) which adds value to the existing FEAST approach by identifying which aspects of gender relations in households affect animal feeding practices and the uptake of feeding interventions; and identifying opportunities and constraints in animal feeding for different household types (Lukuyu *et al.*, 2019a). G-FEAST differs from FEAST as it has separate focus group discussions (FGDs) for women and men, gender-related questions for the both FGDs and individual interviews and separate individual interviews with women as well as men.

In this study, G-FEAST was used to characterize livestock production systems and in particular feed-related aspects in 6 villages of Chieng Chung and Chieng Luong communes, Mai Son district, Son La province, Vietnam. The study was conducted on 5-15<sup>th</sup> October, 2020 with the objective to provide a general overview of the availability and use of feed resources, identify challenges and constraints affecting livestock production through the gender lens, opportunities for improved animal nutrition and propose context-specific interventions on livestock feed for improved animal nutrition. The assessment was carried out through FGDs and individual interviews with farmers ensuring an equal representation of women and men, following the G-FEAST focus group discussion guide (Lukuyu et al., 2019a) and G-FEAST individual farmer interview questionnaire (Lukuyu et al., 2019b).

## 2. MATERIALS AND METHODS

### 2.1 Study location

The selected study location for Vietnam priority country project (*Li-chăn*) of the CGIAR Livestock CRP is Mai Son district, Son La province, chosen to represent different challenges and needs in the NW Highlands of Vietnam. Son La is the largest mountainous province in northern Vietnam with a total area of 1.4 million ha and a total population of 1 million people. The population consists of 12 ethnic groups, comprising 55% Thai, 18% Kinh, 12% H'Mong, 8% Muong and 7% others. The target district, Mai Son, has a diversity of farm types, from grazing and extensive systems at the top of the mountains to intensive farms with strong crop and livestock integration at the bottom of the valleys, with a variety of socio-economic and ecological conditions (Douxchamps *et al.*, 2019).

*Li-chăn* project targets 3 types of farming system categorized on the basis of accessibility in the 2 selected treatment communes – Chieng Chung and Chieng Luong. In Chieng Chung, accessibility was defined as the distance (in minute drive by motorbike) to the concrete road while in Chieng Luong, accessibility was defined as the distance to Co Noi market (in km). Distance to the people's commune committee was also considered to clearly define Type A and B systems. The selected types of farming systems include (A) intensive systems in the lowlands with good access to markets and relatively better capacity for innovation, (B) mixed crop-livestock system in the mid-altitudes with mainly Thai ethnic minorities and (C) remote extensive systems in the high altitudes, with low access to market, fragile environment, mainly H'Mong ethnic group. A total of 6 villages were selected for interventions, 2 villages in each type. Table 1 shows the characteristics for the 6 villages in the study location (*Li-chăn* village selection report).

**Table 1.** Village characteristics in Chieng Chung and Chieng Luong communes

Typology	A		B		C	
	Mòn 1	Mòn 2	Oi	Khoa	Xam Ta	Buôm Khoang
Ethnicity	Thai	Thai	Thai	Thai	Hmong	Hmong
Total number of HHs	154	154	112	203	19	37
Distance to concrete road (mins drive by motorbike)	0	0	5	0	30	30
Altitude (highest point in the village)	970	970	1000	1300	1700	1100
Distance to market (Mai Son) (km)	6	6	10	13	17	18
Distance to commune people committee (km)	0	0	5	1.5	8	11
Livestock holdings (cattle)	72	109	133	114	60	55
Livestock holdings (buffalo)	101	146	64	50	5	19
Livestock holdings (pigs)	160	395	144	310	50	73

### 2.2 Selection of participants and survey structure

A core list of farmers selected on a voluntary basis in consultation from the village heads and participating in all the project's activities, were invited to participate in the G-FEAST exercise. Where necessary, additional participants were invited to ensure gender balance and to represent different land-

and livestock holdings. A total of 137 farmers participated in the study, 67 women and 70 men (Table 2). In 5 out of the 6 villages, 4 FGDs were conducted (2 FGDs with women, 2 FGDs with men) while in 1 village (Mon 2) there were only 3 FGDs (2 FGDs with women, 1 FGD with men) as most men were out in the fields for rice harvesting. From each FGD, 3-9 participants were selected representing each of the landholding category (small, medium and large) were selected for individual interviews.

**Table 2.** Summary of surveyed respondents

Typology	Average age	Women	Men	Total
Type A	37.2	26 (18)	17 (15)	43 (33)
Type B	34.9	21 (17)	26 (17)	47 (34)
Type C	31.2	20 (18)	27 (25)	47 (43)

\* In brackets are the number of participants in individual interviews

## 2.3 Data processing

Narrative reports collected from the FGDs were initially compiled in an Excel file for data cleaning before reporting. Individual interview results were entered and processed using the FEAST data app ([www.ilri.org/feast](http://www.ilri.org/feast)). All the data was uploaded to FEAST data repository for public access ([feastdata.ilri.org](http://feastdata.ilri.org)).

## 3. RESULTS AND DISCUSSION

### 3.1 Farming system

Before 1999, the government granted land and issued land use rights certificate to most households in Mai Son district including the study sites (Chieng Chung and Chieng Luong communes). After 1999, households bought land and were issued with their own land title deeds, some households leasing additional land for agricultural activities. Parents divide land to their children as they come of age but retain the title deed and power to decide on land use. Both men and women can have rights to ownership of land either bought or inherited from the parents and full power to decide on the land use activities. In some villages such as Buom Khoang and Xam Ta, the state has allocated varying portions of the forests as communal land mainly used for livestock grazing, growing trees e.g. Son Tra<sup>1</sup> and timber provision for building houses. In the study site, most of the Type B households own the highest percentage of land across all the 3 scales. Table 1 shows the percentage average land sizes for the 3 types.

**Table 3.** Landholdings in the study site

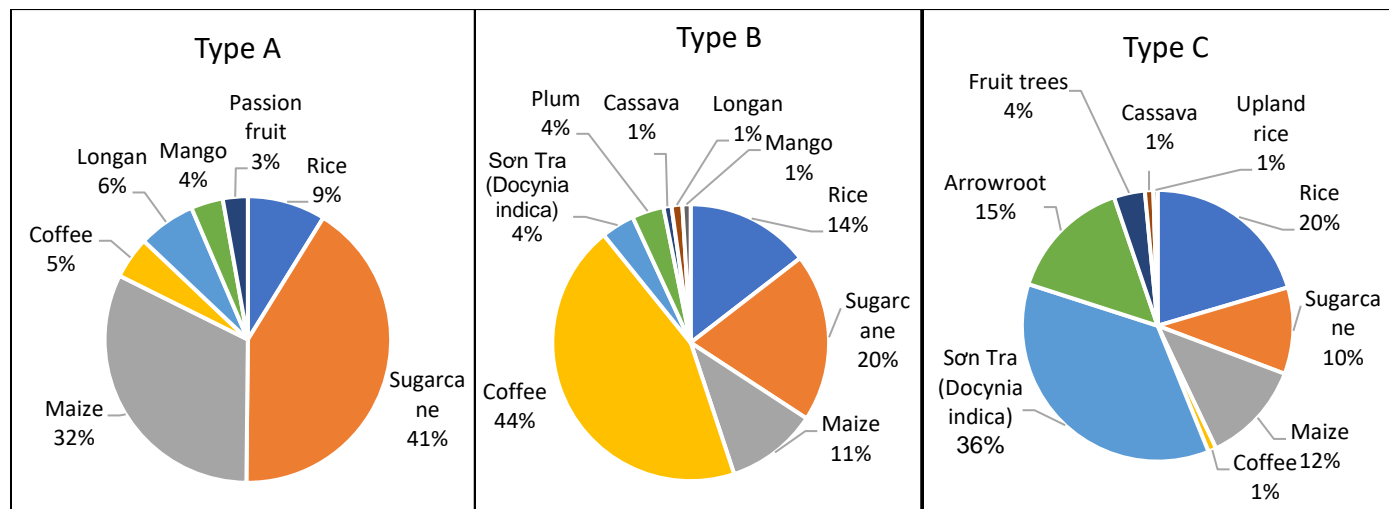
%HH	Type A	Type B	Type C
Landless	0	0	0
Small scale <1 ha	38	45	17
Medium scale	30	40	30
Large scale >2 ha	33	49	19

The production system in the study area is primarily mixed crop-livestock system except for Xam Ta village which has an extensive system. Main crops grown include rice, sugarcane, maize, coffee, fruits

and tubers as listed in Table 4. Average area of crops varies by type with maize and sugarcane dominating in Type A, coffee and sugarcane in Type B and Son Tra<sup>1</sup>, rice, tuber crops and maize in Type C (Figure 1).

**Table 4.** Main crops grown in the study area

Crops	Average ha per HH		
	Type A	Type B	Type C
Paddy rice	0.08	0.12	0.41
Sugarcane	0.38	0.16	0.21
Maize	0.29	0.09	0.24
Fruit trees <sup>2</sup>	0.18	0.06	0.07
Coffee	0.04	0.37	0.02
Son Tra ( <i>Docynia indica</i> )	-	0.03	0.72
Arrow root	-	-	0.30
Cassava	-	0.01	0.01
Upland rice	-	-	0.01
Lentils	-	-	0.01
<b>Forage and food-feed crops</b>			
Maize	0.05	0.02	0.16
Napier grass	0.02	0.01	0.02
Banana	0.01	0.01	0.14



**Figure 1.** Crops grown in Type A, B and C households

Over time, land area available for cultivation per household has decreased due to population increase leading to an increased demand to convert part of agricultural land to build houses or splitting land to

<sup>1</sup> Son Tra (*Docynia indica*), also known as H'Mong apple is an indigenous fruit tree species native to Northwestern Vietnam in forest areas occupied by the H'Mong people, a multipurpose tree for its fruits and restoring natural forest cover (Do et al., 2020).

<sup>2</sup> All fruits (passion fruit, mango, longan, grape fruit, plum, avocado) except Son Tra.



children. Land degradation due to soil erosion in sloping areas and poor soils from excessive cultivation have also led to a decrease in agricultural land. This also links to the reported increase in fallow land especially in eroded steep slopes adding to the already unproductive rocky areas and infertile soils. Type A villages reported not leaving their current farms fallow and continuously cropping. In Type C villages, some farmers leave sections of their land fallow for 3-4 years.

Crop production in this area is mainly rainfed with water scarcity reported during the dry season (November – April). To cope with water scarcity, some farmers have installed irrigation infrastructure taking advantage of zero restrictions imposed in accessing irrigation water. Farmers use water canals, either concrete or unlined, to lead or pump water from the streams into the fields. The main crops that benefit from irrigation include rice, fruit trees and vegetables. Labour costs for farming activities were reported to be reasonable for most households, on average at ~USD 7/day/worker, though sometimes increasing in the peak harvesting period.

As described in the study site section, village selection was based on accessibility. Type A villages have easy access to the main roads all year round. Type B have good roads most of the year but for short distances (~2 km) that are difficult to follow during the rainy season. Oi village has some difficult roads on steep slopes. Type C villages are located far from the main road, connected by about 7 km of dirt roads which are very difficult to use in the rainy season. Only men can travel outside the village during the rainy season.

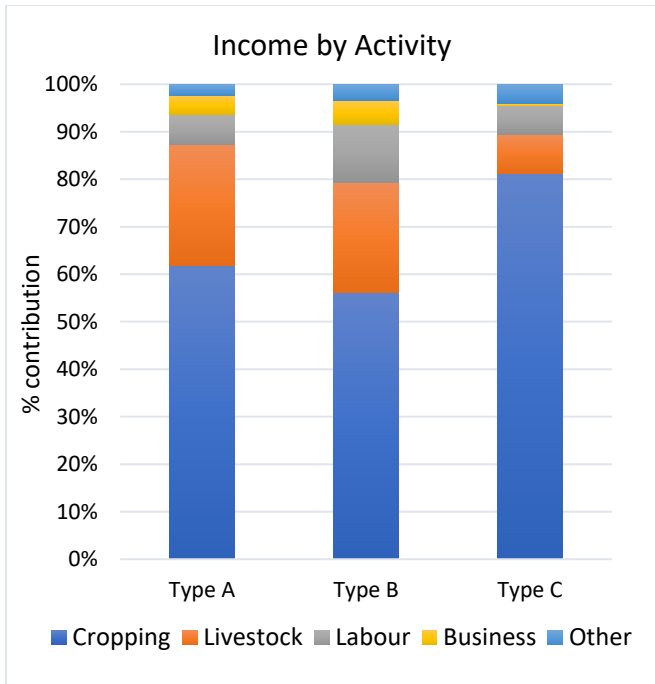
### **3.2 Major income sources**

Cropping activities form the main income source (>50%) followed by livestock production and hired labour in other farms. Contributions of cropping and livestock to income do not vary much in Type A and B households with cropping accounting for 62% and 56% and livestock making up 26% and 23% respectively (Figure 2). Type C households primarily rely on cropping (81%) for income while livestock and labour contribute 8% and 6% respectively. Labour and business only account for 1-6% for all households. A similar trend applies to income sources for women with the highest contribution from cropping (66-83%) followed by livestock production (Figure 3).

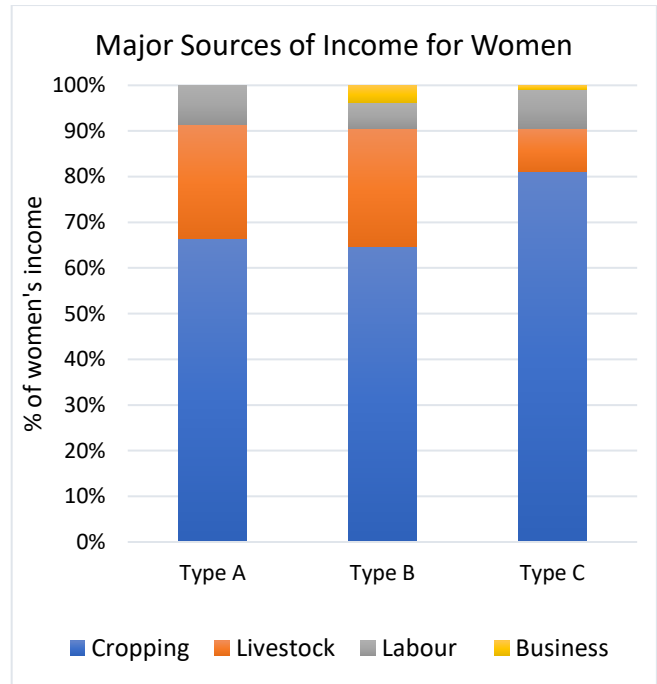
The study respondents reported some household members (Type A – 19%, Type B - 12%, Type C- 13%) migrating to the city to work as casual workers, teach, go to secondary school or universities, seek medical treatment or attend military service. Reasons for migration for work include limited farming land in the village translating to less income from agriculture and availability of higher paying jobs in the city. Young people also take advantage of the spare time during the off-season to look for work outside the village for extra income.

Credit facilities for crop and livestock production are available to most households with the main collateral used for accessing credit being land use rights certificate. About 80% of households in all villages reported having access to formal credit, the remaining 20% opting for private lenders. Poor households sometimes use their farm produce as collateral or can use household registration books, identity cards to borrow up to VND 50 million (~USD 2,170) from the banks. Private/informal lenders have simple procedures for smaller loans but apply high interest rates.



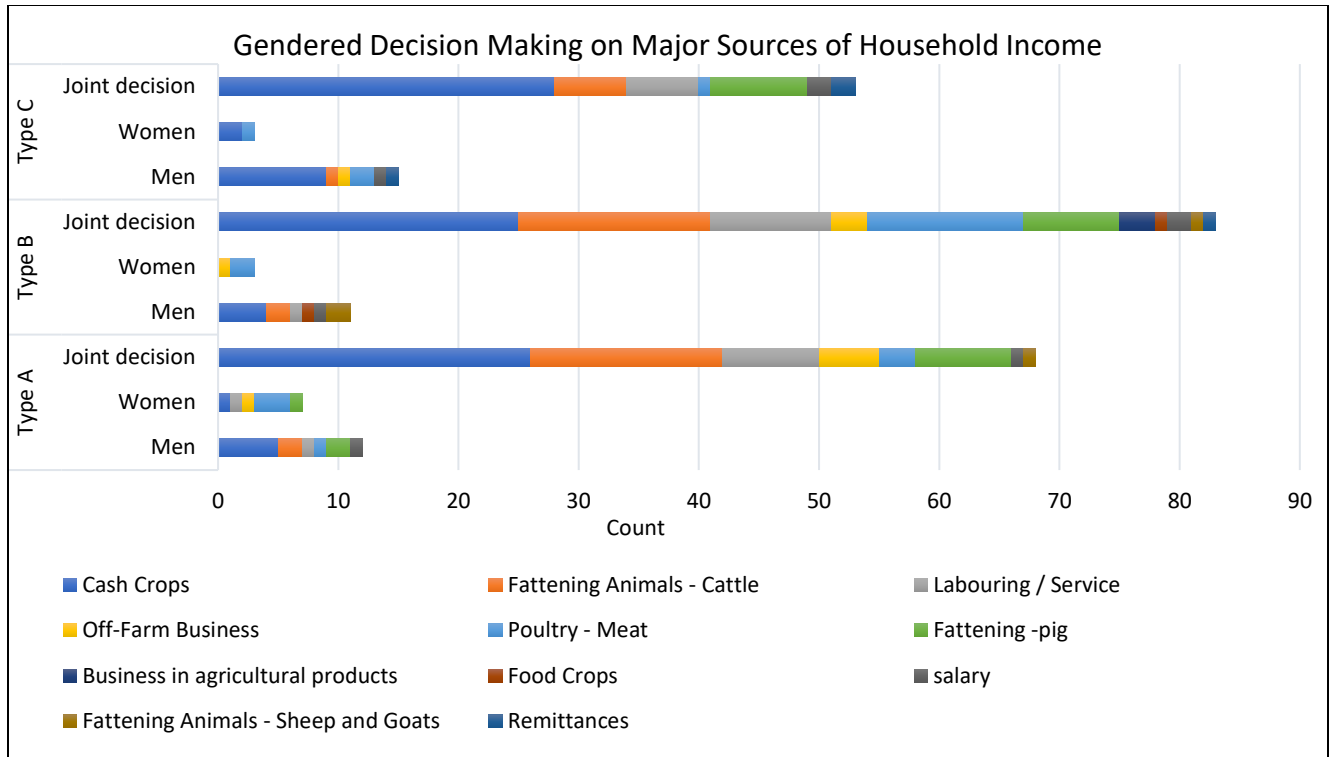


**Figure 2.** Major income sources by activity

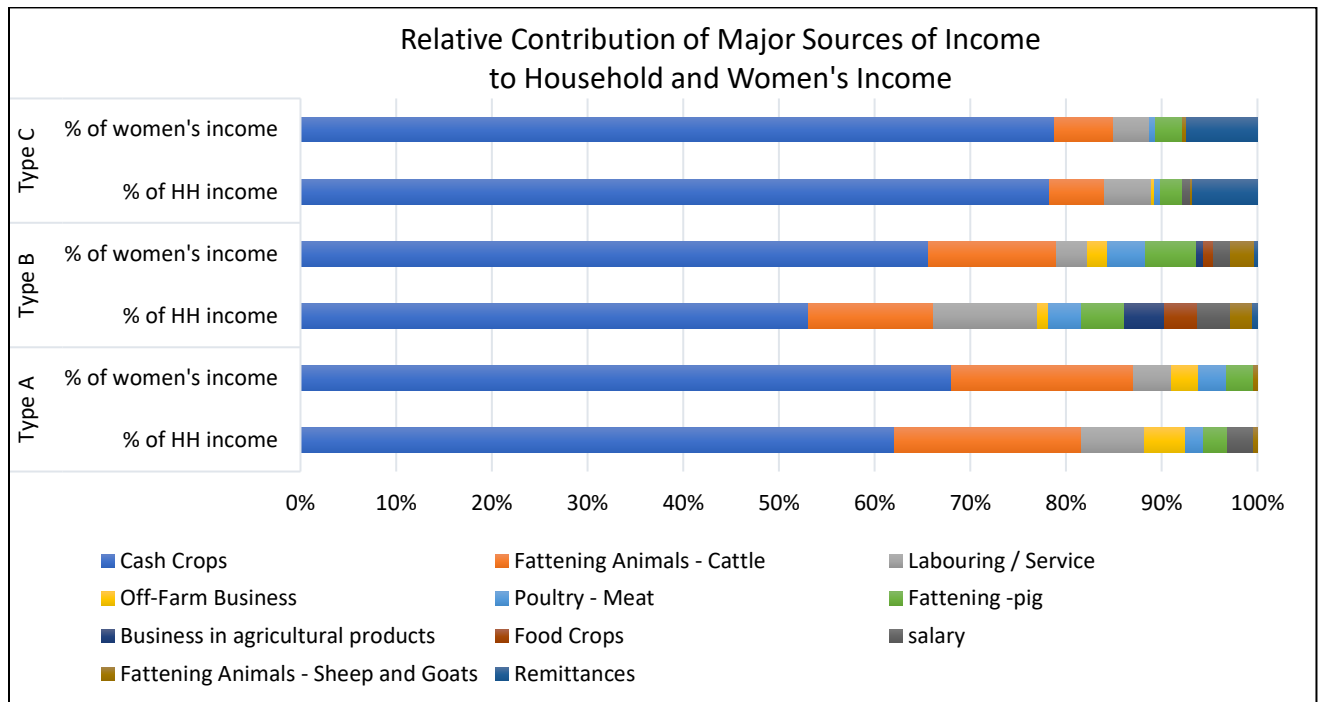


**Figure 3.** Major income sources for women

During the survey, decision making on the use of major sources of household income was predominantly made jointly by the household members (Figure 4). However, respondents who answered on who is more involved in decision making between men or women reported men to have more decision-making power on the use of income from cash crops, cattle, food crops, business and labour. In Type C, women have the least decision-making power. Women have more decision-making power on income from poultry in all the 6 villages. Moreover, women contribute more to income from cash crops and poultry, and less in labor and salary (Figure 5).



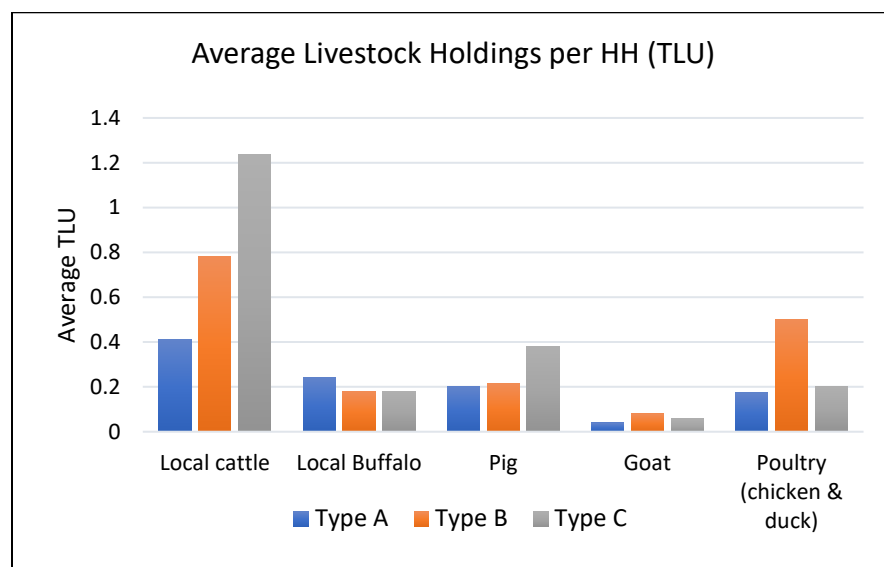
**Figure 4.** Gendered decision making on major sources of household income



**Figure 5.** Relative contribution of major sources of income to household and women's income

### 3.3 Livestock production system

Local cattle are the most dominant livestock species providing meat and also being used as draught animals (Figure 6). The highest numbers of cattle and pigs (local ban pigs) are owned by Type C households. Buffalos are reared in all types and goats to a lesser extent. The main poultry kept in this area include chickens and ducks.



**Figure 6.** Average livestock holdings per household (TLU)

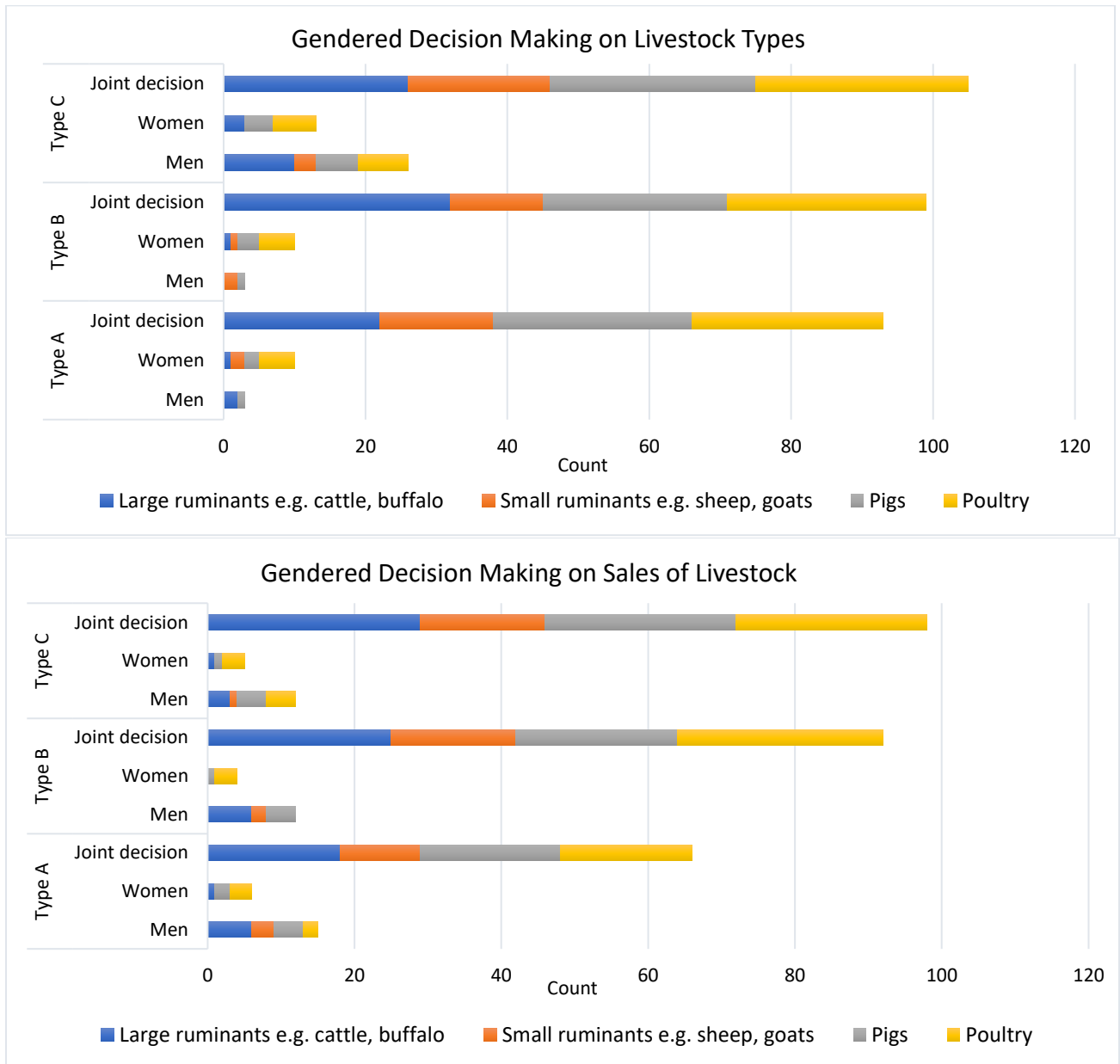
In the last 3 years, only 2-4 cattle and buffalo are sold every year (Table 5). Cattle fetch a higher price in Type C (~USD 4/kg) compared to Type A and B villages (~USD 2.5/kg). On the contrary, buffalos are sold at a higher price in Type A. Pigs, chicken and duck are mostly reared for home consumption though some households sell poultry for income. There are twice as more pigs sold in Type A and B households (10 pigs) as compared to Type C households (5 pigs).

**Table 5.** Livestock number, weight and sales

		Cattle	Buffalo	Pig	Goat	Poultry (chicken & duck)
Number of animals sold	Type A	4.0	2.5	10.2	23.7	22.5
	Type B	2.5	2.4	9.5	21.2	23.7
	Type C	3.8	3	4.9	7.1	5.2
Average weight sold (kg) per animal	Type A	148.2	204.4	55.2	26.1	1.7
	Type B	106.3	160.0	46.3	19.9	1.9
	Type C	106.6	155.0	34.8	21.3	1.5
Average market price (USD <sup>3</sup> per kg)	Type A	2.5	3.4	1.6	1.6	3.9
	Type B	2.6	2.6	1.6	2.4	3.8
	Type C	4.1	2.9	1.6	2.0	4.5

<sup>3</sup> Conversion rate used; 1 USD = 23.026 VND

For the main livestock types and sales, joint decision making is common in most households across the 3 types (Figure 7). In Type A and B households, where the choice of decision making was either men or women alone, men mainly decide on cattle and buffalo while women mainly make decision on pigs, poultry and goats. For livestock sales, men decide on the sales of cattle, buffalo, pigs and goats while women make decision on poultry sales. In Type C households, men predominantly decide on all livestock types and sales.



**Figure 7.** Gendered decision making on livestock types and sales

### **3.4 Management of livestock**

Livestock management differs between the systems and season. In Type A and B households, cattle and buffalos are mostly stall fed in winter time supplemented with grazing on the road side or in the rice fields after harvest in summer. Pigs and poultry are kept in pens throughout the year. During winter, some households graze cattle and buffalo in the afternoons and stall feed the animals the rest of the day. The barns are heated in winter and animals covered in warm clothes.

Type C villages have communal pastures allocated by the government in parts of the forest (~200 ha in Xam Ta and ~84 ha in Buom Khoang). In Xam Ta, cattle and buffalos are left to graze in the forest for most of the year, and the farmers check on them every 10 days, while calves are raised in stalls. Pigs are kept in barns and also allowed to roam within the farmers home. On the other hand, farmers in Buom Khoang mainly stall feed the animals as there is limited communal pasture. The stalls are heated during winter and animals covered with warm clothes.

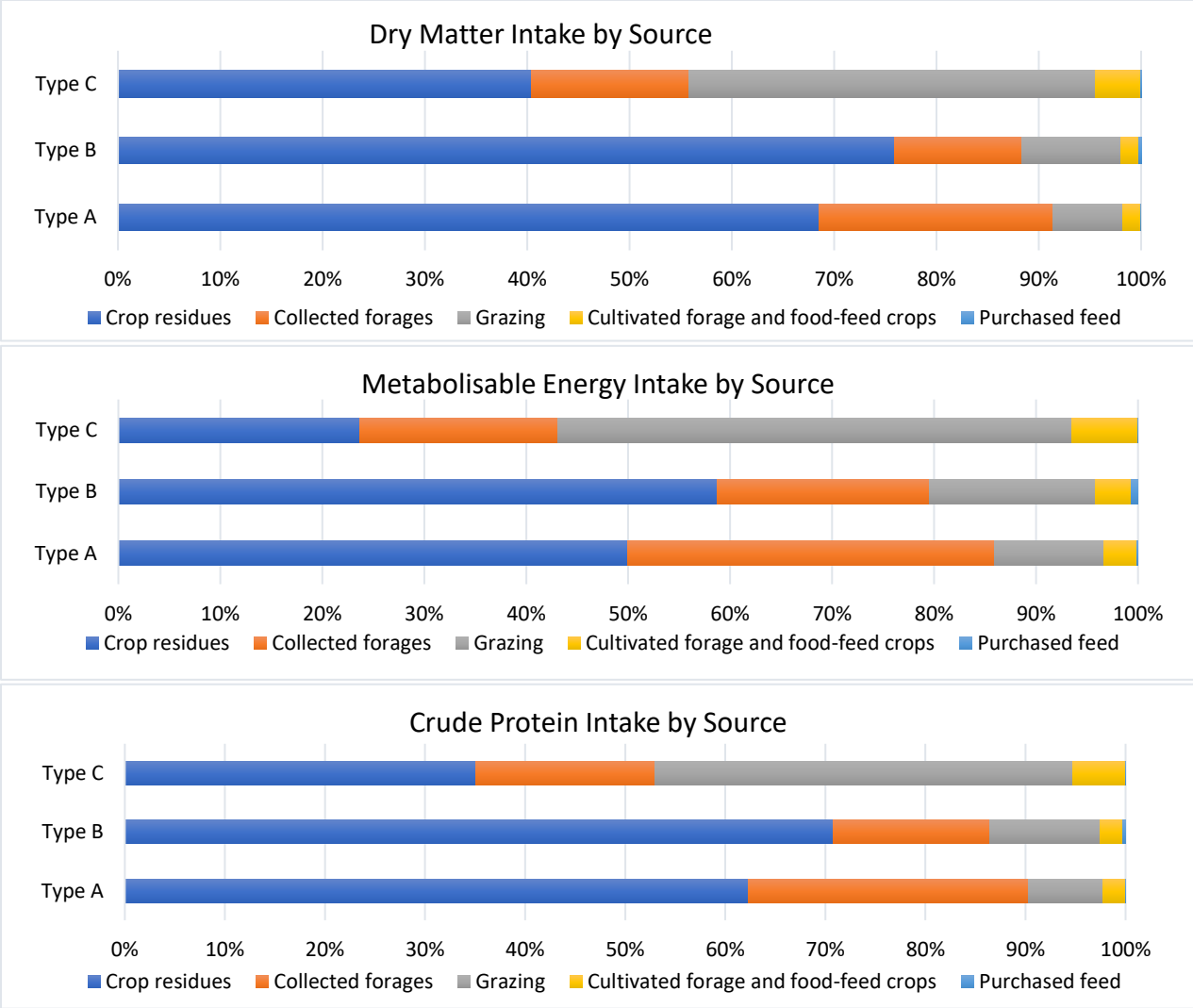
Livestock in this area suffer a range of health problems that commonly affect animals. Cattle, buffalos and goats often suffer from foot and mouth disease, congestion, parasites, bloating and diarrhea. Pigs are affected by African Swine Flu (ASF), edema, stomach problems, bloating and diarrhea. Poultry are mainly affected by pasteurellosis.

Traditional practices for animal health remain common in this area as farmers often prepare herbal remedies to cure or manage certain ailments. For instance, bamboo shoot extract mixed with salt and green banana sap is used for curing foot and mouth disease. Forest leaves, crushed garlic, guava and peach leaves, melon juice and fermented soya bean are mixed in different proportions for treating abdominal discomfort and diarrhea in cattle, pigs and poultry. Different responses were reported on the involvement of men and women in these traditional practices. Men claimed to be responsible for administering herbal remedies because women are afraid of cattle. Women, on the hand, said they are mostly responsible for these traditional practices as the men focus on the heavy work in the farm with little time to tend to livestock.

Bull service is the mostly commonly used method of cattle reproduction in all villages (Type A – 94%; Type B – 99%; Type C – 100%). However, bull service can be costly and also causes inbreeding which results in low quality breeds, poor immune system and increased mortality of newborns. Only a small percentage of households - Type A (6%) and Type B (1%) - practice artificial insemination (AI) for pigs. Pigs mostly reproduce via direct mating.

### **3.5 Livestock feed resources and seasonal availability**

Crop residues comprise the largest feed base contribution in terms of dry matter, crude protein and metabolizable energy, consecutively (Figure 8). Collected forage weighs in second in Type A, on the basis of metabolizable energy, crude protein and dry matter, and also contributes to a lesser extent to the feed base of Type B and C. Grazing is the primary contributor of the feed base in Type C households explained by the presence of communal grazing land. Purchased feed comprising of mixed meal, corn bran, rice bran and cracked grains mainly contributes to pig and poultry feed base.



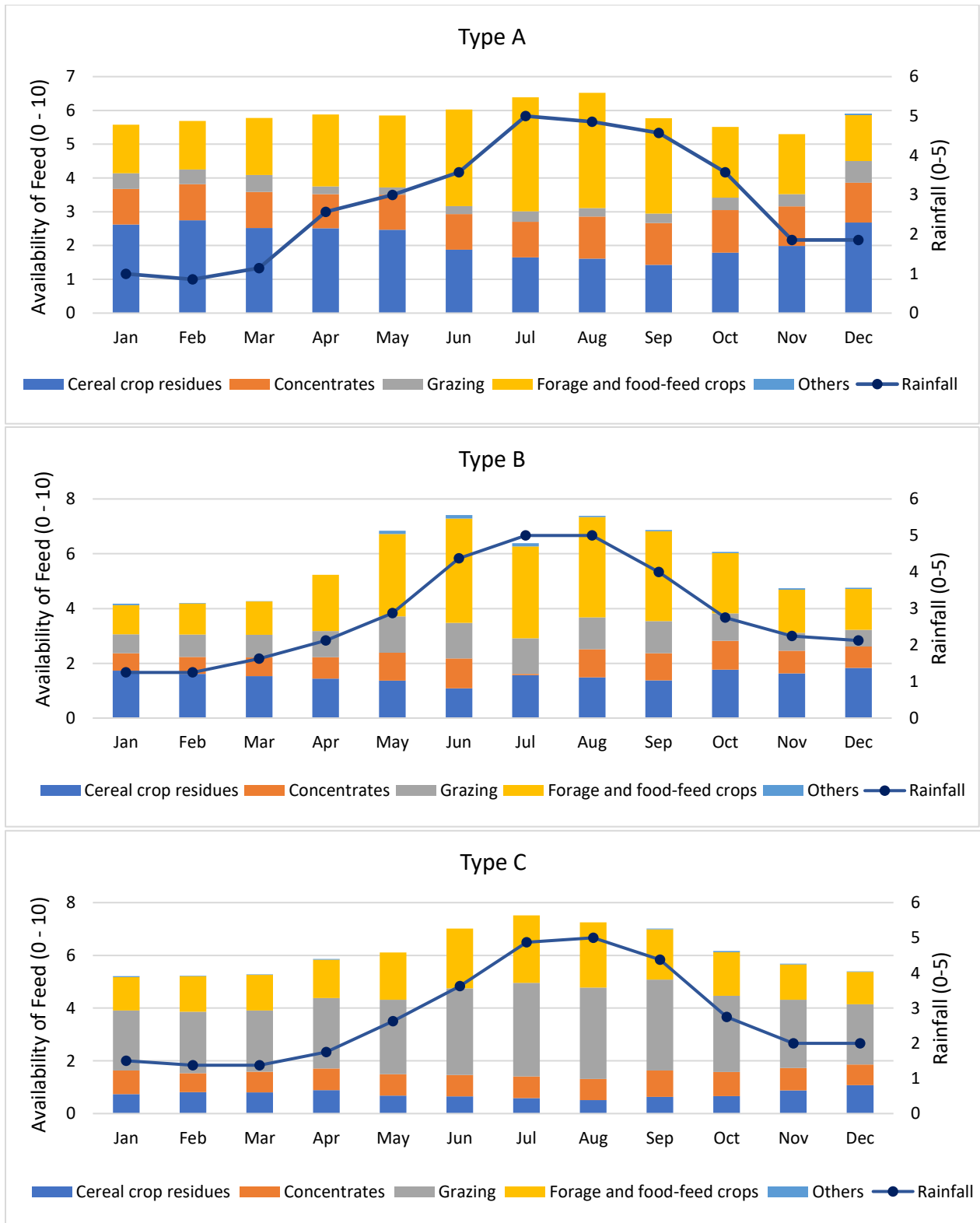
**Figure 8.** Contribution to dietary requirements in the study area

Seasonal availability of feed resources varies significantly in the 3 types with Type A households recording the highest availability of livestock feed (Figure 9). Type A villages predominantly use of green forage and food-feed crops, and crop residues as feed. In this type, livestock feed is available throughout the year. In the rainy season, fresh biomass (Napier grass and maize) is fed to the animals while during winter, farmers prepare silage using crop residues such as rice straw and sugarcane tops and banana leaves. In the dry season, animals are grazed in the fields after harvest or on the road sides with native grass as there is no communal grazing land.

Livestock reared in Type B farms are also fed with green forage and food-feed crops, crop residues and concentrates but suffer from feed shortage during winter/dry season. During the rainy season, fresh grass is cut and fed to the animals while in the dry season, farmers rely on available straw, bran, banana trunk, sugarcane tops. In Type B, cattle and buffalo are also allowed to graze in the field after harvest.

Grazing is more abundant in Type C due to the availability of communal pastures. Xam Ta has 200 ha of forest land designated for grazing which acts as the main source of feed for cattle and buffalo. During winter, calves are confined and stall fed. Buom Khoang relies more on green forage and food-feed crops,

and crop residues, in addition to the limited pasture. In all the 6 villages, pigs are fed with concentrates, banana trunk, sweet potato vine and food waste while poultry are fed concentrates.

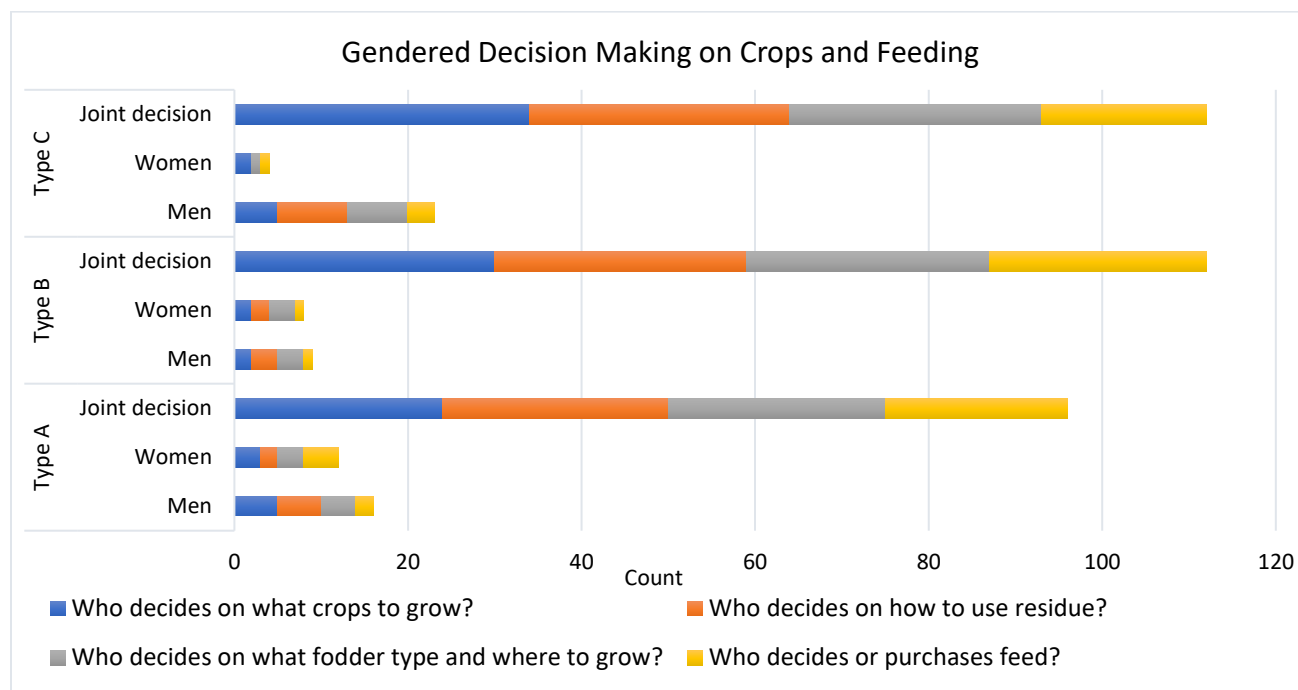


**Figure 9.** Availability of feed resources in Type A, B and C households.



Processing of feed, mainly crop residues and green forage and food-feed crops (Napier or native grass, rice straw, sugarcane tops, banana trunk) is done by chopping, either by hand or using a chopping machine and fed to the animals as fresh biomass or used for silage preparation (in Type A). Silage is often prepared by mixing different ingredients e.g. rice bran, maize bran, ground cassava, banana trunk and salt and stored for later use. Cooked ground corn mixed with vegetables, taro leaves, sweet potato vines and banana trunk is fed to pigs.

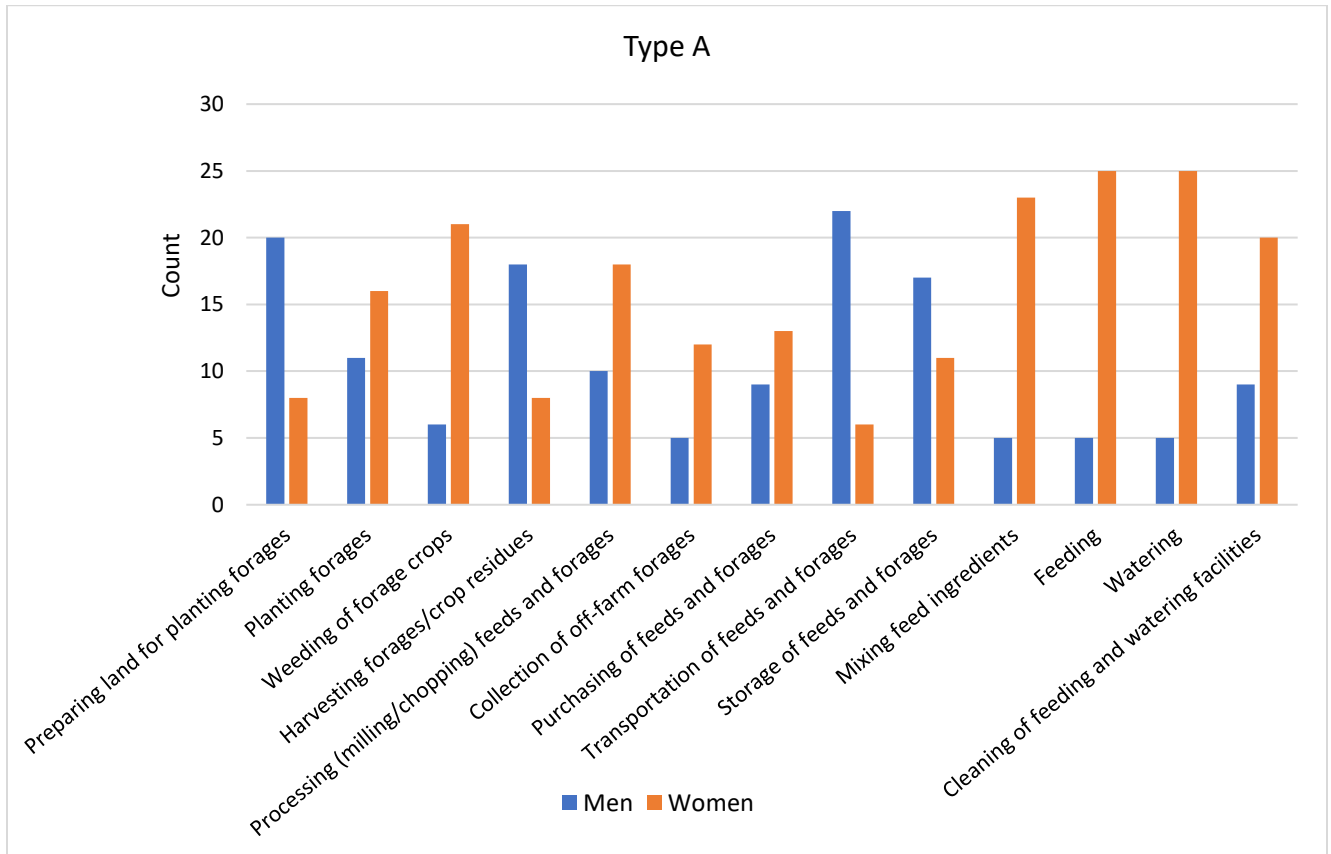
Similar to livestock types and sales, decision making on crops and feed utilization mainly remain a joint decision in the households including food and forage crops grown, residue use and feed purchase (Figure 10). This was as a result of an error in translation and data collection where the option of joint-decision making was added. However, where decision was based either on male or female members of the households, men dominated the decision making of these activities in all the villages with an exception for Type A where more women decide on purchased feed.



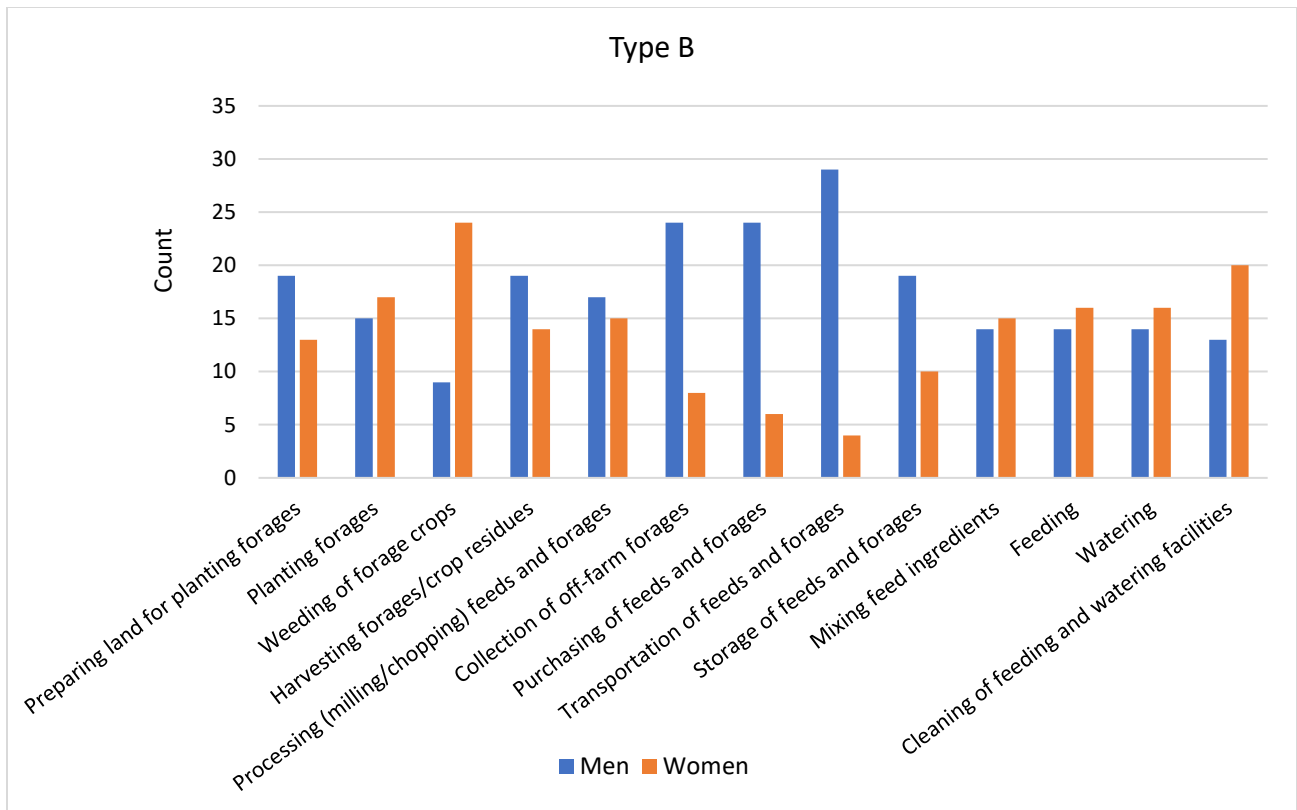
**Figure 10.** Gendered decision making on crops and feeding

Even though planting of forages is minimal in the study area, gender division of labour for practices around feed production, harvesting and feeding is apparent across the 3 types (Figure 11, 12 and 13). In Type A, men are involved in land preparation for planting forages, harvesting, transportation and storage of feeds and forages. On the other hand, women carry out most activities on feeding and livestock management including planting, weeding, collection of off-farm forages, feed purchasing, mixing feed ingredients, feeding, watering and cleaning. A similar trend applies to Type C households where men are mainly involved in purchasing feed and transportation. Women are responsible for almost of all of the rest of the activities except for cleaning of feeding and watering facilities with an equal count for both men and women.

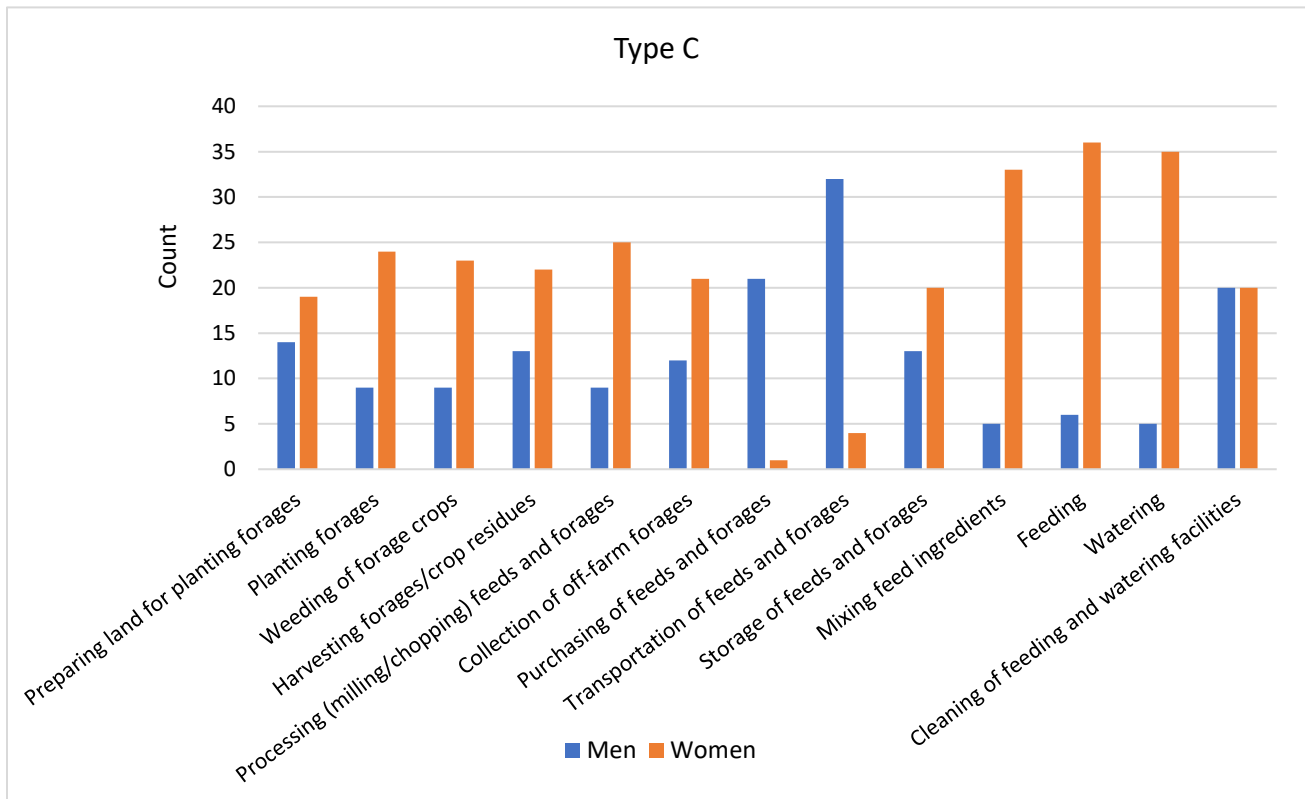
In Type B households, there is a more-or-less even split in gender roles with men responsible for land preparation, harvesting, chopping, collection of off-farm forages, purchasing feed, transportation and storage of feeds and forages. Besides on-farm activities such as planting and weeding, women in Type B households mix feed ingredients, feed, water and clean livestock facilities.



**Figure 11.** Gender Division of Labour in Feed Production, Harvesting and Feeding for Type A households



**Figure 12.** Gender Division of Labour in Feed Production, Harvesting and Feeding for Type B households



**Figure 13.** Gender Division of Labour in Feed Production, Harvesting and Feeding for Type C households

### 3.6 Livestock production constraints

In all the household types, lack of capital, livestock diseases and feed were reported as the main constraints affecting livestock production. The respondents also highlighted a gap in information and advisory services pertaining to markets and livestock husbandry. Tables 6, 7, 8 and 9 provides a summary of identified problems, gender-disaggregated ranking and proposed solutions.

**Table 6.** Major livestock production constraints and suggested solutions in type A households

Problem rank		Problems listed	Most affected	Suggested solutions by farmers
Male	Female			
1	2	Lack of capital	Men	Credit facilities (banks, relatives) Better support from the government
2	1	Livestock diseases	All	Assistance from veterinary workers Keeping the farm clean, using powdered lime, spraying disinfectants Purchasing medicine Vaccination programs
4	4	Market: Low negotiation power, lack of market information	All	Finding other market or better-paying collectors Waiting until the prices go up
5	3	Lack of knowledge on disease diagnostics, livestock husbandry, taking care of cattle in winter	All	Information from neighbors, veterinary workers Trainings Using local knowledge Providing heating during winter (covering cowshed with plastic sheets, setting up fireplace for cattle)
3	5	Lack of winter feed	All	Collecting forages outside the village Making silage Adding residues, rice bran, rice straw Planting forages
Other constraints		Lack of accessibility to veterinary medicines	Men	Finding medicine from other town/city centers
		Lack of improved breeds	All	Crossbreed with breeds from other localities
		Lack of accessibility to forage seeds	All	Seeds provided by the government

**Table 7.** Major livestock production constraints and suggested solutions in type B households

Problem rank		Problems listed	Most affected	Suggested solutions by farmers
Male	Female			
1	2	Lack of capital	All	Credit facilities
3	3	Livestock diseases	All	Assistance from veterinary workers Keeping the farm clean, using powdered lime, spraying disinfectants Purchasing medicine Vaccination programs Traditional remedies (e.g. adding garlic to feed)
		Lack of feed	All	High-yielding forage varieties Training on making silage, feed preservation Supplementing with rice bran Collecting forages outside the village Planting forages
6	1	Lack of knowledge on disease diagnostics, livestock husbandry, taking care of cattle in winter	All	Use heaters during winter Participating in trainings

2	6	Market: Low price negotiation power, lack of market information	All	Find other market or better-paying collectors Wait until the prices go up Market information from various sources
5	5	Lack of genetically improved breeds	Female	Crossbreeding Select good breed, such as 3B (Blanc Blue Belge)
Other constraints		Level of accessibility to the villages	All	Fixing the road annually
		Lack of accessibility to vet medicines	All	Finding medicine from other town/city centers
		Lack of land to plant forage	All	-

**Table 8.** Major livestock production constraints and suggested solutions in type C village (Buom Khoang, Chiang Luong)

Problem rank		Problems listed	Most affected	Suggested solutions by farmers
Male	Female			
1	1	Lack of capital	Male	Credit facilities Better supports from the government
3	2	Livestock diseases	All	Informing vet workers Buying medicines
4	3	Lack of feed	All	High-yielding forage varieties Training on making silage, feed preservation Supplementing with ground maize Collecting forage outside the village Planting forage
5	4	Lack of knowledge on disease diagnostics, livestock husbandry, taking care of cattle in winter	Female	Providing heating during winter (covering cowshed with plastic sheets, setting up fireplace for cattle) Participating in trainings
2		Market: Low price negotiation power, lack of market information	All	Find other market or collectors who pay better Wait until the price go up
Other constraints		Lack of genetically improved breeds	All	Buying piglets/calves from other villages Adopting improved breeds
		Level of accessibility of the villages	All	Fixing the roads
		Lack of land for building livestock shed	All	Finding a place in the maize field

**Table 9.** Major livestock production constraints and suggested solutions in type C village (Xam Ta, Chiang Chung)

Problem rank		Problems listed	Most affected	Suggested solutions by farmers
Male	Female			
2	2	Lack of capital	All	Credit facilities (banks, relatives or agricultural input providers)
3	1	Livestock diseases	All	Assistance from veterinary workers Buying medicine Vaccination programs Participating in trainings
1	5	Lack of knowledge on disease diagnostics, livestock husbandry, taking care of cattle in winter	All	Learn from nearby Thai villages Providing heating during winter (covering cowshed with plastic sheets, setting up fireplace for cattle) Participating in trainings
4	3	Lack of genetically improved breeds	All	Avoid inbreeding

				Artificial insemination
5	4	Lack of feed	All	Planting forages Training on feed preparation and preservation Supplementing with rice bran, banana trunk Collecting forage outside the village
Other constraints		Market: Low price negotiation power, lack of market information	Male	Find markets in nearby towns/cities
		Accessibility to veterinary services	All	Finding service providers in other towns/cities
		Lack of water	All	-

#### 4. CONCLUSION

Livestock production is the second main source of income after crop production in the study area. Lack of feed, particularly during winter was ranked as one of the main challenges to livestock production. From this study and other engagements carried out in the study area, the following are the main conclusions on feed-related aspects – challenges and opportunities.

- In Type A households, there is no major feed shortage as most farmers grow Napier and other food-feed crops such as banana, and utilize crop residues. In addition, some farmers prepare silage for use during winter. There is, however, a need for trainings on better methods of preparation and storing silage that is more palatable to their livestock, appropriate feed mixing and diet proportions for improved nutrition.
- Type B households reported winter feed shortage and low-protein diets heavily relying on low-quality feed e.g. rice straw. This presents opportunities for improved forage varieties, better utilization of crop residues and feed mix and improved diets for cattle and pigs.
- The two villages in type C have different systems; Xam Ta has extensive system relying on communal pastures for grazing, the area has predominantly acid soils and farmers mostly rear traditional pig breeds with high fat content. In Xam Ta, there is an opportunity of improving communal pasture with improved forage varieties, especially acid-tolerant varieties, trainings on winter feed preparation and high-protein diets to achieve lean meat for pigs. On the other hand, Buom Khoang has a mixed crop-livestock system with limited communal pastures, mainly relying on crop residues (maize, sugarcane, rice straw), with similar challenges and opportunities as Type B villages.

## **5. PROPOSED FEED INTERVENTION STRATEGIES**

### **1. Improved forage varieties**

Most farmers only grow Napier, maize and banana as feed on a very small scale with low yields and nutrient content, and forages do not survive the cold winter temperatures. This presents an opportunity to introduce and promote improved grass and legume varieties which are high yielding, high quality and cold-tolerant. These improved varieties, particularly forage legumes, can be integrated into the existing systems by intercropping, growing in rotation with main crops, on contours or rice field banks. The proposed varieties for this area available locally include Ubon Stylo, *Arachis pintoii*, Mulato II, Mombasa guinea, Tanzania guinea and Ubon paspalum. The project will also work together with one local institution (NOMAFSI) currently screening additional forage legumes in one of the treatment communes (Chieng Chung) including *Centrosema pascuorum* and rice bean (*Vigna umbellata*). Interested farmers will select the varieties of their choice to grow on their farms (farmer-led trials). Cross-village visits will also help to motivate the farmers to adopt growing these varieties for improved animal nutrition.

### **2. Availability & access to seeds/planting materials**

In addition to introducing high yielding forage varieties, measures need to be put in place to ensure farmers in the study area have continued access to seeds or planting materials. This will be achieved by linking village and commune leaders to local seed suppliers, working with local extension staff, commune veterinary officers and the local government to ensure availability and access of planting materials to farmers. Selected farmers will also be trained on multiplying planting materials which can then be shared with their neighbours.

### **3. Utilization & preservation of feed (cattle)**

Winter feed shortage and lack of skills for feed preparation were identified as the main challenges facing livestock production. Trainings will be conducted on different feed practices such as right time for harvesting/cutting/grazing, feed classification, diet proportions/feed mix, feeding regime for age groups of cattle and feed processing (silage preparation and treatment of rice straw with urea).

### **4. Improved feed for pigs**

Traditional pig breeds tend to have high fat content and less lean meat, which significantly affects the sale price as the demand for lean meat is high. This intervention aims to improve lean meat of traditional pig breeds through trainings on balanced energy and protein feed sources in the diet, e.g. supplementing pig diets with *Stylosanthes guianensis* (high in protein). Farmers will also be trained on feed classification of available feed resources, diet formulation/feed mix, feeding regime for pig age groups



and feed processing (feed silage preparation or mixed feed fermentation with probiotics instead of cooking).

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