Livestock keeper in Buom Khoang, Chieng Luong commune
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RESEARCH PROGRAM ON Livestock

CGIAR

FARMING SYSTEMS AND ACCESSIBILITY IN NORTH-WEST VIETNAM:
A BASELINE SURVEY FROM THE LI-CHĂN PROJECT

AUTHORS

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LI-CHĂN

CGIAR is a global partnership that unites organizations engaged in research for a food-secure future. The CGIAR Research Program on Livestock provides research-based solutions to help smallholder farmers, pastoralists and agro-pastoralists transition to sustainable, resilient livelihoods and to productive enterprises that will help feed future generations. It aims to increase the productivity and profitability of livestock agri-food systems in sustainable ways, making meat, milk and eggs more available and affordable across the developing world.

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Interview in a Thai household. Photo ILRI/Alliance Bioversity-CIAT/Mai Thanh Tu

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Finally, our appreciation goes to the village heads who helped us to reach the households and to the 622 farmers who responded to the questionnaires.

Contents

Abbreviations and acronyms

AI	Artificial Insemination
CRP	CGIAR Research Program
FIES	Food Insecurity Experience Score
HDDS	Household Dietary Diversity Score
HH	Household
MAE	Male adult equivalent (in terms of calorie demand)
RHoMIS	Rural Household Multi-Indicator Survey
TLU	Tropical livestock units
TVA	Total value of activities
USD	United States dollar
yr	year

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Photo Livestock CRP Photovoice/Song A Trang

SUMMARY

Six-hundred and twenty-two households were surveyed using the Rural Households Multiple Indicator Survey (RHoMIS) in Son La, North-West Vietnam between February 11 and March 23, 2020.

The survey responses were grouped into a farm typology with households close to roads and markets, in the valley bottoms with the best soil and most commercialised and intensified classified as farm Type A; those on the valley edges and slopes, who practice more mixed agriculture and are less specialised classified as farm Type B; and those high on the slopes who have poor road access, poorer quality land, and are generally more extensive and subsistence-oriented than the others classified as farm Type C.

The survey results revealed that livelihood strategies in Son La relied heavily on crop sales for income, although livestock production also contributed significantly to farm income, especially for Type A farms. Off-farm income usually only represented a relatively small proportion of overall household income among the three farm types. Households across the region reported mild food insecurity, with some small differences among farm types, whereby Type A households were reported to be slightly more food secure than the others, and Type C slightly less food secure than Type B.

In terms of gender equality, the general pattern suggested that control over production and ownership of assets is fairly equitable but tends to skew towards male decision making and ownership of land, especially for Type C farms. While most activities were carried out jointly by both sexes, crop planning and animal healthcare were more often undertaken by males, while manure management was undertaken by females.

Challenges in soil fertility were reported by more than 85% of the farming households, with most responding that they experienced soil erosion and soil moisture problems. Crop inputs were used by similar proportions of households among the three farm types, except for irrigation water often used in paddy rice systems, which was used by around 30% of households of farm Types A and B, but by only 6% of Type C farming households.

Around four agroecological practices were employed by farm Types A and B. Type C farms only employed around 3 of these types of practices.

Cropping was diverse in the study site with households growing nine crops on average. There was little variation among farm types in this regard. Crop residues tended to be used more for livestock feed by farm Type A than either of the other two farm types.

Livestock species ownership did not tend to differ among farm types, with nearly all farms owning chicken, and around 50% owning cattle and 50% owning pigs. More than twice as many households from Type A owned buffalo compared to Type B and C farms. Income from buffalo production was much higher for Type A farms despite the fact that Type C farms kept around the same number of buffaloes as Type A farms. This suggested that buffalo kept by Type C farms are used for purposes other than commercial sale (eg, draught power).

The proportions of households using different sources of forage for their livestock feed baskets tended to be similar, although Type A farms reported the highest proportion of households using cultivated forages (73%). Feed basket composition changed on a seasonal basis with Spring feed being dominated by cultivated forage and Winter feed consisting mainly of crop residues and other feed types. In terms of livestock health, Type A farms tended to have a greater proportion of their livestock free from disease.

Overall, gastro-related diseases were reportedly the most common types of diseases across all livestock species. Households from farm Type B tended to use the greatest number of animal health best practices, followed by farm Type A, then farm Type C. Artificial insemination (AI) had never been used by any of the farm types for the breeding of buffalo, chickens, ducks or other poultry, and by only 1% of Type A farms for the breeding of cattle. On the other hand, over 7% of Type A and B farms and 4% of Type C farms had used AI for the breeding of pigs.

Photo Livestock CRP Photovoice/Luong Thi Thu

INTRODUCTION

Li-chăn – Livestock-led interventions towards equitable livelihoods and improved environment in the North-West Highlands of Vietnam, is a project under the CGIAR Research Program on Livestock (Livestock CRP) which aims at providing research-based solutions to drive smallholder farmers transition to sustainable and resilient livelihoods and to more productive small-scale enterprises that will help feed future generations. Vietnam is selected as one of four priority countries to consolidate research from different disciplines and translate it into a pilot with flexible combinations of integrated interventions from 2019 until end of 2021.

Li-chăn has been co-designed by both international and national partners. It is co-implemented by the Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT), International Livestock Research Institute (ILRI), Swedish University of Agricultural Sciences (SLU), Vietnam National Institute of Animal Science (NIAS), National Institute of Veterinary Research (NIVR), Northern Mountainous Agriculture and Forestry Science Institute (NOMAFSI), Sub-Department of Husbandry, Animal Health and Aquaculture of Son La Province, Mai Son Agriculture Division, Mai Son Agriculture Service Center.

Li-chăn aims at stimulating system transformation through bundled livestock-based interventions in North-West Vietnam, covering the areas of livelihoods, environment, equity, and market access to benefit highland farming communities.

The selected study location is Mai Son district, Son La province, was chosen to represent different challenges and needs in the North-West 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.

In support of the contextual analysis, and the monitoring and evaluation of the Vietnam Livestock country project, a baseline survey (the Rural Household Multi-Indicator Survey – RHoMIS) was conducted. The survey had three main objectives:

- to provide a baseline to enable the evaluation of the planned interventions in livestock systems on farm practices and rural livelihoods,
- to characterise in detail the rural livelihoods and livestock systems in the target district; and
- to aid in the assessment and analysis of the dynamics of livestock production systems in reaction to various shocks.

Photo ILRI/Alliance Bioversity-CIAT/Mai Thanh Tu

Little kid and his cattle in Mai Son District, Son La Province, Vietnam.

Photo ILRI/Alliance Bioversity-CIAT/Mai Thanh Tu

METHODOLOGY

A farmer and enumerator discuss land use.

SAMPLE DESIGN

The sample size for the household survey was determined based on data derived from the CRP Humid Tropics household survey in Son La and Dien Bien provinces conducted in 2014. According to an analysis of minimum detectable difference of this data, a survey design of around eight commune clusters with 50 households per cluster resulted in 95% confidence intervals of around 40-65% of the mean. This resulted in a minimum sample of 400 household surveys.

The communes where the surveys were administered were randomly selected from the 21 communes in Mai Son district by assigning a random number to each commune and then ranking the communes by their random number. Due to inaccessibility problems, one commune from Mai Son district (Chieng Noi) was excluded from selection. Households were randomly selected for survey by assigning random numbers to each household and sorting by these random numbers within each commune. To participate in the survey, it was deemed necessary that the household be engaged in farming activities and own a large ruminant or pig. As such, in the instance that the household did not meet these criteria, a household from a replacement list was used instead.

SURVEY DESIGN AND IMPLEMENTATION

The questionnaire was based on the RHoMIS core version 1.6 (see www.rhomis.org), with additional and bespoke modules added for livestock feeding, health, and breeding, as well as ecological landscape management, and uptake interventions promoted by the *Li-chăn* project. The survey was translated into Vietnamese, and implemented by a team of trained enumerators using the android-based open data kit (ODK) software.

DATA ANALYSIS

All data preparation and analysis was conducted in using R language (version 4.0.4) and the RStudio environment (version 1.4.1103). Data and analysis scripts have been archived and are available on request. The meaning and calculation procedure for core indicators are shown in **Table 1**.

Table 1. Description of the core indicators generated from the RHoMIS survey.

Indicator	Explanation and calculation details
HH Size (members)	The number of members of the household.
HH Size (MAE)	The number of members of the household in terms of male adult equivalent (MAE). The number of individuals within each age and sex category are multiplied by their associated coefficient. For example, if the caloric demand of an adult males is 2,500 kCal per day, the coefficient is 1. If the caloric demand of an adult female is 2,200 kCal per day, the coefficient is 0.86.
Land Cultivated (ha)	The total area of land cultivated by the household.
Livestock Holdings (TLU)	The total livestock holdings in terms of tropical livestock units (TLU). Calculated by multiplying the number of heads of livestock by their TLU coefficients and adding all together. The TLU scale is pegged to the mass of one adult cow. For example, one chicken is 0.01 TLU. If a household has five chickens and no other livestock, their livestock holdings will be 0.05 TLU.

FIES	The score of the household on the Food Insecurity Experience Scale, measured on a scale of 0-8, where 8 indicates the most severe experience of food shortages, and 0 indicates no shortages.
Lean months (count)	The number of months in which the respondent states there were shortages of food.
HDDS (flush season) (0-10)	Household dietary diversity score during the a month of the year when there was the most food available. The score range is 1 to 10, where each point represents consumption of one food group at least weekly. The ten food groups are defined in the guidelines for the Minimum Dietary Diversity for Women indicator.
HDDS (lean season) (0-10)	Household dietary diversity score during the a month of the year when there was the least food available. The score range is 1 to 10, where each point represents consumption of one food group at least weekly. The ten food groups are defined in the guidelines for the Minimum Dietary Diversity for Women indicator.
Total value of production ($/MAE/day)	The total value of activities (TVA) in US Dollars per male adult equivalent (MAE) per day. This is calculated by taking sum of annual incomes from farm sales, off farm work, and the value of farm produce consumed, divided by 365, and then divided by the household size in MAE.
Cash Income ($/MAE/day)	Total cash income for the household in US Dollars per male adult equivalent (MAE) per day. This is calculated by taking sum of annual incomes from farm sales and off farm work, divided by 365, and then divided by the household size in MAE.
Off Farm Income ($/hh/year)	The total cash income from off farm activities, in US Dollars per male adult equivalent (MAE) per day. This is based on the question: 'what proportion of your income comes from off-farm sources', with binned responses possible (none=0%, little=10%, under half=20%, half=50%, most=70%, all=90%). The off farm income is therefore: off farm income = prop*(farm income/(100-prop)).
Crop Production Value ($/hh/year)	The annual total value of household crop production in US Dollars per household. This is the sum of the income from all crops and value of all crops consumed at local market prices.
Crop Sold Value ($/hh/year)	The annual total value of household crops sold in US Dollars per household.
Crop Consumed Value ($/hh/year)	The annual total value of household crops consumed in US Dollars per household, at local market prices.
Livestock Production Value ($/hh/year)	The annual total value of household livestock production in US Dollars per household. This is the sum of the income from all livestock products and the value of all livestock products consumed at local market prices.
Livestock Products Sold Value ($/hh/year)	The annual total value of household livestock products sold in US Dollars per household. This includes live sales, sales of meat, eggs, milk, or dairy produce.
Livestock Products Consumed Value ($/hh/year)	The annual total value of household livestock products consumed in US Dollars per household, at local market prices. This includes consumption of meat, eggs, milk, or dairy produce.
Potential kCal pers day	The kCal potentially available to each household member per day (measured in MAE). There are two main portions of this calculation. The first is the calories consumed directly from self-produced food. The second is the calories which could be acquired through the cash incomes generated. These are quantified according to local market prices for staple crops.
Market Orientation	The proportion of farm produce which is sold, where the 'amount' of farm produce is measured in cash value, not mass.
Number of income sources	A count of the number of discrete sources of cash income reported within the last 12 months.
Female control of production	The proportion of the total value of activities (TVA) which is controlled by a female in the household. For each farm product or income stream, a question is asked regarding who in the household decides on consumption or spending. Through this it is possible to determine the proportion of total value controlled by males or females.

TYPOLOGY OF FARMS

Based on consultations with partner organisations and early assessments of the local context, three farm types were identified according to their accessibility to roads and markets. Households closest to roads and markets, in the valley bottoms with the best soil and most commercialised and intensified were classified as Type A households. Households on the valley edges and slopes, who practiced more mixed agriculture and were less specialised were classified as Type B households. Finally, those households high on the slopes who had poor road access, poorer quality land, and were generally more extensive and subsistence-oriented than the others were classified as Type C households. Full criteria are listed in the appendix.

The 175 villages within the ten communes were each categorised according to this typology, whereby all households from that village were designated as the same farm type. The majority of households interviewed were Type A or Type B (see **Table 2**). The typology groupings were not spread evenly between the communes, which reflects the geographic differences between the study locations (see **Figure 1**).

Table 2. Number of households surveyed by farm

Type	Number of interviews
A	242
B	329
C	51

Figure 1. Number of respondents, per typology and commune

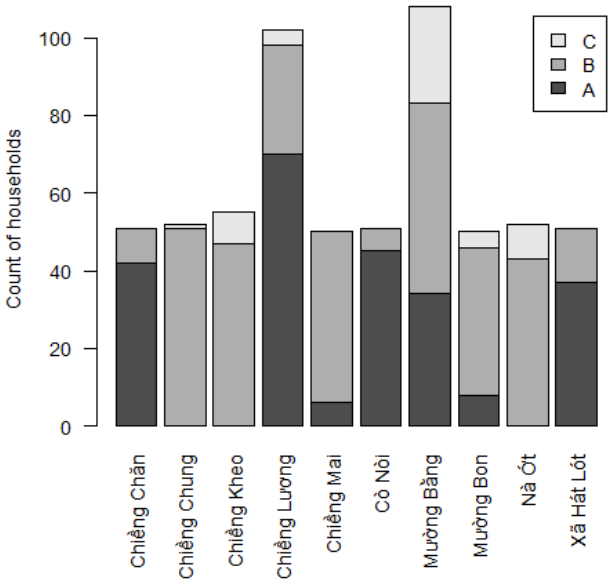


Photo Livestock CRP Photovoice/Ly A Trong

Low-access household with a diverse cultivation system.

Photo: ILRI/Alliance Bioversity-CIAT/Mai Thanh Tu

RESULTS

Interview in a H'Mong household.

SAMPLE SUMMARY

Household interviews were carried out in Mai Son District, Son La Province, North-West Vietnam between 11 February and 23 March 2020. Six hundred and twenty-two interviews were collected across 175 villages in ten communes (**Figure 2**). The communes were: Nà Ớt, Chiềng Kheo, Mường Bon, Xã Hát Lót, Chiềng Mai, Mường Bằng, Cò Nòi, Chiềng Chung, Chiềng Lương, and Chiềng Chăn.

The communes where the surveys were administered were randomly selected from the 21 communes in Mai Son district by assigning a random number to each commune and then ranking the communes by their random number. Due to inaccessibility problems, one commune from Mai Son district (Chieng Noi) was excluded from selection. Households were randomly selected for survey by assigning random numbers to each household and sorting by these random numbers within each commune. To participate in the survey, it was deemed necessary that the household be engaged in farming activities and own a large ruminant or pig. As such, in the instance that the household did not meet these criteria, a household from a replacement list was used instead.

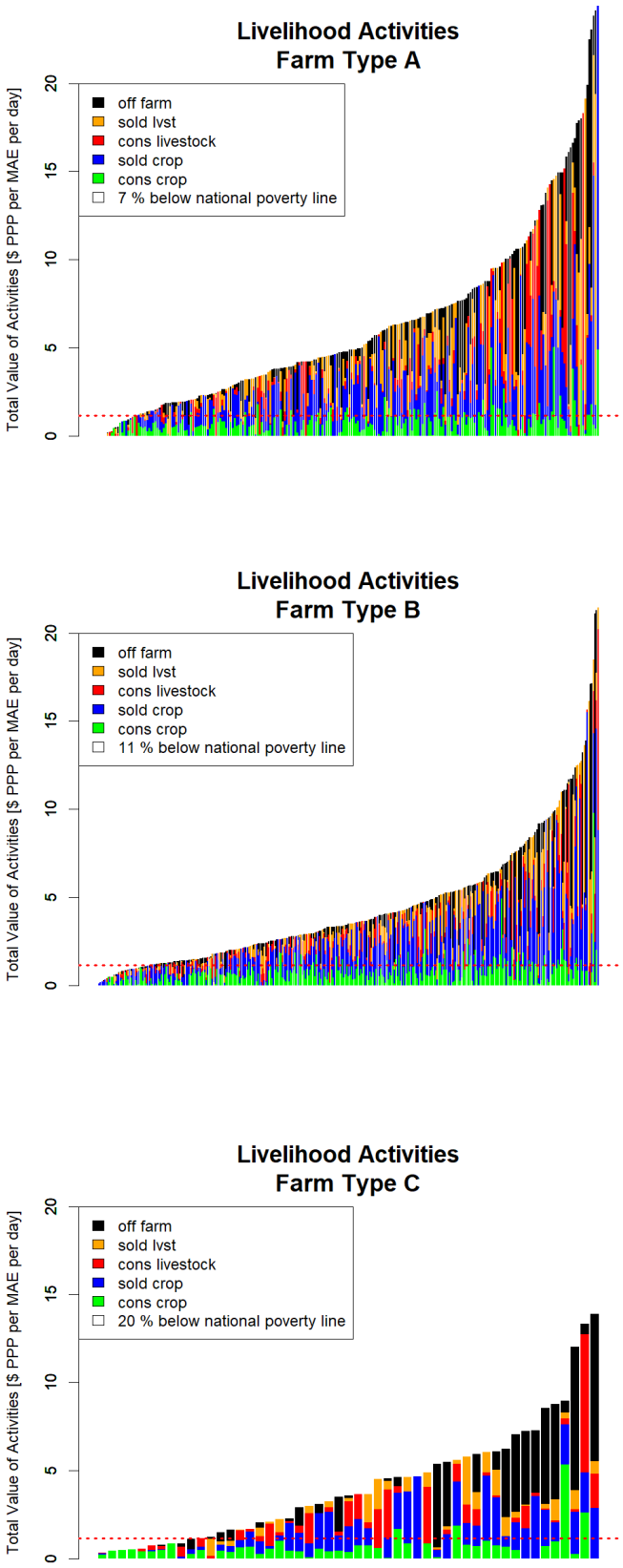
About two thirds of the respondents were male, and about two thirds of the respondents self-identified as a household head (the remainder were mainly spouse of head). According to the enumerator evaluation of responses on survey implementation (reliability and rapport), it seemed to go well. The survey duration averaged 48 minutes, which is within the expected duration for the questionnaire (**Table 3**).

Figure 2. Location of household surveys

Table 3. Summary of respondent information

Location	Number of interviews	% Female respondents	% Male respondents	% Household heads	Duration of surveys (avg mins)	Duration of surveys (sd)	% Reliable or very reliable	% Easy or medium rapport
Son La	622	32	68	66	48	20	87	99

Figure 3. Value of production and sales from crops, livestock, and off farm activities



LIVELIHOOD ACTIVITIES

The bar charts of **Figure 3** show the total value of households' income and agricultural production. The height of each bar represents the total value in terms of USD per male adult equivalent per day. The colours within the bars show where that income or value came from: crops which were consumed, crops which were sold, livestock produce that was consumed, livestock produce that was sold, or paid off-farm activities. Note that due to the differing number of interviews in each farm type, there are differing numbers of vertical bars, as each bar represents one household.

Type A were indeed the wealthiest in terms of income, followed by type B, followed by type C. The differences were not huge however.

Most households produced a basic quantity of crops for consumption (green), and relied heavily on crop sales for income (blue). Most households also kept livestock, and consumed some of their livestock produce (orange). Type A derived more value from livestock sales (red) than the other farm types. Type C appeared to generate less value from livestock production compared to the others, which implies a combination of lower livestock ownership and/or lower livestock productivity.

Many households also earned off-farm incomes, but these were generally supplemental rather than forming a major component of livelihoods.

ASSETS AND INCOMES PER FARM TYPE

Assets and incomes per farm type are summarised in **Table 4**. Farm size was pretty similar between the types. Livestock ownership was higher for farm Type A compared to the others. The total value of all farm produce, and the actual cash incomes, were highest for Type A, followed by Type B, and then Type C. Value of crop production was highest for Type A, followed by Type B and then Type C. Livestock production value was also higher for Type A, and then Type B and C earned similar values from livestock. Farm Types C and A earned the most from off-farm income, and farm Type B earned considerably less from off-farm activities. In terms of market orientation, Types A and B sold about two thirds of their produce, whereas Type C sold about half of their produce. All farm types had around three sources of cash income on average.

Overall, these results show that Type A appears to have higher incomes, more intensified crop production, and more livestock production, probably due to both more ownership of livestock and greater intensification. All farm types were engaged in sales of produce to markets, although Type C was less engaged with markets than the others. Type C appeared to be generally poorer and less intensified, and despite further distance to towns and roads, were often engaged in off-farm work, which suggests a need to supplement farm incomes. Type B were somewhere in between these two, generally relying on farm production and sales, but were not as productive as Type A.

Table 4. Summary of farm assets and income by farm type

Farm Type	A		B		C	
	mean	sd	mean	sd	mean	sd
HH Size (members)	4.8	1.5	4.7	1.6	5.0	1.7
Land Cultivated (ha)	1.6	1.2	1.4	1.2	1.8	1.5
Livestock Holdings (TLU)	3.6	4.6	2.3	2.1	2.7	2.3
Total value of production ($/MAE/day)	5.9	5.2	4.1	3.7	3.9	3.3
Cash Income ($/MAE/day)	4.1	4.5	2.9	3.2	2.6	2.9
Crop Production Value ($/hh/year)	2839	2803	2557	2575	1939	1613
Livestock Production Value ($/hh/year)	1999	2762	1167	1899	1053	1230
Off Farm Income ($/hh/year)	1106	2814	510	2029	1205	2533
Market Orientation (% produce sold)	66	27	64	25	50	29
Number of income sources	3.6	1.6	3.3	1.7	3.2	1.8

FOOD SECURITY

There appeared to be mild food insecurity in the study area. Type A was slightly more food secure than the others, Type C slightly less food secure, and Type B in the middle.

March, April and May were the leaner months in terms of food availability (**Figure 4**). **Table 5** presents food security indicators. On the Food Insecurity Experience Scale (FIES), households reported mild food insecurity (scoring 1 or 2 out of a possible 8, where a higher number indicates more experience of hunger). On the household dietary diversity score (HDDS), there was some small difference between the flush and lean seasons, but it was not great. Households generally scored about 5 out of a possible 10, where each point represents weekly consumption of a specific food group. This suggests a nutritionally adequate but not plentiful diet. In terms of the potential calorie availability if all incomes were used to purchase food, and all farm products consumed, households appear to be well able to meet their basic calorie demands.

Figure 4. Hungry months by proportion of households

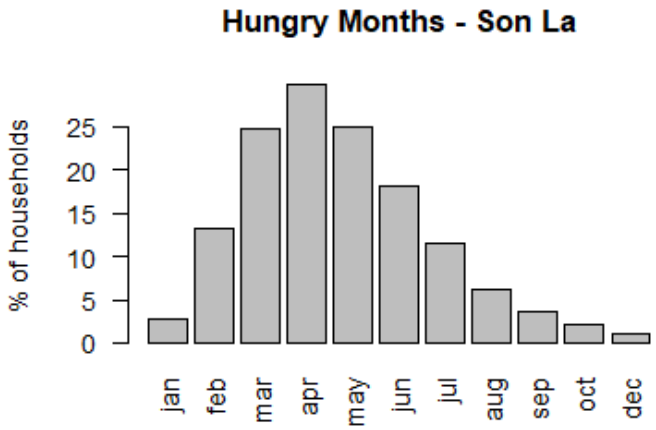


Table 5. Summary of food security indicators by farm type

Farm Type	A		B		C	
	mean	sd	mean	sd	mean	sd
Lean months (count)	1.0	1.4	1.6	1.7	1.7	1.4
FIES (0-8)	1.2	1.6	2.0	2.0	2.5	2.1
HDDS (lean season) (0-10)	5.3	1.9	5.5	2.0	4.3	2.5
HDDS (flush season) (0-10)	5.6	2.0	6.0	1.9	5.3	2.1
Potential kCal pers day	19,530	19,102	14,549	13,557	13,559	12,092

Figure 5. Foods eaten at least weekly by farm type

The actual food groups consumed are shown in Figure 5. The food groups consumed were fairly similar between the farm types, with very frequent consumption of grains, leafy vegetables, and meat. Fruits, eggs, and other vegetables were also often consumed. Legumes, nuts and seeds, and vitamin A rich fruits and vegetables were consumed less frequently. Farm Type C consumed slightly less animal sourced foods than the others. Farm type B consumed more vegetables and fruits of all varieties, perhaps suggesting a culture of kitchen gardens or horticulture.

GENDER ISSUES

Gender issues were assessed through three sets of questions: decision making overspending of incomes and use of farm products (termed "control of production"); through assessment of ownership of productive assets such as land and livestock; and through engagement in farming activities.

Figure 6 shows the female control of production for each farm type. The general pattern was that a bit over half of households reported fairly equitable levels of control, and a bit less than half of households reported control heavily skewed towards male decision making. These two distinct groupings regarding control of production were evident in each farm type, although there was slightly more male domination in type C compared to the others. A small minority of households reported very high levels of female control of production, these are typically single female-headed households (about 5% of the study population).

Table 6 shows ownership of assets, for each farm type and each of the two sexes. Joint ownership was possible and in that case both male and female ownership was recorded. Livestock were jointly owned in almost all cases, with some exceptions amongst Type C, where males more commonly owned cattle, pigs, and chicken compared to females. Land ownership was however more clearly male dominated, with twice as much male land ownership compared to female. Again, there was a slightly larger male bias amongst farm type C compared to the others.

Table 6. Summary of ownership of assets by gender and farm type

Farm Type	A		B		C	
Gender	Females	Males	Females	Males	Females	Males
Land (%)	50	93	46	93	31	96
Cattle (%)	53	54	54	55	59	67
Buffalo (%)	44	44	19	19	10	12
Pigs (%)	45	45	46	46	51	61
Goats (%)	11	10	13	14	10	10
Chicken (%)	63	62	70	68	76	84

Figure 6. Female control of production by farm type

Photo ILRI/Alliance Bioversity-CIAT/Mai Thanh Tu

Women and their buffaloes in Mon village, Chieng Luong commune.

Table 7 shows female and male contributions to farming activities. The values represent the proportion of households who report males and/or females taking part in each activity. Most activities were carried out jointly by both sexes, although there were a few notable exceptions. Crop planning and animal healthcare were more often undertaken by males and not by females. Females more often undertook manure management than males (at least for farm types A and C).

Table 7. Summary of female and male contributions to farming activities

Farm Type	A		B		C	
Gender	Female	Male	Female	Male	Female	Male
Crop planning (%)	65	95	57	92	49	98
Land preparation (%)	94	95	89	93	98	94
Weeding (%)	98	95	96	89	96	94
Harvesting (%)	97	95	98	93	98	94
Animal health (%)	71	90	72	86	71	84
Herding (%)	25	26	34	35	33	33
Cutting cultivated forage (%)	63	60	61	61	67	65
Collecting forage (cattle) (%)	53	50	46	48	57	51
Collecting forage (buffalo) (%)	17	15	10	10	6	6
Collecting forage (goats) (%)	10	10	11	11	10	8
Manure management (%)	90	78	70	74	84	67
Milking cattle (%)	0	0	0	0	0	0

Table 8. Summary of land area owned and cultivated by farm type

Typology		A		B		C	
		mean	sd	mean	sd	mean	sd
Land area (ha)	Owned	1.5	1.2	1.4	1.1	1.8	1.5
	Cultivated	1.6	1.2	1.4	1.2	1.8	1.5

LAND AND SOIL MANAGEMENT

Almost all households owned the land they farmed (>95% of housheolds in each farm type). About 10% of households in each farm type rented extra land for agricutlural use, and about 10% of households reported using communal land (**Table 8**).

Farms were generally about one hectare in size, and rarely larger than three hectares. Farm type C more commonly had larger farms comapred to the other farm types. The land are distrubutions are show in **Figure 7**.

Figure 7. Histogram of land cultivated (ha) and % of households in Son La

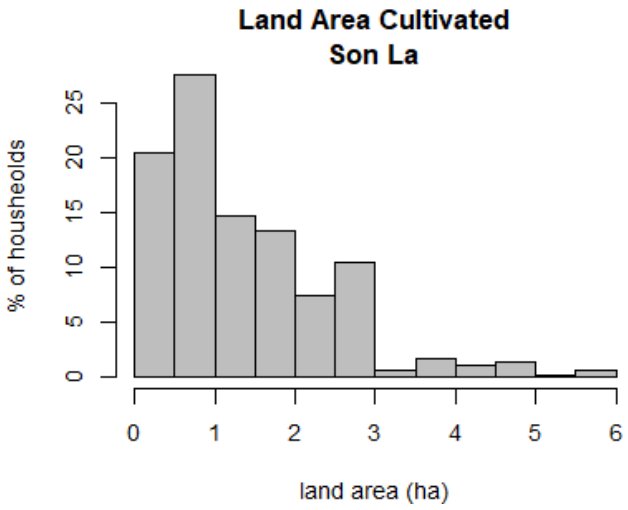
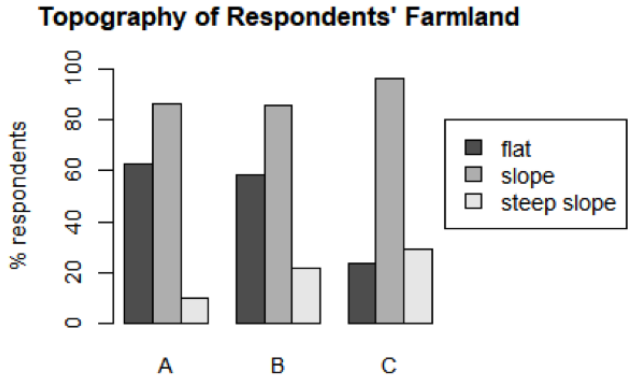


Figure 8. Topography of respondents' land by farm type



The topography of the land varied between the farm types (**Figure 8**). Farm Types A and B typically had access to both flat and sloping land, whereas far fewer Type C households had access to flat land. This influences the types of crops which can be grown, and increases the labour requirement for cropping.

Land management practices such as soil or water conservation measures, integration of livestock-crop-trees, and recycling of biomass are reported in **Table 9**. On average, a household in Farm Type A or B used four agro-ecologically sound practices, and households in Farm Type 3 used three agro-ecological practices (**Figure 9**). The most frequently used practices were returning of crop residues to soils, application of manures to soils, feeding of crop residues to animals, cut off drains and minimum till. There was more scope for integration of trees, use of legumes for soil fertility, and anti-soil erosion measures. It should be noted that almost all households applied chemical fertilisers and pesticides. Despite all these practices, almost all households reported that they perceived problems due to limited soil moisture, soil fertility and soil erosion.

Figure 9. Number of agroecological practices by farm type

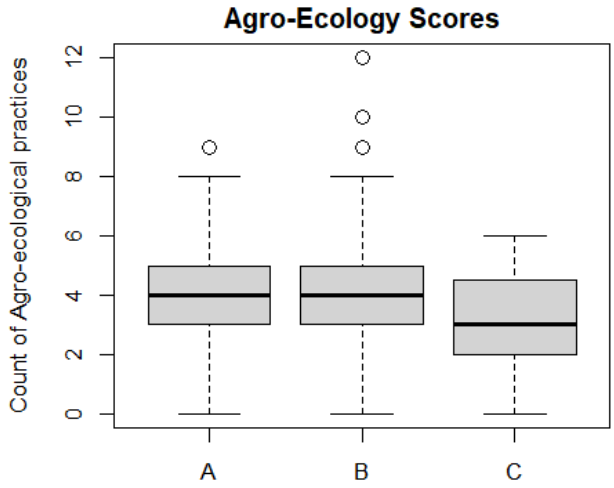


Table 9. Land and soil management by farm type

Typology		A (% of hh)	B (% of hh)	C (% of hh)
Farmer perceptions	Soil fertility problems	91	93	86
	Soil erosion problems	83	87	86
	Soil moisture problems	96	95	98
Crop inputs used	Irrigation	31	27	6
	Fertilisers	97	98	98
	Pesticides	78	85	82
	Manure	75	63	59
	Hybrid Seeds	34	45	41
	Compost	0	1	0
	None	0	1	0
Soil and Water Conservation Measures	Cut off drain	22	50	22
	Min tillage	34	20	22
	Mulching	2	5	0
	Check dams	2	2	0
	Contour ploughing	7	3	0
	Terraces	1	1	0
	Soil or stone bunds	0	6	2
	Ridge and furrow	1	0	2
	Hill afforestation	2	3	2
	Strip planting	8	6	2
	Water ponds	0	0	0
	Basin planting	0	0	2
	Percolation pit	2	2	0
Agricultural Integration Measures	Use of crop residues	78	87	73
	Feeding crop residues to animals	54	44	47
	Use of own animals' manure to crops	40	33	29
	Use legumes for soil fertility	12	13	8
	Soil fertility interventions	28	36	22
	Tree use for food/fodder	2	4	0
	Agroforestry use	20	33	22

Photo Alliance Bioversity-CIAT/Sabine Douxchamps

Cultivation on steep slopes prone to erosion in Buom Khoang, Chieng Luong commune.

CROPS

Cropping was fairly diverse, with households on average growing nine crops, and in some cases even up to around twenty different crops. There was not much difference between the farm types in this regard. The frequency with which crops were grown is shown in **Figure 10** below, for each farm type. The major crops were rice (either irrigated of rain fed), maize, sugar cane (mainly for Farm Type A), and coffee (mainly for Farm Types B and C). Rice was mainly consumed in the home, maize was mainly sold, and coffee and sugar cane were almost exclusively sold (see **Table 10**).

Longan and Mango were also reported as important crops by a minority of households. The other crops – mostly fruits and vegetables – were not considered central to the household economies, but presumably supplemented diets.

Figure 10. Proportion of households cultivating commonly grown crops by farm type

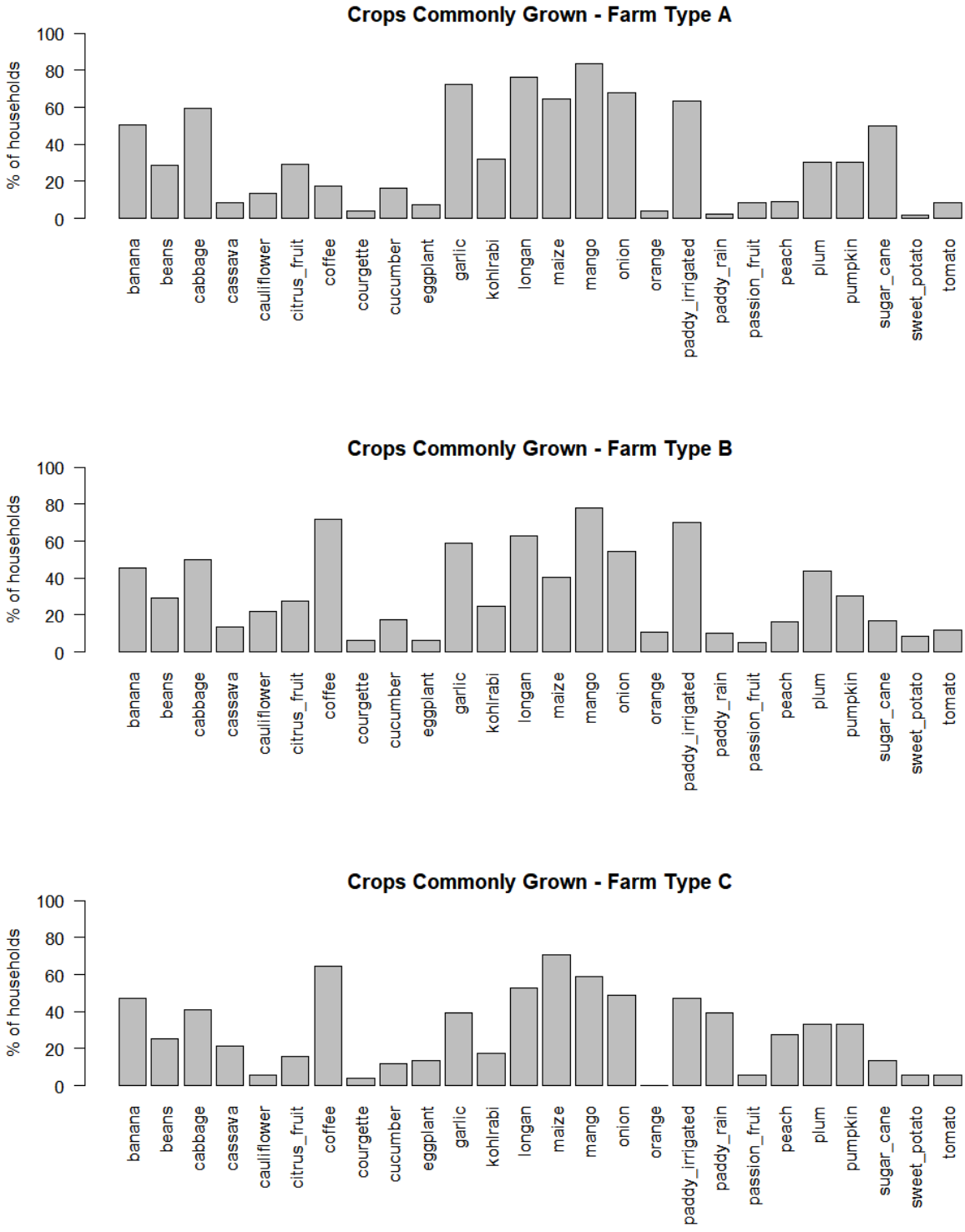


Table 10. Crop production and use by the six main crops and farm type

Typology		A		B		C	
		mean	sd	mean	sd	mean	sd
Rice	Harvest (kg)	1377	1056	1206	1381	871	489
	Land area (ha)	0.5	0.8	0.2	0.3	0.4	0.4
	Yield (kg/ha)	5393	7395	8621	8345	3897	4467
	Consumed (%)	79	17	81	16	100	14
	Sold (%)	21	12	19	13	0	0
	Sale income ($/yr)	325	240	756	1865	214	NA
Maize	Harvest (kg)	8046	7018	6828	9368	8235	8929
	Land area (ha)	0.9	0.9	0.6	0.6	0.7	0.6
	Yield (kg/ha)	10752	12355	12969	11288	13519	13813
	Consumed (%)	38	33	31	33	18	18
	Sold (%)	62	16	69	20	82	15
	Sale income ($/yr)	1426	1330	1082	1336	1438	1099
Coffee	Harvest (kg)	2952	3945	5986	7100	3571	3790
	Land area (ha)	0.4	0.3	0.8	0.8	0.8	0.7
	Yield (kg/ha)	6822	5535	8565	9082	5480	6255
	Consumed (%)	0	NA	0	NA	0	NA
	Sold (%)	100	0	100	2	100	0
	Sale income ($/yr)	842	1092	1723	2064	648	947
Sugar Cane	Harvest (kg)	65718	54583	46958	36539	52857	29134
	Land area (ha)	1.1	0.9	0.9	0.8	1.0	0.6
	Yield (kg/ha)	66318	42967	78930	70254	69932	41985
	Consumed (%)	0	NA	5	7	51	NA
	Sold (%)	100	2	95	6	49	19
	Sale income ($/yr)	2071	1873	1606	1272	1353	1076
Mango	Harvest (kg)	990	1690	484	2717	1040	1135
	Land area (ha)	0.5	0.6	0.4	0.5	0.512	0.3
	Yield (kg/ha)	1929	3548	1684	5702	2474	2331
	Consumed (%)	17	22	29	33	10	0
	Sold (%)	83	19	71	20	90	0
	Sale income ($/yr)	1213	1739	359	2419	377	336
Casava	Harvest (kg)	9167	11243	14105	15092	4314	3402
	Land area (ha)	0.5	0.5	0.7	0.5	0.7	0.5
	Yield (kg/ha)	26144	19708	26082	24610	4656	3191
	Consumed (%)	0	NA	34	NA	9	NA
	Sold (%)	100	3	66	8	91	0
	Sale income ($/yr)	644	776	1024	1131	296	133

CROP RESIDUES

Table 11 describes how the different farm types managed their crop residues by the different crops. Type A farms tended to use crop residues more for feed than either farm Type B or farm Type C, which was that farm type that used crop residues least for animal feed. Rice crop residues was the crop used most for livestock feed, being used by over 50% of Type A farms as livestock feed. Maize was more commonly burned by Type A farms (40%), but was also commonly incorporated directly back into the soils by all farm types (between 16-29% of HHs). Survey respondents generally considered that they did nothing with coffee crop residues suggesting that farmers did not perceive much value in the residue of these crops. Sugar cane crop residue was more commonly either burned or used as livestock feed across all farm types, although a smaller proportion of farms also incorporated these residues directly back into the soil. Other uses of crop residues (e.g. composting, sale, use as a fuel) were not common. Often respondents said they did "nothing" with the residues, which is not entirely logical, but explains why some residues do not appear to be utilised.

Table 11. Crop residue uses by crop and farm type

Crop	Farm type								
	A (% HH)			B (% HH)			C (% HH)		
	burn	soil	feed	burn	soil	feed	burn	soil	feed
Rice	5	23	56	19	29	47	27	25	37
Maize	40	26	7	12	16	3	33	29	2
Coffee	2	1	0	2	26	0	10	4	0
Sugar cane	37	13	36	9	4	12	10	2	10

Nb. The above are the most frequently reported uses. "Burn" refers to burning in situ. "Soil" refers to direct return to soil, whereby residues are left in the field and ploughed back in.

Photo ILRI/Alliance Bioversity-CIAT/Mai Thanh Tu

Cattle grazing crop residues, Mai Son district.

LIVESTOCK OWNERSHIP AND USE

As shown in **Figure 11**, livestock species ownership was similar across the three farm types. Chicken ownership was nearly ubiquitous across all farm types being owned by around 90% of households. The second most commonly kept livestock species was cattle, owned by between around 55-65% of households. There was more diversity in buffalo ownership with around 45% of Type A farms keeping buffaloes, around 20% of Type B farms, and around 11% of Type C farms. Pigs were also commonly kept, being kept by around 45% of Type A and B farms and by around 60% of Type C farms.

Table 12 provides more detail with regard to livestock ownership and production purpose. Most income generated from livestock was derived through cattle production and sales, milk production was not an objective for these smallholder farmers. Income from buffalo production was much higher for Type A farms ($257 year-1) compared to Type B and Type C farms ($23 year-1 and $0 year-1 respectively). This was in spite of the fact that Type C farms kept around the same number of buffaloes (2) as Type A and B farms. This suggests that the buffalo kept by Type C farms are used for purposes other than commercial sale (e.g. draught power), as borne out by the figures for buffalo sales, which were higher for Type A and B farms (0.63 and 0.43 respectively) than Type C farms (0.17). This also explains why more Type A and B farms reared improved buffalo breeds (5 and 4% respectively) compared to Type C farms (2%). The other main source of income from livestock production came from pigs with Type A farms again generating most income ($173 year-1) compared to Type B ($156 year-1) and C ($101 year-1) farms.

Figure 11. Proportion of households keeping different livestock species by farm type

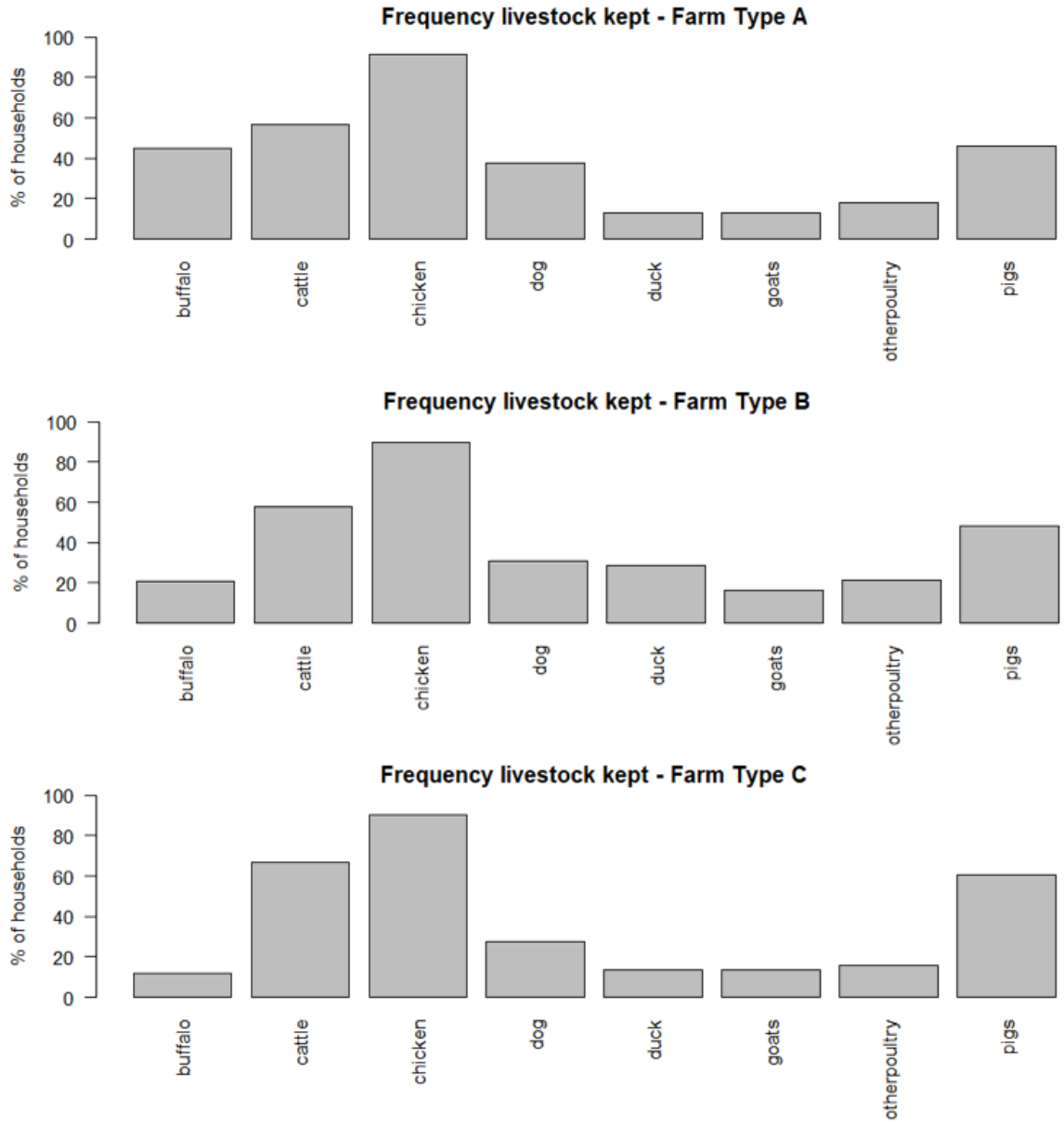


Table 12. Livestock production variables by livestock species and farm type

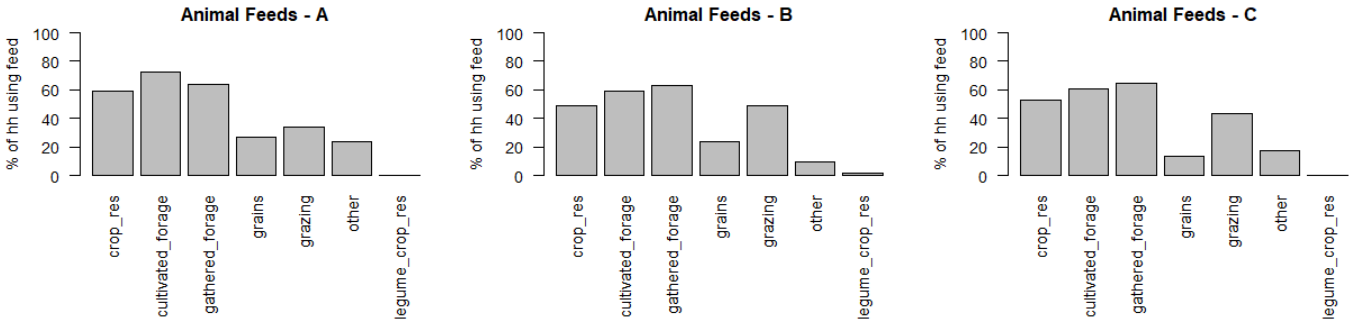
		A		B		C	
		mean	sd	mean	sd	mean	Sd
Cattle	kept (count)	2.6	3.1	2.1	1.7	2.5	2.6
	births (count/yr)	0.9	1.3	0.7	0.8	0.8	0.8
	sold (count/yr)	1.1	2.9	0.6	1.6	0.6	0.9
	slaughter (count/yr)	0.1	0.5	0.0	0.3	0.1	0.4
	milked (count)	0	0	0	0	0	0
	cash income ($/yr)	246	740	154	675	203	422
% of hh with improved breeds		14	-	19	-	21	
Buffalo	kept (count)	1.9	4.1	1.7	0.9	2.0	0.9
	birth rate (count/yr)	0.3	0.7	0.4	0.7	0.7	0.8
	sold (count/yr)	0.6	4.0	0.4	0.8	0.2	0.4
	slaughter (count/yr)	0.0	0.1	0.0	0.2	0.0	0.0
	milked (count)	0	0	0	0	0	0
	cash income ($/yr)	257	854	23	463	0	190
% of hh with improved breeds		5	-	4	-	2	-
Goats	kept (count)	6.1	4.3	4.6	4.7	3.3	0.8
	birth rate (count/yr)	NA		NA		NA	
	sold (count/yr)	3.5	2.7	2.1	4.6	1.2	1.6
	slaughter (count/yr)	0.1	0.4	0.2	0.6	0.4	0.9
	milked (count)	0	0	0	0	0	0
	cash income ($/yr)	12	225	5.0	203	0.0	107
% of hh with improved breeds		1	-	3	-	0	-
Pigs	kept (count)	4.9	12.9	3.6	4.6	4.0	3.4
	birth rate (count/yr)	9.5	13.3	8.1	11.7	4.7	7.3
	sold (count/yr)	6.9	15.5	4.9	9.9	2.0	3.4
	slaughter (count/yr)	0.8	2.5	0.7	1.2	0.9	1.7
	cash income ($/yr)	173	1563	157	913	101	329
% of hh with improved breeds		12	-	17	-	16	-
Chicken	kept (count)	51.8	77.1	39.7	57.7	35.1	45.8
	birth rate (count/yr)	44.9	46.8	70.9	105.0	35.5	29.5
	sold (count/yr)	13.2	76.3	8.8	40.1	4.5	13.4
	slaughter (count/yr)	36.2	23.3	34.9	39.3	31.6	22.9
	eggs /chicken /day	0.4	0.0	0.3	1.2	0.3	0.3
	cash income ($/yr)	46	243	40	311	23	66
% of hh with improved breeds		21	-	25	-	23	-
Ducks	kept (count)	30.7	89.0	17.7	32.1	10.3	6.3
	birth rate (count/yr)	6.0	10.7	12.4	37.5	2.3	2.6
	sold (count/yr)	10.0	15.8	10.8	50.9	2.3	2.6
	slaughter (count/yr)	13.9	12.5	23.7	31.3	7	8.7
	eggs /ducks /day	0	-	0	-	0	-
	cash income ($/yr)	0	32	0	125	0	7
% of hh with improved breeds		1	-	2	-	2	-

LIVESTOCK FEEDING

As can be viewed in the **Figure 12**, the proportions of households using different sources of forage for their livestock feed baskets tended to be similar for each of the farm types, with crop residues, cultivated forage, and gathered forages being used by around 50% or more households. Type A farms exhibited the highest proportion of households using cultivated forages (73%), while 59% of Type B farms used cultivated forages, and 65% of Type C farms. Grazing practices were also used as part of the feed basket by all farm types, with fewer Type A farms using grazing (34%) compared to Types B (49%) and C (43%).

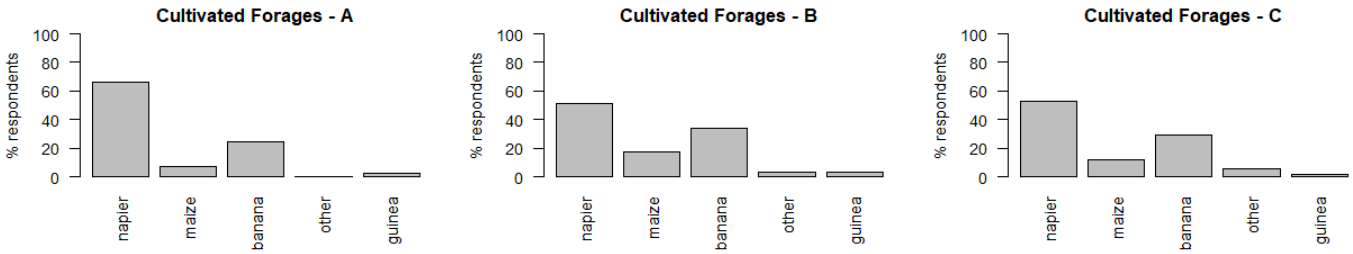
Households from Type A and C farms reported experiencing peaks in insufficient grazing for cattle during the months of February-April (up to 16% of households), while the peak months for insufficient grazing for Type B farms extended from December-April. Type A and B farms reported purchasing cattle feed throughout the year with a greater proportion of households purchasing cattle feed from December-April. Much fewer households from Type C farms reported purchasing cattle feed. No households from this farm type reported the purchase of cattle feed during the months of April or from June-December.

Figure 12. Proportion of households using different animal feeds by farm type



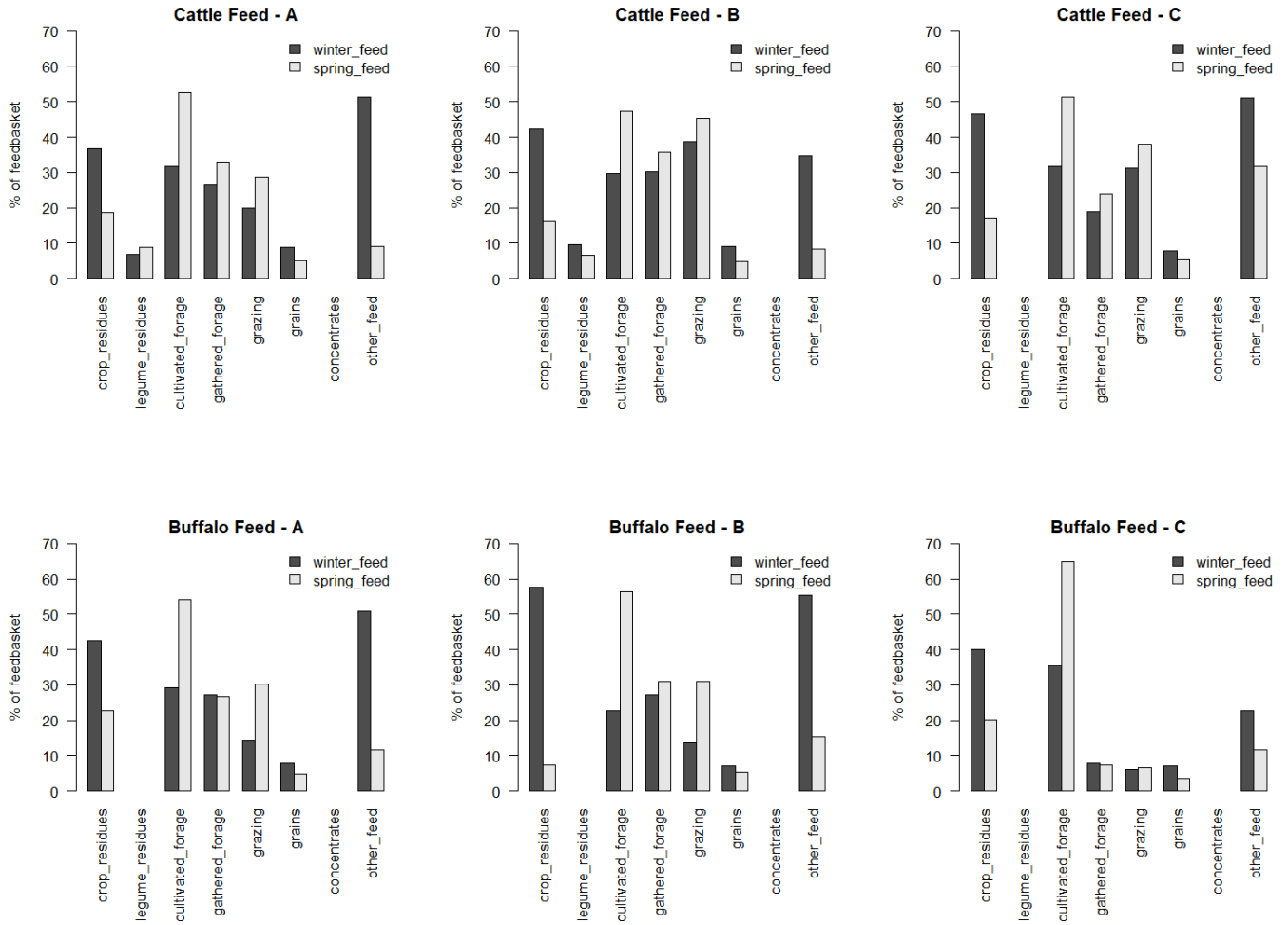
Respondents were asked which crops they cultivated for forage purposes. Napier grass accounted for the most popular cultivated forage species accounting for between 50-65% of households, being cultivated slightly more by Type A farms (around 65%). Banana and maize were also widely reported (**Figure 13**). Although these are not primarily forage crops, it underlines the importance respondents place on multi-functionality of crops. Type C farms dedicated more land area to forage crop cultivation (0.23 ha) compared to Type A (0.16 ha) and C (0.14 ha) farms.

Figure 13. Proportion of households using different forage crops by farm type



In **Figure 14,** the feed baskets for cattle and buffalo are presented by season and farm type. Overall, both cattle and buffalo receive similar feed baskets by farm type and season, with the exception of buffalo kept by Farm Type C, which use less gathered forage and grazing for their buffalo. Spring feed is dominated by cultivated forage across farm types with 50% or more of the feed basket of households consisting of cultivated forage. In the winter, the feed basket tends to consist mainly of crop residues and other feed types.

Figure 14. Feed basket contents by season, livestock species, and farm type



LIVESTOCK BREEDING

Artificial insemination (AI) had never been used by any of the farm types for the breeding of buffalo, chickens, ducks or other poultry, and by only 1% of Type A farms for the breeding of cattle. On the other hand, as seen in the Table 13, over 7% of Type A and B farms and 4% of Type C farms had used AI for the breeding of pigs. According to respondents, between 4-5% of pigs bred over the last 12 months were conceived using AI. The AI community scheme accounted for between 1-2% of total pig breeding.

Table 13. Pig breeding variables by farm type

	A	B	C
Pigs owned (count)	6.7	4.2	4.2
Total births (live births/year)	9.5	8.1	4.7
Birth rate (livebirths/head of livestock/year)	2.6	2.9	1.1
AI births in herd (count within herd)	2.2	0.7	1.0
Proportion of pigs bred with AI in the last 12 months (%)	9.0	4.6	3.9
Overall proportion of pigs bred using AI (%)	7.4	7.6	3.9
Proportion of pigs bred with AI community scheme (%)	2.1	0.9	2.0

LIVESTOCK HEALTH

Table 14 presents the incidence of different disease types among livestock among the three farm types. Type A farms tended to have a greater proportion of their livestock free from disease, in particular with respect to cattle (78%), buffalo (77%), pigs (73%), and chickens (33%). This contrasted with farm type B households, which had fewer households reporting that their livestock remained free from disease (57% cattle, 65% buffalo, 39% pigs, 14% chicken). Overall, gastro-related diseases were reportedly the most common types of diseases across all livestock species.

Table 14. Livestock disease incidences by livestock species and farm type

Livestock	Disease	Farm type		
		A (% of hh)	B (% of hh)	C (% of hh)
Cattle	Depression, inappetence, fatigue	3	12	15
	Gastro	7	25	21
	Reproductive	1	1	0
	Respiratory	4	7	6
	Other	13	13	9
	None	78	57	71
Buffalo	Depression, inappetence, fatigue	4	6	0
	Gastro	6	12	0
	Reproductive	-	-	-
	Respiratory	2	6	0
	Other	15	20	0
	None	77	65	100
Pig	Depression, inappetence, fatigue	5	23	23
	Gastro	20	37	23
	Reproductive	0	2	3
	Respiratory	5	17	13
	Other	9	20	23
	None	73	39	35
Goat	Depression, inappetence, fatigue	15	15	0
	Gastro	23	41	20
	Reproductive	4	4	0
	Respiratory	15	20	20
	Other	12	13	0
	None	50	50	80
Chicken	Depression, inappetence, fatigue	10	15	16
	Gastro	40	60	36
	Reproductive	-	-	-
	Respiratory	15	26	32
	Other	30	28	34
	None	33	14	25

According to respondents there were not large differences in proportions of livestock vaccinated among the farm types (Table 15). Cattle and buffalo tended to be the most vaccinated livestock species. Up to around 80% of cattle and buffalo were vaccinated across farm types. The proportion of goats, pigs, and chicken vaccinated were much lower, perhaps reflecting their economic value, ranging from around 20-45%.

Table 15. Livestock health by livestock species and farm type

	Farm type		
	A	B	C
Cattle sick 2 month	0.0	0.0	0.0
Cattle died 2 month	0.0	0.0	0.0
Cattle HH vaccinated (%)	77	82	79
Buffalo sick 2 mnth	0.1	0.1	0.0
Buffalo died 2 mnth	0.0	0.0	0.0
Buffalo HH vaccinated (%)	79	83	67
Goat sick 2 mnth	0.0	0.0	0.0
Goat died 2 mnth	0.0	0.0	0.0
Goat HH vaccinated (%)	35	22	20
Pig sick 2 mnth	0.0	0.0	0.0
Pig died 2 mnth	0.0	0.0	0.0
Pig HH vaccinated (%)	30	46	29
Chicken sick 2 mnth	0.0	0.1	0.1
Chicken died 2 mnth	0.0	0.1	0.1
Chicken HH vaccinated (%)	48	43	23

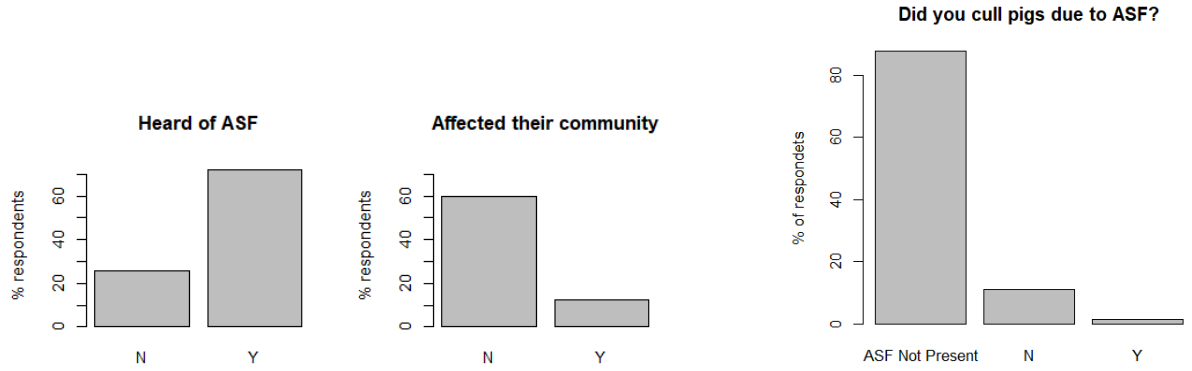
Table 16. Use and perception of veterinary services by farm type

	Farm type		
	A	B	C
Biosecurity count 0-5	0.7	1.0	0.4
Used vet (%)	72	64	55
Vet uses per year (count)	2.3	2.0	2.0
Quality public vets (-2to+2)	1.2	1.2	1.3
Quality private vets (-2to+2)	1.1	1.0	0.3
Quality drug stores (-2to+2)	1.1	1.0	1.0

Biosecurity count in Table 16 denotes the number of best practices used by households and promoted as part of the intervention projects (deworming, fencing, footbaths, record keeping, and improved handling of sick animals). Households from farm Type B scored highest in terms of biosecurity score, followed by farm Type A, then farm Type C. A greater proportion of Type A farms used veterinary services (72%) compared to Type B (63%) and C (55%) farms. The perceived quality of public and private vets overall was positive. However, Type C farms households' perception of quality of public vets tended to be higher than their perception of quality of private vets.

As viewed in the figures below, African Swine Fever (ASF) was first observed in Vietnam in February 2019. Around 70% of respondents to the household survey had heard of the disease, and 60% indicated that the disease had already affected livestock in their community, although around 90% indicated that their livestock herd had not been affected. Of those that had pigs infected, the majority did not cull their pigs (Figure 16).

Figure 15. Respondents' interactions with African Swine Fever



PROJECT INTERVENTIONS

The proportion of households undertaking farm practices associated with intervention activities is shown in Table 17. Overall, Type B farms tended to practice the most farm activities associated with the intervention activities in the area. Animal vaccinations are administered by around two thirds of households from Type A and B farms. On the other hand, only 43% of households from Type C farms use vaccines. Similarly, Type A and B farms tend to deworm, use footbaths, treat mastitis, and employ improved techniques for handling sick animals compared to Type C farms. Similar differences are also observed for more general farm management practices related to intervention activities. Farm types A and B tended to employ more improved feed baskets, improved soil fertility management, and fencing compared to Type C farms. They also incorporate the production and sale of niche livestock products into the livelihood strategies compared to Type C farms.

Table 17. Proportion of households that practice program interventions by farm type

Intervention type	Intervention activity	Farm type		
		A (% of hh)	B (% of hh)	C (% of hh)
Animal health and disease prevention	Vaccines	71	64	43
	Deworming	31	43	20
	Footbath for visitors	3	5	2
	Mastitis prevention	0	1	0
	Improved handling of sick animals	15	24	6
	Use of artificial insemination (AI)	5	5	6
Farm management	Improved feed baskets	28	30	10
	Improved soil fertility management	28	36	22
	Fencing	14	20	10
	Niche livestock products	1	2	0
	Record keeping	2	2	2
	Other	7	2	6

Photo ILRI/Alliance Bioversity-CIAT/Mai Thanh Tu

SYNTHESIS AND CONCLUSIONS

Highlands, Son La province.

Overall, farm types tended to rely on crop sales for the majority of their income, however, livestock production was also an important income source, especially for Type A households. Off-farm income usually only represented a small proportion of total household income. Food insecurity in the region was mild, with Type A farms reportedly more food secure than the other farm types.

In terms of gender equality, while overall there appeared to be a fairly equitable share in control of production and ownership of assets, there was a slight skew towards male decision-making and ownership of land, especially for Type C farms. With high levels of perceived fertility problems due to erosion and lack of soil moisture across all farms, the proportion of households from each farm type using agricultural inputs was similar, except for irrigation water which was less accessible to Type C farms. Type C farms also used, on average, one fewer agroecological techniques to enhance soil fertility (3), than farm Types A and B (4).

Cropping practices were diverse across all farm types, with an average of nine crops being cultivated per household. Nearly all households owned chickens and around 50% owned cattle and pigs. However, more than twice as many households from Type A owned buffalo compared to Type B and C farms. The proportions of households using different sources of forage for their livestock feed baskets tended to be similar, although Type A farms reported the highest proportion of households using cultivated forages and crop residues.

Feed basket composition changed on a seasonal basis with Spring feed being dominated by cultivated forage and Winter feed consisting mainly of crop residues and other feed types. In terms of livestock health, Type A farms tended to have a greater proportion of their livestock free from disease. Households from farm Type B tended to use the greatest number of animal health best practices, followed by farm Type A, then farm Type C. Seven percent of Type A and B farms and 4% of Type C farms had used artificial insemination for the breeding of pigs.

This household survey highlights several entry points to stimulate system transformation through bundled livestock-based interventions in Mai Son district.

On the genetics side, breed quality should be improved for both cattle and pigs for all farm types. This could be achieved by improving farmers knowledge on breed selection, increasing access to AI services for cattle, and increasing the capacity of farmers to perform AI for pigs. Farmers should be encouraged to use improved practices to handle animal diseases, from vaccines to basic biosecurity measures and handling of sick animals, especially type C households.

In terms of animal feeding, all households would benefit from the introduction of cultivated forages in their production system, and from feed conservation techniques for the winter time. Recycling of crop-residues and animal manure should be encouraged further, especially again for type C households who are less familiar with these practices. Although soil fertility decline and erosion were reported as critical, soil conservation measures are not widespread and should be promoted in the region. Residues burning should be particularly avoided.

Finally, there is scope for the development of specialized livestock products, especially for type A households who have already a bit more experience with livestock sales and a better connection to markets.

This survey targeted one type of actors, the farmers. Future activities and interventions will need to also assess the needs and priorities of other actors of the sector: service providers, extension services and local authorities. Their support and involvement will be essential to ensure successful improvement of livelihoods and the environment in Mai Son district.

APPENDIX: VILLAGE TYPOLOGY CLASSIFICATION

This appendix shows the information on which the village-level typology classifcation was based. Each table relates to one commune.

Chieng Chung

Village	Types	Ethicity	Distance to concrete road (mins drive by motorbike)	Altitude (highest point in the village)	Distance to market (Mai Son) (km)	Distance to commune people committee (km)	Livestock holdings (Buffalo)	Livestock holdings (Cattle)	Livestock holdings (Pig)	Confine or Grazing	Poverty rate end of 2019 (%)	Total number of hhs	Notes
Bản Mé (Bảng Cang + Bản Mé)	B	Thai	0	1400	18	4	15	81	163	Confine + Tethering	4	196	Some kinh got married to thai
Bản Hạm	B	Thai	0	1200	15	0	5	76	215	Confine + Tethering	7	120	1 Slaughter house
Bản ít hò	C	Hmong	30	1600	23	7	17	90	160	Grazing	73	40	High altitude
Bản Khoa (Bản Khoa + Ít Mai)	B	Thai	0	1300	13	1.5	50	114	310	Confine + Tethering	4	203	Several big pig farms
Bản Lọng Nghịu	B	Thai	0	1200	16	2	19	46	90	Confine + Tethering	5	196	
Bản Mảy	B	Thai	0	1200	16	2	14	28	100	Confine + Tethering	9	82	1 Slaughter house
Bản Nam (Bản Nam + Nà Men)	B	Thai	3	1500	12	3	51	197	201	Grazing	8	129	
Bản Nghịu Ten (Bản Nghị + Ten)	B	Thai	0	1300	12	2.5	29	155	140	Confine + Tethering	7	165	
Bản Ngòi (Bản Ngòi + Nà Mè)	B	Thai	0	1100	7	3	41	85	200	Confine + Tethering	8	187	Several big pig farms
Bản Tường Chung	B	Thai, Muong, Tay, Mong, Xin Mun	10	1000	18	5	0	13	4	Confine + Tethering	24	76	Low altitude
Bản Xam Ta	C	Hmong	30	1700	17	8	5	60	50	Grazing	84	19	High altitude

Chieng Luong

Village	Types	Ethicity	Distance to concrete road (mins drive by motorbike)	Altitude (highest point in the village)	Distance to market (Co Noi) (km)	Distance to commune people committee (km)	Livestock holdings (Buffalo) updated 8/2020	Livestock holdings (Cattle)	Livestock holdings (Pig)	Confine or Grazing	Poverty rate end of 2019 (%)	Total number of hhs	Notes
Bản Phiêng Nọi	B	Thai	15	818	18	8	12	20	11	Grazing	65	20	Medium altitude
Bản Pó In	B	Thai	5	740	2	5	131	108	119	Confined	13	181	
Bản Lù (Bản Lù 1 + Lù 2)	B	Thai	5	966	7	5	204	264	607	Confined + Grazing	10	258	
Bản Mật Sàng (Bản Mật + Sàng)	A	Thai	0	815	8	2	174	276	195	Confined	10	221	
Bản Oi	B	Thai	5	1000	10	5	64	133	144	Grazing	9	112	
Bản Mờn 2	A	Thai	0	970	6	0	146	109	395	Confined + Grazing	6	154	
Bản Mờn 1	A	Thai	0	970	6	0	101	72	160	Confined + Grazing	5	154	
Bản Lụng Tra (Bản Lụng Sàng + Tra)	A	Hmong, Kho Mu	0	940	9	4	36	136	18	Confined + Grazing	44	77	
Bản Kéo Lồm	B	Hmong, Thai	0	1000	10	9	19	62	67	Grazing	76	50	
Bản Lạn Quỳnh (Bản Lạn + Kích)	A	Thai	0	800	8	5	106	198	264	Confined + Grazing	11	169	
Bản Chi 2	A	Thai	0	811	7	6	94	80	278	Confined + Grazing	24	113	
Bản Ý Lường	A	Thai	0	900	9	3	123	132	264	Confined + Grazing	10	164	
Bản Chi 1	A	Thai	0	810	7	5	132	21	0	Confined + Grazing	19	128	
Bản Phú Lương	A	Kinh, Thai	0	800	7	5	75	69	2161	Confined	4	67	Big pig farms by migrated Kinh from Hung Yen province
Bản Tảng	B	Thai	7	926	9	4	60	40	30	Confined + Grazing	19	64	
Bản Búa Bon	C	Hmong	25	1100	15	10	27	32	0	Grazing	79	29	Poor
BảnThẩm Phẩng	C	Hmong	30	1200	18	11	13	43	19	Grazing	75	24	High altitude
Bản Buôm Khoang	C	Hmong	30	1100	18	11	19	55	73	Grazing	89	37	High altitude
Bản Nà Rầm	C	Thai	30	1200->800	8	5	11	38	0	Grazing + Confined	29	34	High altitude (Nà Rầm used to be on high moutain >1200m but due to stone slide, it was moved to near Phu Luong)

Mường Bằng

Village	Types	Ethicity	Distance to concrete road (mins drive by motorbike)	Altitude (highest point in the village)	Distance to market Chieng Mung (km)	Distance to commune people committee (km)	Livestock holdings (Buffalo)	Livestock holdings (Cattle)	Livestock holdings (Pig)	Confine or Grazing	Poverty rate end of 2019 (%)	Total number of hhs	Notes
Bản Co Trai + Nà Hoi + Nà Ỏ = Nà Trai	B	Thái	2	700	7	2	57	83	68	Confine (Cut & Carry)	8.8	84	Concrete road in all village, about 2 km bad road
Bản Bằng + Chu Văn Thịnh = Bằng Thịnh	B	Kinh, Thái	5	588	5	0	45	111	65	Confine	9.8	184	3 km bad road
Bản Lương + Mạt = Lương Mạt	C	Thái	5	789	10	5	35	139	180	Confine	10.4	125	2 km bad road, slope poorest
Bản Mời + Mé = Mé Mời	B	Thái	7	727	7	3	22	240	544	Confine	8.9	190	4 km bad road
Bản Liềng + Quỳnh Bằng = Liềng Quỳnh	A	Thái	0	630	6	2	73	230	267	Confine	7.3	192	Concrete road in all village
Mai Châu + Xuân Quỳnh + Quỳnh Trai = Quỳnh Châu	B	Thái, Kinh, Hmong	0	503	6.5	3	22	208	155	Confine	15.9	113	Mai Chau is poorest (45.5 %)
Bản Giàn + Noong Bon = Giàn Bon	B	Thái	5	708	7.5	4	35	87	96	Confine	7.6	119	3 km bad road
Quỳnh Sơn + Tần Pàu = Quỳnh Pàu	A	Thái	0	618	4.5	2.5	23	121	126	Confine	8.8	80	
Bản Xùm + Hào = Xùm Hào	C	Thái	5	705	10	5	60	148	110	Confine + Grazing	9.5	115	3 km bad road
Bản Phang + Hin Hụm + Ít Có = Phang Hụm Có	C	Thái	10	800	14	8	85	105	395	Confine + Grazing	6.5	213	5 km bad road
Bản Cắp	A	Thái	0	618	3	3	7	97	122	Confine	10.4	77	
Bản Bó	A	Thái	0	675	4	2	47	112	463	Confine	7.6	118	
Bản Sẳng	B	Thái	1	679	3	3	38	85	117	Confine	8.1	86	

Chiềng Chăn

Village	Types	Ethicity	Distance to concrete road (mins drive by motorbike)	Altitude (highest point in the village)	Distance to market Hat Lot	Distance to commune people committee (km)	Livestock holdings (Buffalo)	Livestock holdings (Cattle)	Livestock holdings (Pig)	Confine or Grazing	Poverty rate end of 2019 (%)	Total number of hhs
Bó Pháy + Cầu Đường = Yên Bình	A	Hmong	10	879	14	3	14	63	150	Confine +Tethering	7.23	83
Quỳnh Lương + Quỳnh Lúa = Quỳnh Nam	A	Thái	3	663	15	1	76	101	320	Confine +Tethering	22.99	174
Tà Chan + Chiềng = Chan Chiềng	C	Thái	30	243	16	12	218	352	180	Confine +Tethering	46.51	43
Chiềng Đen	A	Thái	10	663	15	4	98	133	350	Confine +Tethering	11,2	128
Phường	A	Thái	1	663	15	0	109	96	410	Confine +Tethering	8.54	82
Hùn	A	Thái	1	663	15	0.5	61	80	113	Confine +Tethering	1.81	166
Sài Lương	A	Thái, Kinh	2	663	15	1.5	76	101	320	Confine +Tethering	3.13	32
Sài Lương 1	A	Thái, Kinh	2	663	15	1.5	105	87	250	Confine +Tethering	10	40
Tong Tải A	B	Hmong	20	793	15	5	5	36	43	Confine +Tethering	6.06	33
Tong Tải B	B	Hmong	20	793	15	5	48	35	96	Confine +Tethering	0	97
Tong Chiêng	C	Hmong	30	700	25	8	30	24	82	Confine +Tethering	21.05	95
Huổi Hài	C	Hmong	30	720	25	7	8	3	45	Confine +Tethering	0	87
Nặm Luông	B	Hmong	20	622	20	6	22	27	87	Confine +Tethering	6.36	110
Si	C	Thái	30	252	40	12	31	39	150	Confine +Tethering	3.62	143
Kiếng	C	Thái	40	235	50	15	45	35	35	Confine +Tethering	3.18	157

Nà Ớt

Village	Types	Ethicity	Distance to concrete road (mins drive by motorbike)	Altitude (highest point in the village)	Distance to market (Mai Son/ Co Noi), km	Distance to commune people committee (km)	Livestock holdings (Buffalo)	Livestock holdings (Cattle)	Livestock holdings (Pig)	Confine or Grazing	Poverty rate end of 2019 (%)	Total number of hhs
Lụng Cuông	B	Hmong	0	1328	60	15	14	52	45	Cut and carry + Tethering	48,93	47
Xà Vịt	B	Thai	0	990	50	5	40	140	140	Cut and carry + Tethering	27,26	118
Nặm Lanh	B	Hmong, Khmu	0	837	47	2	8	37	150	Cut and carry + Tethering	88,37	43
Xà Kìa	B	Thai	10	766	47	2	2	78	60	Cut and carry + Tethering	57,14	42
Nà Un	C	Thai, Hmong, Xinhmun	30	910	55	10	2	100	200	Grazing + Tethering	97.36	38
Há Xét = Há Xét + Huổi Kẹt + Lộng Lót	B	Thai, Hmong, Xinhmun, Khmu, Kinh	0	1015	50	8	10	151	110	Cut and carry + Tethering	68.69	115
Ớt Chả = Nà Ớt + Pá Chả	B	Thai, Hmong, Kinh	0	785/1015	40	0	14	47	33	Cut and carry + Tethering	35.95	89
Nà Hạ	B	Thai, Hmong	0	813	38	2	7	87	80	Cut and carry + Tethering	25.3	83
Lọ Dên = O Lọ + Huổi Dên	B	Hmong, Thai	10	879	36	4	5	60	110	Cut and carry + Tethering	62.06	58
Trạm Hin = Trạm Cọ + Hin Đóm	B	Thai, Xinhmun, Hmong, Kinh	15	985	33	7	2	137	164	Cut and carry + Tethering	59.37	96
Pá Sung = Sông Hom + Pá Khoang	C	Hmong	30	1496	38	2	3	60	50	Cut and carry + Tethering	87.27	55

Chiềng Kheo

Village	Types	Ethicity	Distance to concrete road (mins drive by motorbike)	Altitude (highest point in the village)	Distance to market (Mai Son), km	Distance to commune people committee (km)	Livestock holdings (Buffalo)	Livestock holdings (Cattle)	Livestock holdings (Pig)	Confine or Grazing	Poverty rate end of 2019 (%)	Total number of hhs
Bản Có Tình = Bản Có + Tình	B	Thái, Kinh	0	900	13	0	10	65	64	Cut and carry + Tethering	37.95	167
Lon Kéo = Nà Lon + Nà Kéo	B	Thái	0	900	13	1	28	145	38	Cut and carry + Tethering	36.67	150
Buốt Văn = Buốt + Tô Văn	B	Thái	20	900	17	4	5	275	330	Cut and carry + Tethering	35.16	184
Nà Viền = Nà Viền + Pắng Sẳng A	B	Thái, Hmong, Kinh	0	900	20	10	17	67	52	Cut and carry + Tethering	48.74	122
Pắng Sẳng = Pắng Sẳng B	C	Hmong	60	1600	25	17	0	33	54	Tethering + Cut and carry	97.73	44

Chiềng Mai

Village	Types	Ethicity	Distance to concrete road (mins drive by motorbike)	Altitude (highest point in the village)	Distance to market Mai Son	Distance to commune people committee (km)	Livestock holdings (Buffalo)	Livestock holdings (Cattle)	Livestock holdings (Pig)	Confine or Grazing	Poverty rate end of 2019 (%)	Total number of hhs
Bản Cơi Quỳnh= Cơi + Quỳnh Mai + Huổi My	A	Thai, Kinh	0	905	27	10	22	223	44	Confine + Tethering	18.3	109
Bản Pòn = Pòn + Thủy Lợi	B	Thai	0	747	28	7	7	111	256	Confine + Tethering	36.3	113
Bản Cúp = Cúp + Nà Nghè	B	Thai	0	734	30	5	2	95	35	Confine + Tethering	59.8	107
Bản Vụt Bon = Vụt + Bon	B	Thai	0	800	32	3	0	78	92	Confine + Tethering	27.8	108
Tiểu khu Ngã Ba	A	Thai, Kinh	0	800	32	3	0	0	184	Confine + Tethering	3.7	109
Bản Ban = Ban + Táp Ban + Nà Dong	B	Hmong, Xinh Mun, Thai	0	800	35	0	13	99	168	Confine + Tethering	29.32	133
Bản Mé Mận = Mé + Lọng Mận	B	Kinh, Thai	0	900	37	2	2	16	38	Confine + Tethering	21.11	90
Bản Cuộm Sơn = Cuộm 1 + Cuộm 2 + Hoa Sơn 1	B	Thai, Kinh	0	900	38	3	8	39	113	Confine + Tethering	21.8	124
Bản Dăm Hoa = Dăm + Cáy Ton + Hoa Sơn 2	B	Thai, Kinh	0	900	40	5	13	141	1202	Confine + Tethering	17.7	113
Bản Co Sâu = Có Sâu + Lụng Và	B	Thai, Hmong	0	1007	41	6	9	82	159	Confine + Tethering	30.09	113
Bản Puốn Vạy = Puốn + Nà Đốc + Vạy	B	Thai	10	995	43	8	98	33	93	Confine + Tethering	21.58	139

Mường Bon

Village	Types	Ethicity	Distance to concrete road (mins drive by motorbike)	Altitude (highest point in the village)	Distance to market Hat Lot	Distance to commune people committee (km)	Livestock holdings (Buffalo)	Livestock holdings (Cattle)	Livestock holdings (Pig)	Confine or Grazing	Poverty rate end of 2019 (%)	Total number of hhs
Bản mứn đoàn kết = Bản Mứn + Đoàn Kết	B	Kinh, Thai	0	605	10	4	45	98	202	Tethering, cultivated forage	5.2	115
Bản Ỏ Tra = Bản Tra + Ỏ	B	Thai	0	589	9	3	19	132	142	Tethering	3.9	102
Bản bon = Bon + Đấu Mường	A	Thai, Kinh	0	600	6.5	0	30	119	183	Tethering	3	66
Bản Lẩm Cút = bản Lẩn + bản Cút	B	Thai	0	633	9	3	5	178	115	Tethering	1.8	167
Bản Mai Tiên	A	Kinh	0	636	5	1			957	Tethering	8.1	74
Bản Mai Quỳnh	B	Thai	0	588	6	1	12	77	208	Tethering		
Bản Mé	A	Thai	0	600	5	0	18	161	121	Tethering	4.1	170
Bản Nà Viền	B	Thai	0	646	5	3	19	53	183	Tethering	0	48
Bản Rừng Thông	C	Hmong	20	639	14	20		38	348	Tethering, cultivated forage	5.1	78
Bản Tà Xa = Tà Xa + Lán Nanh	B	Thai, Kinh	0	677	10	12	11	182	117	Tethering	2.6	194
Bản Tiến xa	B	Kinh, Thai	0	300	11	7	6	101	132	Tethering	2.7	185
Bản Un = Bản Un + Củ Pe	B	Thai, Kinh	0	636	4	2	16	259	64	Tethering	3.1	195
Bản xa căn	B	Thai	0	646	6	2	12	78	192	Tethering	9.3	43

Hát Lót

Village	Types	Ethicity	Distance to concrete road (mins drive by motorbike)	Altitude (highest point in the village)	Distance to market Hat Lot	Distance to commune people committee (km)	Livestock holdings (Buffalo)	Livestock holdings (Cattle)	Livestock holdings (Pig)	Confine or Grazing	Poverty rate end of 2019 (%)	Total number of hhs
Bản Hoa Quỳnh = Hoa Quỳnh +428	A	Thai	0	667	15	8	62	25	154	Confine + Tethering	2.38	84
Bản Phiêng Chai =Co Chai + Phiêng Sày	B	Khmu, Thai	5	803	12	6				Confine + Tethering	7.01	157
Bản Búng Lay= Huổi Búng + Kho Lay	A	Thai	0	667	12	2	14	112	114	Confine + Tethering	2.52	119
Bản Lọng Khoang = Lọng Khoang + Phiêng Lặp	A	Thai, Kinh	0	708	12.5	2.5	8	137	352	Confine + Tethering	4	100
Bản Nặm Ban = Nà Ban + Nặm Lạ	A	Thai	0	670	11	4	74	77	6	Confine + Tethering	2.5	200
Bản Nà Cang	A	Thai, Kinh	0	685	7	3	0	13	2041	Confine + Tethering	2.2	135
Bản Nà Hạ = Nà Hạ + Lọng Lặm	A	Thai, Kinh	0	685	7	2.5	3	51	115	Confine + Tethering	6.11	131
Bản Ngồ Hén = Nà Hén + Púng Ngồ + Co Phung	B	Thai	0	1025	17	7	64	206	662	Confine + Tethering	6.4	156
Bản Nà Sảng = Nà Sảng + Bản Ngọc Tân	A	Thai	0	684	15	8	163	114	161	Confine + Tethering	2.81	178
Bản Nà Sy = Nà Sy + Co Hiên	A	Thai	0	704	14	6	52	134	264	Confine + Tethering	5.38	186
Bản nông xôm	A	Thai	0	678	10	2	0	12	180	Confine + Tethering	0	60
Bản Tiến Sơn	A	Thai, Kinh	0	706	10	4	1	12	288	Confine + Tethering	1.7	59
Tiểu khu 10	A	Thai	0	600	10	4	0	48	945	Confine + Tethering	0.5	192
Thôn Tiền Phong = TK Tiền Phong + Tiền Phong 3	A	Thai, Kinh	0	704	10	6		1	3	Confine	0.62	323
Tiểu Khu Nà Sản	A	Thai, Kinh	0	626	16	6	0	47	1036	Confine + Tethering	1	193
Bản Lót	A	Thai	0	734	14	4	13	118	111	Confine + Tethering	5.6	36
Bản Yên Tiến = Nà Tiến + Yên Sơn	A	Thai	0	688	10	0	2	42	50	Confine + Tethering	1.30	154
Bản Củ Nghè = Nà Nghè + Củ	A	Thai	0	708	14	4	6	183	282	Confine + Tethering	5.38	130

Cò Nòi

Village	Types	Ethicity	Distance to concrete road (mins drive by motorbike)	Altitude (highest point in the village)	Distance to Co Noi market	Distance to commune people committee (km)	Livestock holdings (Buffalo)	Livestock holdings (Cattle)	Livestock holdings (Pig)	Confine or Grazing	Poverty rate end of 2019 (%)	Total number of hhs
Bản Bó Hặc	A	Thai	0		7	7	204	187	499	Confine + Tethering	2	126
bản Hin Thuội	A	Thai	0		7	7	77	107	18	Confine + Tethering	4	73
Nong Quỳnh =Tân Quỳnh + Hua Nong	A	Thai	0		10	10	171	123	6	Confine + Tethering	3	229
Bản Mòn	B	Thai	5		12	12	181	163	257	Confine + Tethering	4	210
Bản Mu Kít	A	Thai	0		8	8	43	43	50	Confine + Tethering	2	159
Bản Nhạp	A	Thai	0		5	5	170	197	402	Confine + Tethering	0	159
Cò Nòi = Cò Nòi + Phiêng Nâm	A	Thai	0	700	0	0	303	407	309	Confine + Tethering	3	237
Bản Quỳnh Tiến	B	Thai	5	600	12	12	28	74	101	Confine + Tethering	4	73
Huổi Dương	A	Kinh	0	700	12	12	13	12	0	Confine + Tethering	9	57
Noong Mòn = Noong Mòn + Mai Thuận	B	Hmong	5	700	10	10	28	162	189	Confine + Tethering	9	210
Noong Te	A	Thai	0	700	8	8	44	153	63	Confine + Tethering	2	133
Phiêng Hỳ	A	Hmong	0	800	10	10	24	11	120	Confine + Tethering	2	57
Sơn Pha	A	Thai	0	700	7	7	45	55	46	Confine + Tethering	0	83
Tân Quế	A	Kinh	0	700	10	10	0	3	698	Confine + Tethering	10	61
TK 19/5	A	Kinh	0	700	4	4	0	14	305	Confine + Tethering	0	210
TK 2	A	Kinh	0	700	2	2	0	3	300	Confine + Tethering	1	223
TK 26/3	A	Kinh	0	700	0.5	0.5	0	12	2320	Confine + Tethering	2	213
TK 3	A	Kinh	0	700	3	3	5	31	795	Confine + Tethering	1	173
TK 3/2	A	Kinh	0	700	5	5	0	5	455	Confine + Tethering	1	415
TK Bình Minh	A	Kinh	0	700	3	3	0	20	124	Confine + Tethering	1	320
TK Quyết Thắng	A	Kinh	0	700	4	4	40	129	903	Confine + Tethering	2	151
Lếch	A	Thai	0	700	3	3	119	244	176	Confine + Tethering	1	218
Mé Lếch	A	Kinh	0	700	2	2	38	34	630	Confine + Tethering	2	121
Tiểu khu 1	A	Kinh	0	700	0.5	0.5	0	0	40	Confine + Tethering	1	160

Village	Types	Ethicity	Distance to concrete road (mins drive by motorbike)	Altitude (highest point in the village)	Distance to Co Noi market	Distance to commune people committee (km)	Livestock holdings (Buffalo)	Livestock holdings (Cattle)	Livestock holdings (Pig)	Confine or Grazing	Poverty rate end of 2019 (%)	Total number of hhs
TK Thống Nhất	A	Kinh	0	700	5	5	3	55	229	Confine + Tethering	3	213
Kim Sơn	A	Kinh	0	700	9	9	16	6	246	Confine + Tethering	0	59
Nà Cang	A	Hmong	0	700	2	2	12	23	7	Confine + Tethering	5	37
Hua Tát	A	Thai	0	700	2	2	91	71	0	Confine + Tethering	5	123
Xuân Quế	A	Kinh	0	700	10	10	1	1	332	Confine + Tethering	1	68
Quỳnh Sơn	A	Thai	0	700	6	6	31	75	225	Confine + Tethering	1	75
Bình Yên	B	Thai	5	600	10	10	52	54	55	Confine + Tethering	3	37
TK 39	A	Kinh	0	700	4	4	0	0	927	Confine + Tethering	2	201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