

Stocktaking review for the Livestock CRP with focus on Sonla, NW Vietnam.

Tassilo Tiemann

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Executive Summary

This review was commissioned in order to provide guiding information that can support the decision making process regarding suitable activities and locations within Son La province for a new phase of the Livestock CRP. Son La is diverse in terms of geography and ethnic composition and has in recent years experienced significant economic development in some districts, especially Moc, Chao and Van Ho, due to their climatic conditions, resembling temperate conditions and allowing for the cultivation of out of season and specialty crops. Tourism too has opened new livelihood pathways and is now one of the economic pillars of the province. Still, many more remote upland areas are little influenced by these trends and for them market access and/or environmental degradation are the most serious concerns, while poverty remains only in pockets, and all three aspects move along a NW-SE axis.

While the whole Northern Region ranks high in the attention of policy makers and donors, an increasing income gap has been growing between rural and more urban areas, leading to economic migration. Ethnic minority women seem to be the most disadvantaged group due to lack of access to knowledge or participation in vocational training, exempting them from many economic opportunities that the proximity to two borders offers. But also infrastructure, despite improvements in recent years, poses still constraints to more remote communities. Socio-geographic typologies distinguish between three systems, the valley areas, mid-level and highland areas, which all have their distinct ethnic composition and farming systems. Communities in more mountainous areas are normally less integrated into value chains. Agricultural systems in general show low productivity due to challenging terrain, low use of improved genetics, low inputs, traditional practices, low mechanization, and inappropriate use of agrochemicals. Livestock is a minor commodity for farmers but yields good profits per unit and provides income security. However, some local specialties and breeds of livestock have successfully penetrated the market at premium prices and present viable economic niches. While cattle and buffaloes have the highest prevalence in the region in all of Vietnam, their market share is still small compared with pork and poultry, though all have increased in the last decade. The pollution of natural water ways as well as the erosion of hill sides due to unsustainable farming practices are a severe problem in many communities. While Son La may not be a perfect project site, a number of research and extension opportunities exist for a range of project activities, including potential partner projects for collaboration. In terms of urgency, focus on environmental issues, sustainable farming system, food safety, and linking farmers to markets seem the most relevant topics for the area.

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Introduction

For its last phase of 2.5 years, the Livestock CRP in Vietnam is seeking to explore new challenges and reorient its focus towards a more systems based approach with stronger inter-institutional ties. In order to achieve results in this short time span processes have to be streamlined as much as possible. One way of doing so is by taking advantage of already available data and project sites and testing existing research products (tools, methodologies, materials, approaches) within the developing frameworks of already established projects. This review aims at assessing what data and projects are available and what potential intervention opportunities they open up. This information is meant to help inform the decision making process and shorten initial analysis processes or make them unnecessary as available data can be used to proceed to the next step of intervention.

This review is thus only partly meant as basis for the site selection process, but more importantly as a source of information for defining the most relevant activities in the selected sites, to be selected out of the basket of interventions available to the centers from decades of research in the field of smallholder livestock development. It is not a comprehensive source of information in itself but encourages further reading of the cited documents for a comprehensive situational assessment.

1 Rationale

A new system focus is aspired, revolving around livestock's role in improving sustainability of smallholder farming systems. It will involve several aspects of sustainability, including ecological, economic, and social (e.g. related to available work force), and consider diverse spatial (international, national, subnational, local) and temporal (immediate, medium-term, long-term) scales.

Common sites and linked activities will be chosen in order to facilitate collaboration between diverse actors and stakeholders. It also allows for direct data linkage, potentially increasing the depth of research results, comprehensive partnerships and trust building with development actors and stakeholders, and improved focus.

2 Characterization of farming systems and farming landscapes in the NW

Domain mapping

In 2014, the Humidtropics CRP characterized two provinces in northern Vietnam with the aim of choosing suitable intervention field sites. Initially, a spatial analysis was conducted to inform the discussion and provide basic underlying information on main variation. Three socio-economic and biophysical layers (domains) strongly related to the feasibility and attractiveness of specific development and livelihood strategies were used, which were seen as providing good explanatory power in predicting the type of agricultural enterprises and development pathways encountered in different rural communities. Areas were rated as low or high for each domain with the thresholds indicated below. The three layers relate to land degradation, market access and poverty.

Land degradation was measured using the Global Human Appropriation of Net Primary Production (HANPP), which is based on the remotely-sensed Normalized Difference Vegetation Index (NDVI) as a proxy. The method measures deviation in net primary productivity (NPP) from the norm taken as an indicator of land degradation or improvement. The threshold was set as Low (L) for equal and less than 20 %, and High (H) for more than 20% of HANPP.

Market access was assessed through lights at night on satellite images, which have been found to be highly correlated with industrial activity and Gross Domestic Product. The threshold for Low (L) is equal and less than 0.1, and High (H) more than 0.1, where a value of 1 stands for saturation in large cities.

Poverty was mapped based on available data from existing databases and nationally representative household surveys conducted in various years. For poverty a thresholds for Low (L) was equal and less than 35% of people living below USD 1.25/day, and High (H) more than 35%.

A detailed description of all methods can be found in (Stegg, 2014).

Based on these thresholds a map of all three domain layers combined was created for Son La and Dien Bien provinces, showing all eight combinations of overlays of Low and High thresholds in the order: Land degradation – Market access – Poverty (Figure 1).

A clear gradient is visible from NW to SE of the area, with of low degradation, high market constraint and high poverty in the NW and an exact reversal in the SW, reflecting generally less intensive systems

in the former and more commercially oriented systems in the latter. However, contrasting pockets can be found in both extremes. Noteworthy seems the central zone in which low market constraint is paired with high poverty with both low and high degradation sites.

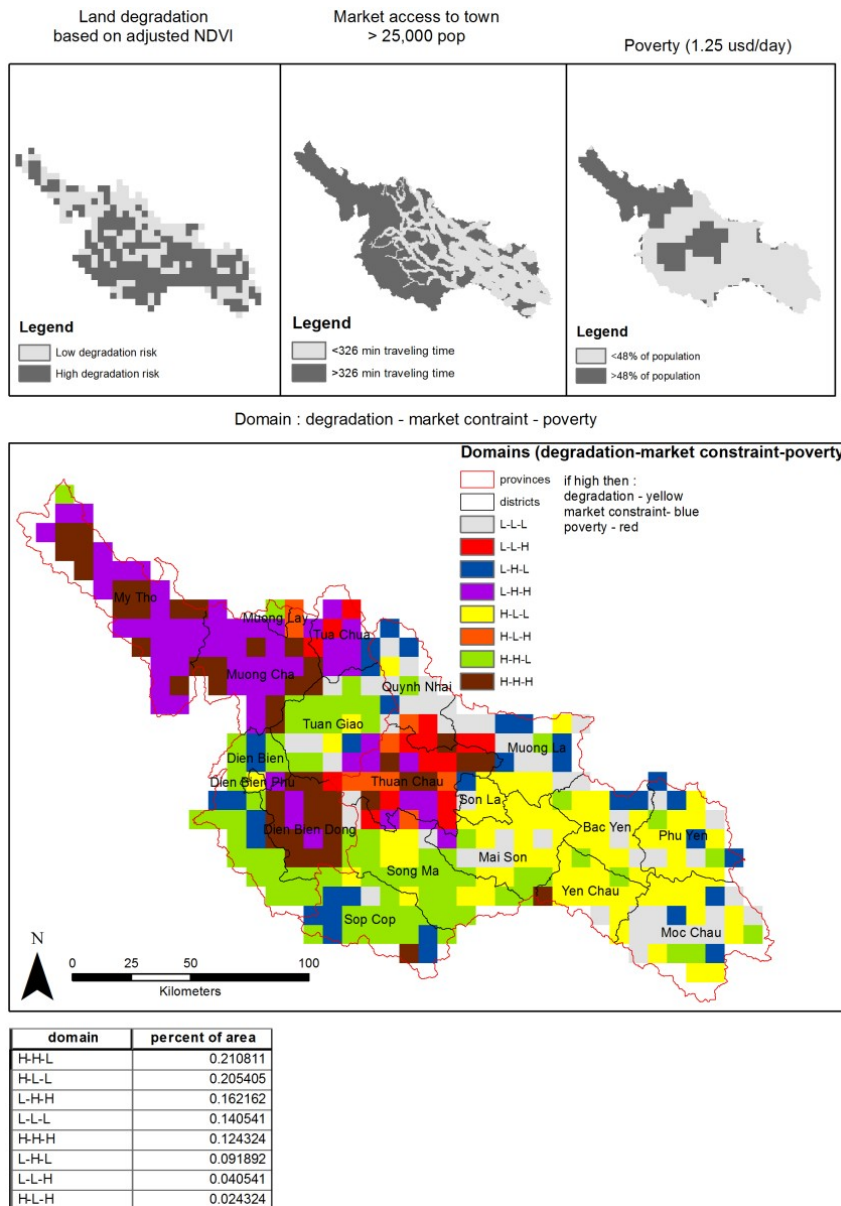


Figure 1: Domains for Son La and Dien Bien provinces, Vietnam.

The generated data were compiled into a table providing the relative frequency of each overlay per district as a measure of system diversity (Table 1)

Table 1: Percentage of households falling into one of eight overlay combinations, characterized by three domains: environmental degradation, market constraints, and poverty.

Province	District	Overlay combinations								a) Environmtl. degradation b) market constraints c) poverty
		Low-Low-Low	Low-Low-High	Low-High-Low	Low-High-High	High-Low-Low	High-Low-High	High-High-High	High-High-Low	
		LLL	LLH	LHL	LHH	HLL	HLH	HHH	HHL	
Dien Bien	Dien Bien	0%	0%	24%	4%	0%	0%	0%	72%	
Dien Bien	Dien Bien Dong	5%	0%	0%	14%	0%	0%	67%	14%	2/3 represented plus most vulnerable HHH
Dien Bien	Dien Bien Phu	0%	0%	0%	0%	100%	0%	0%	0%	Unlikely choice due to concentration in one category
Dien Bien	Muong Cha	0%	0%	0%	59%	0%	7%	33%	0%	
Dien Bien	Muong Lay	0%	0%	0%	50%	0%	0%	0%	50%	2/3 represented
Dien Bien	My Tho	0%	0%	0%	62%	0%	0%	35%	3%	
Dien Bien	Tua Chua	0%	30%	0%	70%	0%	0%	0%	0%	
Dien Bien	Tuan Giao	20%	0%	12%	8%	8%	0%	4%	48%	3/3 represented
Son La	Mai Son	22%	0%	0%	4%	56%	0%	0%	19%	3/3 represented
Son La	Moc Chau	38%	0%	10%	0%	41%	0%	0%	10%	2/3 represented
Son La	Muong La	40%	10%	25%	0%	20%	0%	0%	5%	
Son La	Phu Yen	21%	0%	21%	0%	47%	0%	0%	11%	
Son La	Quynh Nhai	50%	11%	17%	0%	6%	6%	6%	6%	
Son La	Son La	20%	0%	20%	0%	60%	0%	0%	0%	
Son La	Song Ma	0%	4%	0%	4%	25%	4%	0%	63%	3/3 represented
Son La	Sop Cop	4%	0%	29%	0%	8%	0%	4%	54%	
Son La	Thuan Chau	4%	29%	0%	21%	0%	21%	25%	0%	1/3 represented
Son La	Yen Chau	7%	0%	0%	0%	71%	0%	7%	14%	
Son La	Bac Yen	22%	0%	11%	0%	61%	0%	0%	6%	
Two provinces combined		14%	4%	9%	16%	21%	2%	12%	21%	Blue categories are the 3 most represented in the 2 provinces

The 3 most common overlays in both provinces may be seen as the most representative or relevant conditions. They include high environmental degradation (42%), high market constraints (37%) and low poverty (42%) in 3 combinations. However, overall, environmental degradation and market constraints are high in 56% and 58% of the area, respectively, with the former being found distributed throughout the area but less concentrated in the NW, and the latter being less relevant in the SE. Poverty poses a problem in 34% of both provinces but is almost exclusively to be found in the NW (Figure 1).

Conclusions, domain mapping

- Market access and Environmental degradation are the biggest problems, poverty is concentrated in pockets
- Environmental degradation is less relevant in the NW (Dien Bien)
- Market constraints are less relevant in the SE (Son La)
- Poverty is most marked in the NW (Dien Bien)

Situational analysis

Initial stakeholder consultation revealed the following topics as potential interventions (Staal et al., 2016):

- Integrated livestock systems,
- Improved tree-crop systems,
- Improved rice production systems,
- Conservation agriculture,
- Sustainable food crop/multicrop systems.

Data collection to specify suitable locations and entry points consisted in secondary data review (government and non-government organizations) for the period 2003-2013; Key informant interviews relating to policies, programs and government directions at province, district and commune levels; Focus group discussions with participatory rural appraisal (PRA) tools in 10 communes and 5 districts of Son La and Dien Bien provinces; Three household surveys focused on forest, agriculture and small business orientation were carried out among 32 households; Ten visits to urban and provincial markets to assess product diversity, prices and trends, packaging and labeling, transportation and supply chain; Final stakeholder consultation to verify results.

The Food systems for Healthier Diets Flagship of the Agriculture for Nutrition and Health (A4NH) program selected sites through the use of secondary data and online surveys among key stakeholders. The three most important selection criteria for their rural site were identified as nutritional status and food security, rural-urban linkages, and poverty. Further criteria included tourism, other projects, partner relations, provision of food to the lowlands, food system issue hotspot, ethnic diversity, and food for home consumption.

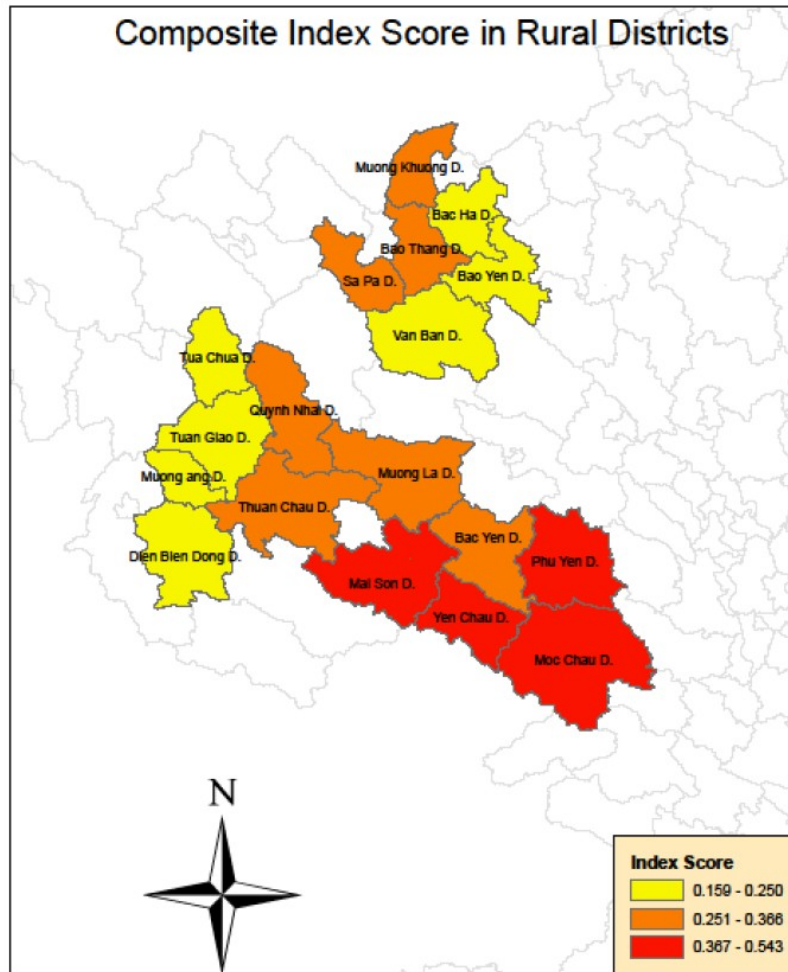


Figure 2: Districts with highest priority (red) for in-depth food system research in the A4NH CRP.

Context

The region is hilly to mountainous, with remote areas, poor infrastructure and relatively lower population density (Son La 80 ppl/km²). Belts and pockets of higher population density stretch around and between towns and cities along lower elevation topography. About 50% of areas labeled as forest in Son La are devoted to rubber planting and other forest use (Staal et al., 2016). About 65 000 ha of natural forest has been lost for maize cultivation between 2002 and 2009 (La et al., 2016).

Data from 2008-2012 indicate a constantly growing income but a clear income disparity between urban and rural areas, with urban income double or triple that of rural income, which is considered a social problem, especially among the ethnic minorities in the remote areas. Even though the poverty rate has

drastically fallen over the past 30 years, a large number of near poor exists which would increase the number of poor significantly if poverty thresholds were slightly changed. H'Mong, Dao, La Hu and Cong people are among those with the highest poverty rates (Staal et al., 2016).

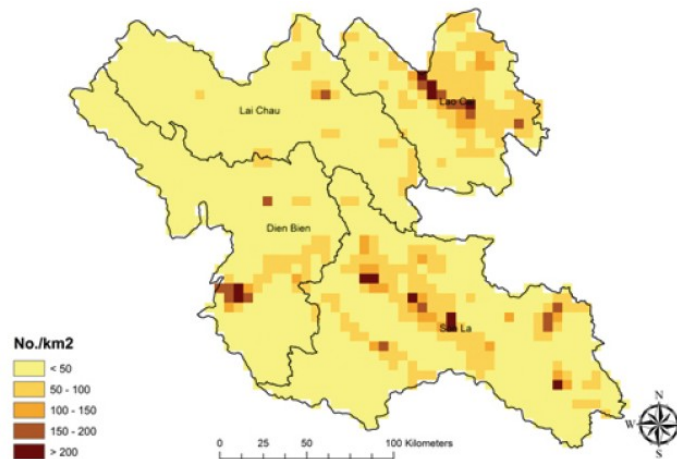


Figure 3: Population density of four provinces in NW Vietnam (CIESIN)

Households were grouped through cluster analysis into 4 distinct groups: wealthy (10%), poor (49%), innovative (24%), and crop-oriented (16%). Each of these groups were characterized as to general characteristics, crop production, livestock production, market, innovation, and nutrition (Hiwasaki et al., 2016, pp29ff). They found that income was influenced by livestock but income diversity was lower the higher the number of ruminants was. In a collaboration between INRA, CIRAD and NIAS another typology was developed for pig farms in Son La, resulting also in 4 groups: Type 1 “small diversified farms with low levels of productivity” (25%), Type 2 “small farms with off farm activity and high productivity on land” (30%), Type 3 “specialized farms with large pig herd” (23%), Type 4 “large mixed crop-livestock farms” (23%). A detailed description is provided in Le (2015). For beef cattle, a similar assessment was done a decade ago, but the author claims that little has changed on the ground and that the results are still valid (Le et al., 2010). The farm types specified were small mixed farms, medium mixed farms, and specialized large-scale beef farms.

Malnutrition is considered a problem in some areas, where between 20.8–23.5% of the children under five were underweight; 31.9–37.8% of children were stunted and 6.7–7.2% were wasting. Iron and Vitamin A deficiencies are above the national average and as consequence of the nutrition transition

taking place in the country, traditional foods, including nutrient rich dark green vegetables, sesame and tofu, are becoming less prominent in the diet (Staal et al., 2016).

Private sector investments in agriculture in Son La were below 5% of total investments and took place in the form of joint venture schemes, joint-stock companies or cooperative alliances. They occupy, however, more than 26% of land in the province, reflecting that most investments flowed into rubber and tea (70%), and a smaller proportion into processing, and provision of agricultural inputs. Investments in livestock focus on pig and fish production (Staal et al., 2016).

The study from Staal et al (2016) provides furthermore gender disaggregated figures on education, literacy, employment, infrastructure, the role of women and youth, decision making processes and policy environment, Institutions and civil society.

The site selection procedure of the A4NH program identified 2 districts in Son La as priority districts, those being Moc Chau and Mai Son, based on their 3 main selection criteria (de Haan et al., n.d.). Taking into account all other criteria too, a clear priority gradient manifested (Figure 2)

In 2016, the percentages of poor households and near-poor households in Moc Chao were 12.75% and 6.71%, respectively. The prevalent ethnic groups are Kinh (38.5%), Thai (30.1%), Hmong (12.2%), Muong (12.4%), Dao (5.7%), Xinh Mun (5.7%), Tay (0.08%) and others (0.06%). Malnutrition prevalence of children under five years old is still high at 21%. The district has 109,000 inhabitants and shares a border with Laos. About 1/3 of the area is agricultural land.

Mai Son is a mountainous district with 154,100 inhabitants of six ethnic groups including Thai (55.62%), Kinh (30.53%), Hmong (7.42%), Xinh Mun (3.23%), Kho Mu (2.49%), and Muong (0.65%).

Topographic effects

Staal et al. (2016) differentiate 4 production zones, Forested, Cultivated Upland, Rice fields, and Home gardens (Table 2).

Soil degradation on sloping land is particularly pressing in Son La Province. A major need to develop sustainable farming systems for improved soil quality has been identified. Valley bottoms have the best soil quality but present little total area. Increased production in these areas may be possible by

introducing a second crop of vegetables or rice between September–December or during off season from June–August, as is the case in Moc Chau with off-season vegetable crops. Most smallholding farms have land in all four production zones.

Table 2: Characteristics of various production zones

Land use	Natural, plantation and regenerated forest	Cultivated area (upland crops)	Rice field	Home garden
Slope	Steep (>15°)	Moderately steep (5–15°)	Flat	Flat (<5°)
Species	Hawthorn fruit (Son tra), cardamom, regenerated shrubs	Cassava, maize, tea	Rice and vegetables	Plum, longan mango, avocado, coffee around home gardens
Soil status	Rich soil mixed with gravel, black colour, red layer beneath	Red soil, no gravel	Rich soil	Rich soil, flat with high humus content
Soil layer	20–30 cm	30–40 cm	50–60 cm	50–60 cm
Problems	Low-quality forest	Water scarcity, high soil erosion	Limited rice area	Limited area

A short section on zoning in Mai Son district, classifying the administrative zoning can be found in Cesaro (2016, p. 276) (Figure 4).

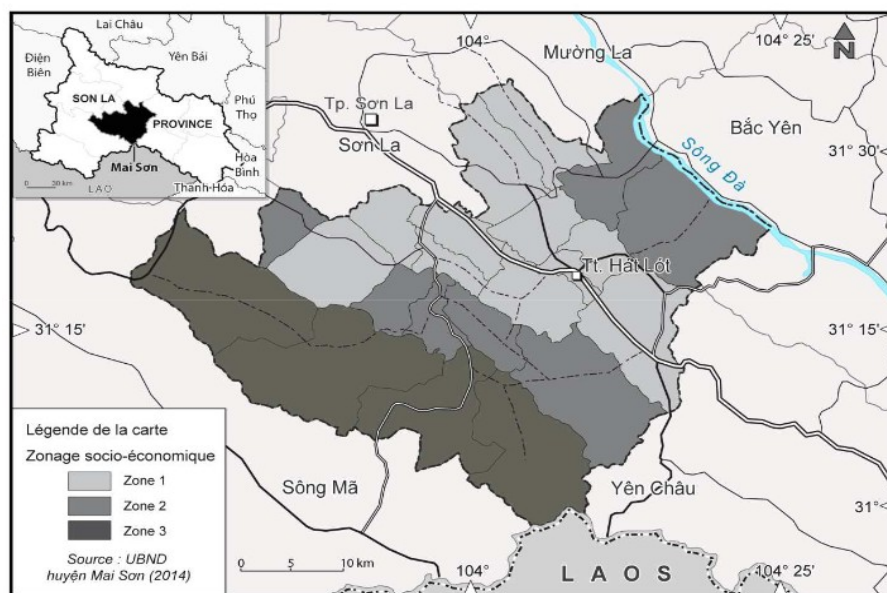


Figure 4: Classification of the communes in Mai Son according to their economic development level

Production systems

The two main crops in terms of production area and income contribution are maize and rice. Cassava takes up the third largest area and annual crops such as soybean and peanut and perennial crops such as tea and coffee are significant sources of income and the most commonly grown cash crops. Fruits and vegetables also play a notable role for income generation.

In Son La specifically, maize and rice production areas are large and yields are high. The diverse climatic conditions together with a reasonable infrastructure favor production, of specialty crops such as mango in Yen Chau district, plum and vegetables in Moc Chau and Van Ho districts, hawthorn fruit (Son tra) in Bac Yen and taro in Thuan Chau. Maize production is advanced and mainly supplied to enterprises in the livestock sector such as CP Thailand and some food enterprises in Hung Yen and km 29 on the Hanoi-Son La road.

Returns from agricultural enterprises including a variety of crops and livestock have been presented and discussed in Tables 14 and 15 of (Staal et al., 2016)). Livestock can generate a notable income, but lags generally behind some cash crops. Non-timber forest products provide an important source of income, especially for the H'Mong and Dao people who live in high-altitude areas, at low investment costs, which is crucial for poor families.

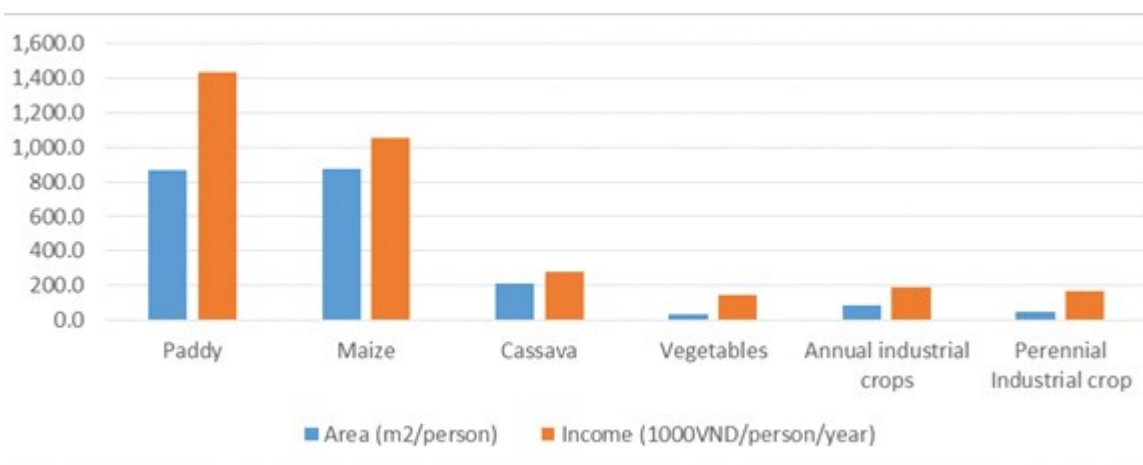


Figure 5: Average area planted to and income generated from main crops in NW Vietnam

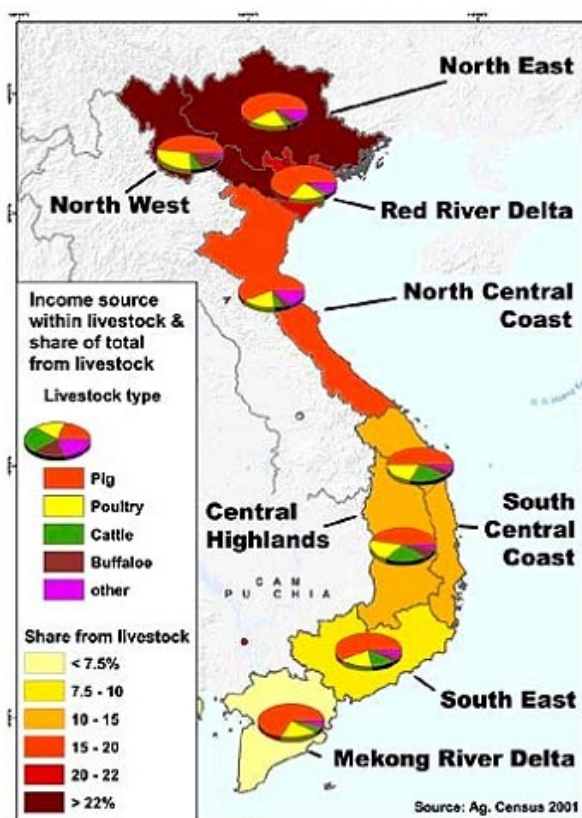
Local varieties of pigs, chickens and cattle are the major animals raised in locations above 800 masl. Inadequate infrastructure contributes to high production costs, causing producers to take advantage of on-farm feed supply and adaptability of local breeds. Free range systems are the norm for pigs and

chicken; cattle and buffaloes are taken into the forest to graze during the day and are brought home at night. The lack of feed during the winter months is a serious problem and contributes to livestock mortality in cold weather.

For post-production activities, about 143 collaborative farmer groups and 83 cooperatives operate in Son La, contributing to job creation, increasing incomes and suggesting new forms of organization in the production and distribution of products. However, only about 30% of cooperatives operate effectively and thus trust in the usefulness of cooperatives is low and many farmers see little incentive of joining them.

The role of livestock

The importance of livestock follows a north-south gradient in Vietnam, with the highest relevance in the north (Figure 6).



Pigs are the most important source of cash income from livestock. Several large commercial pig farms are located in Mai Son and Moc Chau districts.

Extensive reviews with situational analysis and description of opportunities for the pig sector in Northwest Vietnam (Baltenweck et al., 2017) and Mai Son district specifically (Cesaro, 2016, p. 273ff (in French)) conclude that the sector, due to its rapid development in the past, has run into social and environmental problems which offer opportunities for research and interventions. Those may include work with more commercially oriented producers and ways to link smallholders into more modern investment and production schemes. Dealing with effluents from more intensified production has been reported as being a pressing issue for some communities too.

Figure 6: Livestock as income source in total and per animal species. Source: ILRI

The Northwestern Region is leading in the number of buffaloes, and second in cattle production. Today, Cattle and buffalo are raised for meat and not for draft power as in the past. The number of all livestock species, except buffaloes has increased between 2010 and 2016 (Table 3). The support programs for cattle in Son La Province have led to a large increase in numbers, especially due to dairy programs. Other projects such as the ACIAR funded LPS/2008/049, *Overcoming technical and market constraints to the emergence of profitable beef enterprises in the north-western highlands of Vietnam* tried to improve the beef value chain in Thuan Chau and Mai Son districts. A recent project, *Intensification of beef cattle production in upland cropping systems in Northwest Vietnam* (ACIAR, LPS/2015/037), works in similar contexts, in Dien Bien. Still, only a limited number of studies on beef value chains exists for Vietnam, with Smith et al. providing the most updated information, which is summarized at <http://www.asiabeefnetwork.com/country-profiles/viet-nam/overview> .

Poultry has increased steadily feeding into Hanoi and other markets, with close to million birds in the province. High feed cost, weak veterinary services and unstable markets are major constraints and require more support from government or other organizations (Staal et al. 2016). Especially for livestock related activities the available credit opportunities are insufficient.

Table 3: Livestock in Son La province (government data).

Livestock	Number of animals	
	2010	2016
Buffaloes	156,000	145,590
Cattle	156,000	265,560
Pigs	453,000	609,020
Poultry	5,200,000	5,944,940
Goats + sheep	136,000	259,110
Horses	17,000	

Among other uses, rice, maize, cassava, soybean, sweet-potato and vegetables are used as animal feed on farm and none of these crops is produced for export. Except for maize the proportion of use as animal feed is between 10-15%. (Detailed data on use of a number of crops can be found in Table 13, Staal et al., 2016).

Based on 12 years of research under the SFB 564 The Uplands Program, the potential for the development of a marketing option for specialty local Ban pork of a Thai ethnic smallholder cooperative group in Northwest Vietnam was assessed (Le et al., 2016). They conclude from data collected specifically in Son La city and the Thuan Chau district that sufficient demand for this specialty product exists, that it is competitive and that, once registered as a trademark, a profitable value chain can be expanded and benefit smallholder farmers, a view shared by others (Baltenweck et al., 2017). More detailed analysis on Carcass grading and its potential for a quality feedback system was assessed (Muth et al., 2015), optimum sales weight (Muth et al., 2017a) as well as discriminating the quality of local pork from extensive production (Muth et al., 2017b). On a wider scale, the competitiveness of smallholder pig farming in the changing landscape of Northwest Vietnam was assessed too, concluding that the scale barrier between small scale and larger producers requires the investigation of alternative forms of contracts that provide incentives for the private sector to engage with smallholders (Baltenweck et al., 2017). Producer groups or cooperatives are seen as promising in addressing market barriers when external support is provided, but their economic sustainability remains unknown. Schöll et al. (2016) addressed this question partly in pig value chains, through a comprehensive analysis of the economic success as one of the key factors for a long-term operation of farmer groups, showing that projects supporting farmer groups with training and in-kind subsidies seem to have the highest impact on the increase of income of members in comparison with non-members.

Ives (2018) notes that more research on cattle production is required. While the value chain comprises many stakeholders, the role of a large number of them is localized and transitory, and few specialize in cattle and beef marketing. Additionally, beef value chains are difficult to separate from buffalo value chains. Though slaughterhouses play a key role in the value chain, most have no certification, and the value of live animals is based primarily on estimated meat yield and current prices, not on animal characteristics (age, sex). Approximately 90% of beef production in Vietnam is extensive, and in recent years, cattle production has decreased due to bad weather and diseases, whereas consumption of beef is gradually increasing, though still seasonal.

The above mentioned older but still relevant studies provide additional information on resources use, cattle performance and outputs on these different cattle-keeping farm types (Le Thi Thanh et al. 2011). They show that household farms raise cattle at very low input levels, while medium farms had much

lower costs for cattle keeping than small farms, and large farms provided high inputs. In the highlands only the local Yellow cattle was found, which was less prolific in the highlands than in lowland areas.

The relation between cattle keeping and poverty status of household farms in Son La province, taking into account altitude, community remoteness and technology adoption of the investigated households were considered for an evaluation of the feasibility of smallholder beef cattle production in the upland areas (Le et al., 2013). The study concludes that smallholder mixed farms in northern Vietnam can only be successful in cattle production if forage, labor and capital conditions are suitable. Beef cattle production development should thus primarily target regions with available grazing grounds while other considerations, such as breeding, marketing and credit programs are secondary. Poor households kept no or only small numbers of draft cattle, while for very poor families, small animals are more appropriate than beef cattle production activities. Cattle competes with other livestock for limited farm resources. Wealthier farmers with available forage resources have advantages in keeping larger numbers of cattle and other livestock compared with the poor and thus realize higher cash incomes. Engagement in cattle production could be promising for them, provided that feed resources and family labor are available, and if the non-market value of cattle is not higher than the beef market value (i.e. farmers do not make economic loss) (Le et al., 2018). The most promising beef farms were mixed farms in remote high mountain areas, where the farmers could increase their cattle production on the basis of available fodder resources from pastures. This might be significantly constrained or favored by communal or village arrangements regarding the use of communal lands for grazing. However, a strong trend to ever reduced pasture areas has been observed, resulting in complete abolishment of grazing land (Le et al., 2018). The same publication also provides an example of the major use of pastures in different cattle production systems in Son La province and prospects for improving pasture management.

Both studies conclude that the development of smallholder beef cattle production in northern Vietnam can only be promising in the remote highlands, where common land for grazing is still available. In these areas, poor infrastructure, difficult market conditions, and low education levels and high poverty rates are constraining factors. Only in specific advantageous beef regions, smallholder farmers might engage in beef production, if appropriate policies are implemented to support them in raising and marketing cattle (Le et al., 2018, 2013).

Slightly contrary to other sources, Ives (2018) calls the North West of Vietnam “dominated by smallholder cattle farmers” with an average of 3.5 heads per household. Cattle breeds include 74 % Vietnam Yellow cattle, 13% H’Mông cattle, and the remainder consisting of Lai Sind and Brahman. Only 10% of farmers use cut and carry approaches all year round; 60-90% use a combination of tethered grazing and supplemental feeding; among highland farms free-grazing is common. While the reasons for the high number of animal losses during cold seasons are sufficiently understood now – being mainly a combination of under-nutrition, harsh conditions, parasitic burdens and other health issues, which makes resisting cold challenging for animals – a number of topics are open to further investigation, such as provincial and local subsidies to buy roughage for cattle during cold periods; provision of cereal silage; draft free stable designs for cattle; forage plantations and management; agricultural residue use; ensiling summer/autumn over supply of fresh fodder.

Conclusions, Situational analysis

- Increasing income gap between rural and urban areas
- >30% incidence of stunting among children
- Proximity to two borders offers some interesting economic opportunities
- Ethnic minority women may be the most disadvantaged due to lack of access to knowledge or participation in vocational training
- The region ranks high in the attention of policymakers and donors
- Evolving civil society organizations
- Diverse and challenging terrain, with potentially high soil erosion and degradation, high labor requirements to work sloping lands, and relatively low percentage of crop land
- Unique opportunities for temperate crop species
- Livestock is relatively minor in total production but yields good profits and provides income security
- Some local specialties and breeds of livestock have successfully penetrated the market at premium prices
- Low productivity due to challenging terrain, low use of improved genetics, low inputs, traditional practices, low mechanization, and inappropriate use of agrochemicals.
- Insufficient reliable data about and inadequate attention to investment in natural resource management, such as in the context of protecting biodiversity, soil and water resources and particular use of indigenous knowledge for sustainable practices
- Pollution of waterways with sewage, manure effluent and agrochemicals

3 Ethnic minorities

The most common ethnic minorities in Son La are Thai (which present the actual majority in the province), Hmong and Muong (Figure 7). Kinh people comprise about 15% of the population.

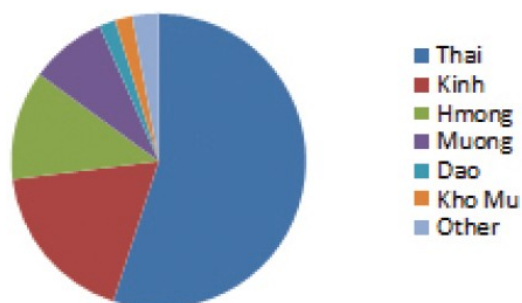


Figure 7: Ethnic composition in Son La.

The landscape is ethnically segmented with Hmong living on the less fertile mountain tops and Thai living in the river valleys. A detailed account of the spacial distribution of ethnic minorities in the northern region including a description of their agricultural practices and three exemplary case studies were given by Tran (2003). The farming systems vary depending on location and ethnicity with all traditional systems being highly adapted to the locality. In the low mountain zone, composite swidden systems comprise highly integrated agricultural systems in which paddy, swiddens, orchards, home gardens, fish ponds and livestock are all managed as component of the same system. This level of interaction means that changing one element will affect other components too, which requires a profound understanding of the system as a whole in order to achieve sustainable change (Tran, 2003).

Bonney and Duong (2015) describe Hmong people as spatially isolated, marginalized by language barriers and suffering negative stereotyping. Mountain dwelling is a powerful notion for Hmong people and ‘saib loojmem’ (literally “sighting the veins of the dragon”) determines the siting and design of houses and structures. Hmong agriculture is integrated into the social and religious system. Typical households live in patrilineal clusters, often with less than 5 cattle, selling 1-2 cattle per five years. Cattle-keeping is not just a cash reserve but also a wealth status and religious symbol. It is an egalitarian society and democratic within family, clan and community decision-making. Power and authority is highly structured on the basis of household, lineage and clan. Hmong women are the ‘keepers’ of traditional culture, while Hmong men may be more likely to adopt new practices. Hmong

people are humble around strangers but easily insulted and do not forgive easily. Markets are places that have cultural and religious meaning, which may affect facilitation of change.

In Thai society the man is responsible for cattle, while Hmong households divide the responsibility more equitable. Thai people practice more controlled livestock keeping and semi-free grazing while Hmong tend to graze cattle freely. The average cattle number in Son La is 3-4 animals in 80% of households, with Hmong selling generally more animals than Thai people. About 46% of all households keep animals only for breeding, 35% for breeding and draft (especially in the low lands), and only 15% for sale. Thai people are more income oriented when selling their animals and apply feed conservation in the form of rice straw and maize (stalks?) more often than Hmong people (>90%HH vs ~30%HH, respectively). Hmong cattle pens are generally separated from their homestead while Thai keep their animals under their houses. Pens generally lack flooring, walls and have poor roofing leading to reduced disease resistance. This leads to more dead animals during the cold season among Hmong than among Thai people. This leads to the overall conclusion, that both group require different change and extension strategies.

While in production ethnic minorities contribute significantly to overall outputs, more upstream activities such as produce collection on district or provincial level is exclusively dominated by Kinh people. Thai ethnic minorities, are still the most involved, playing a significant role in fruit and vegetable value chains.

The rural Kinh and Thai generally have more and bigger farms, use higher inputs and so may have a bigger environmental impact. They also have more traction and participation in value chains. Interventions targeting the ethnic minorities, if successful, will have a greater effect on poverty alleviation and disparity. Organizational strategies would have to take into account these structural differences in social groupings and networks.

Women of all ethnicities are generally more disadvantaged compared with men due to poorer education, sometimes facing language constraints, poor inclusion in value chains and poor uptake of subsidies and extension opportunities. Again, organizational strategies would need to be designed to specifically address the needs of women and may be particularly relevant in certain product markets such as fruits and vegetables, and for any attempt to address dietary diversity and nutrition.

4 Drivers in the area

Policies

While very top-down in the early days of the country's independence, the process of law and policy formulation has been standardized and improved over time, with greater emphasis on consultation. Major weaknesses today include lack of coordination across the large number of agencies that develop policies, excessive detail in policies and associated regulations, poor policy feasibility and predictability of outcomes, simplistic policy impact assessment, a lack of specific and measurable indicators, and limited resourcing from the state. A comprehensive analysis of policy processes, including a case study of the 2015 decree on incentive policies for investment in agriculture and rural areas, was provided by Petersen (2017, chap. Policy development in Vietnam: theory vs practice). It is therefore advisable to consider, that while well intentioned, a number of policies are more of a hindrance than a help at achieving stated goals and that production decisions should be left to farmers (Petersen, 2017, chap. Evaluation of Vietnam's food security policies).

The priority policies for agriculture in the mountainous areas of Vietnam aim to ensure food security encouraging rice and maize production. Some provinces have support policies to develop special local high-value rice varieties. Decision No. 2331/QĐ-TTg gives farmers partial government subsidies through provision of hybrid seeds, fertilizers and Machinery (tractors, threshing machines). Lack of incentive or knowledge of poor minority people leads to their exclusion from taking advantage of the subsidy (Staal et al., 2016). An official focus on beef cattle production in the highland areas of Vietnam to facilitate poverty alleviation programs for smallholder farmers and address environmental issues of intensified cropping such as erosion (Ives, 2018), may provide the impetus for developing project activities in this field. Endeavors are to be concentrated in the three districts with the largest number of cattle: Thuận Châu, Sông Mã (100 km from the city) and Mai Sơn.

Decision No. 800/QĐ-TTg aims to enhance the role of agricultural extension agents, improve technology transfer through training and increase investment in postharvest technology to reduce losses. Organizing smallholder producers into collective groups, cooperatives or companies is encouraged to improve the standard of living of farmers (Staal et al., 2016).

Decision No. 1847/QĐ-BKHHCN and Decision No. 1746/QĐ-BKHHCN by the Ministry of Science and Technology are the basis for the program 'Science and technology for sustainable development of

northwest Vietnam'. They apply technologies to drive change such as feed processing machines for buffaloes in the cold season to produce biomass pellets from agricultural byproducts. The program focuses on cattle breeding and animal feed, scaling up macadamia production, improved organic vegetable production, aquaculture in hydropower reservoirs for export, ginseng (Lai Chau ginseng) and medicinal herb production, supply and value chains development (Truong Vu Bang Giang, VNU, 2017).

The national livestock strategy aims at reducing the proportion of pigs to total livestock from currently about 72% to 62% in the next 10 years, while increasing poultry from 21-28% and beef from 8-10%, (Dr. Quang, IPSARD, personal communication).

On provincial level, policies focus on two aspects: i) strengthening local commercial production through training and ii) input provision and supporting subsistence crops through advisory services. Specifically supported are: Local and hybrid rice, potato, cassava, maize, rubber, tropical vegetables and fruits, buffaloes, Green crayfish, carp, tilapia and Son Tra (2013 data). As fully complying with technical requirements is difficult for poor households, due to significant investments and management, the number of producers who benefit from these support policies remains limited (Staal et al., 2016).

Contract farming is incentivised and finds most prominent adoption in tea and cassava production.

A payment for environmental services scheme exists since 2004 in Vietnam, pilots were established in Son La in 2008 and have since been expanded nationwide. The scheme seems to focus mainly on tree plantations though (Staal et al., 2016).

Provincial policies focus on attracting investors to build trading centers and supermarkets to promote consumption of local products, namely vegetables, milk, Hawthorn and taro. The focus is mainly on medium to large enterprises, rather than smallholders (Staal et al., 2016).

Thuận Châu has been actively encouraging cattle production, following the decision by the Son La government to develop cattle and increase cattle numbers to 22,000 heads. Low interest loans for developing cattle, forage planting and calves were made available. Approximately 400 ha of elephant grass were planted and the government continues to support breeding efforts and forage use (Ives, 2018).

Market forces

The large bulk of agricultural produce goes via three types of distribution channels to major population hubs such as Hanoi and the Red River delta to satisfy in-country demand. Chinese imports nevertheless impact a number of Vietnamese value chains. Depending on the exported amount as well as eventual border restrictions commodity prices in Vietnam will fluctuate. While exports of crops like maize, fruits (mainly plum), tea, and coffee from Son La are minor, they basically go exclusively to China and Taiwan (Staal et al., 2016). For livestock, especially pigs produced in country, prices can decrease by close to 50% when Chinese import rules are changed, as has been the case in 2016 due to Vietnam not being acknowledged as a Foot-Mouth Disease free country (Baltenweck et al., 2017).

In Muong Coi farmers articulated their plans to produce more cross-bred and exotic pigs to serve increasing market demand while in Bac Phong, where market access is limited, and ethnic minority groups are dominant, farmers opted to invest more in indigenous pigs and their crosses (Baltenweck et al., 2017).

It is predicted that consumption of traditional pork products (fresh, unprocessed pork) will grow at about 6% per year, and consumption of modern pork products (chilled, frozen, and processed pork products) will increase at 18-21%. Per capita pork consumption is predicted to rise to 22.1 kg and 27.8kg for 2020 and 2030, respectively. Leanness, safety, and hygienic slaughtering and processing are of increasing interest for consumers. Ban pigs as a restaurant specialty are a premium niche market (Baltenweck et al., 2017).

Land use change as a result of intensification, the rapid growth of commercial/industrial forest cultivation, especially rubber plantations, and hydro-electric development are among the main drivers of forest degradation. Thus, tree coverage is on the rise in total nominal terms, but forest functional quality is being reduced (Staal et al., 2016).

Son La's beef value chains reach local and urban markets (Hanoi), and include contract farming for Thang Tung enterprise. Meat quality and sensory analysis in consumer surveys have distinguished beef from the province indicating consumer willingness to pay premium prices if origin and safety are guaranteed. Beef consumption is increased from September to December related to lunar calendar traditions, and prices may go up during this period. However, lack of uniformity in quality and long transport times, as well as food safety still seem to pose problems (Ives, 2018).

Cattle movements, such as animals coming from Laos and affecting market prices can be short to medium term drivers, as well as hydropower projects which affects pig flows to feed large work forces (Huyen Le, NIAS, personal communication). While China exerts a certain influence on N-Vietnam, Son La is more influenced by local trends and developments, especially as trade of animal products to China from Vietnam is currently constrained.

Son La may not be representative for NW-Vietnam as living standards and prices are higher, and more employment opportunities provide more off-farm income. Farmers move thus out or up: Committed farmers want to develop their farms into more commercially oriented activities, while other take the opportunity to get out of farming (Huyen Le, NIAS, personal communication). Migration out of agriculture has deep implications for labor structures and supply in many households, leading to changes in household agricultural production. A case study found that renting or exchanging agricultural land has become common within and between communes in order to re-distribute land. Because many farm laborers have migrated, various forms of labor exchanges have emerged (Nguyen et al., 2015).

5 Recent projects and development efforts

Integrated Agriculture

The Humidtropics CRP collected a wide variety of data and conducted among other things also value chain analyses for a variety of products, such as maize, pigs, plums and tea in Son La province. These products had been identified as most relevant in the current farming context and were mapped and analyzed as to constraints and possible interventions (Karimov et al., 2016). The document also describes transaction procedure between value chain stakeholders, as well as partner networks. While it does not show specific integration options, those may arise from the description of the value chains.

On sloping land in upland areas, there are some examples of maize intercropped with pumpkin or peanuts (Staal et al., 2016). Past crop extension projects focused on maintenance and production of parent rice seeds, sugarcane intensification and rattan production (in 2015), as well as Canna production (in 2017) (Ha Thuy Hanh, NAEC, 2017).

The *Strengthening the Framework for Production and Marketing of Organic Agricultural Products in Northern Vietnam* (MOAP), implemented by Agricultural Development Denmark Asia (ADDA), finishing in 2019 and working on improving food security for producers and consumers, primarily targeting ethnic minorities, poor households and farmer groups, with the Vietnam Organic Agriculture Association (VOAA) as main partner. They established Participatory Guarantee Systems (PGS) of several organically produced commodities including vegetables, nuts, fruits and chicken (ADDA, 2018).

The Climate Change and Ethnic Minorities in Northern Vietnam (CEMI) project, carried out by ADDA, ended in June 2017 and was implemented in Dien Bien, Son La and Lai Chau aiming to support ethnic minority farming communities in remote and mountainous areas of the three provinces. This included providing information on climate change policies for ethnic minority farmers, impacts of local policies and natural resources planning to address local climate change adaptation, food security, and poverty reduction. The project was mainly implemented as a promotion channel for training on sustainable agricultural methods and information provision through farmer field schools, group trainings, courses etc. (Phung and Nguyen, 2017).

The topic of sustainable integration and trade-offs has been addressed more frequently in recent years. The project *Trade-off and synergies of integrating intensive Livestock production with Agroecology in Mountainous regions* (TAG), is based on the work of four research institutions combining ongoing projects on the development of intensive livestock production and/ or projects of agroecology options in mountain areas in northwest of Vietnam and the northeast of Laos: CIRAD (UMR Selmet, UR Aida), the National Institute of Animal Science (NIAS). With collaboration with the University of Tasmania and University of Queensland through the Beef Cattle 2 project (ACIAR, LPS/2015/037) and Maize project (ACIAR, SMCN/2014/049) (Blanchard, 2017). While the CIRAD component recently ended and will only restart in 2020, the ACIAR projects are still ongoing.

Livestock

ACIAR has funded a number of projects over the past 10 years in NW Vietnam, mostly focusing on improved livestock production. Project LPS/2008/049 *Overcoming technical and market constraints to the emergence of profitable beef enterprises in the north-western highlands of Vietnam* assessed quality and marketing related aspects of beef from Son La, as well as the effect of feeding on temperature

resistance. Their findings among others are that low temperature and feeding levels (below maintenance, maintenance, and above maintenance) significantly reduce digestibility and affect metabolic rates of cattle, with below maintenance feeding exacerbating cold stress and temperature effects on blood urea concentration. A range of feeding options have been tested with good result (Ives, 2018).

ACIAR's AGB/2016/031, *Developing a Trade Model and information network for cattle and beef trade sector of SE Asia and China*, was a Small Research Activity implemented by the University of Queensland and finished in Sept, 2017, which developed a comprehensive Spatial Price Equilibrium (SPE) model of the regional beef industry and a set of information gathering, collation and dissemination tools to help develop the cattle and beef sector in South East Asia and China.

Past extension projects focused on integrating livestock production with public animal health (2015, 2016), fattening beef cattle (2015, 2016), high quality honey production (2017), and fish raising techniques, 2015-2017 (Ha Thuy Hanh, NAEC, 2017). Projects focusing on poverty reduction through promotion of livestock production all failed. The schemes aimed at providing more productive animal breeds to smallholders for more efficient and market oriented production (Huyen Le, NIAS, personal communication).

The above mentioned TAG project (CIRAD) has offered four scenarios to farmers and identified improvement of forage production via *Pennisetum purpureum* as the most popular option for them as it is known and spreading. *Panicum maximum*, which can better cover the winter deficit is little known and thus less trusted (Blanchard et al., 2018).

Most large scale projects funded by FAO, IFAD and ADB focus on livestock production in the North-eastern region.

6 Current projects with synergy potential

The A4NH CRP works in Moc Chao and Mai Son districts, Son La province. The program has recently completed base-line surveys in Moc Chao on nutritional status including anthropometric measurements in 30 villages, on food consumption behavior in 10 villages, and with a 24h recall for dietary assessment in 10 villages per site. A baseline report, food systems profile, and manuscript on food

systems divergence along a rural - urban transect are in preparation. Additionally food systems characterizations on food flows, food environment (food outlets), and main indicators of diet footprints (e.g. per-capita greenhouse gas emissions and per-capita water use). Implementations on the ground are to be started soon.

The Northwest of Vietnam is one of three focus areas for ACIAR funded project activities.

ACIAR project (LPS/2015/037) *Intensification of beef cattle production in upland cropping systems in Northwest Vietnam*, led by Stephen Ives, is mainly focusing on activities in Dien Bien but still works on some forage extension and DARD training in Thuan Chao and Mai Son.

ACIAR project *Improving maize-based farming systems on sloping lands in Vietnam and Lao PDR* (SMCN/2014/049) led by Michael Bell, focuses on developing more sustainable and diversified maize-based systems on sloping lands in Son La province in Vietnam and in Houaphan province in Laos. Among other options, they are testing grass strips for erosion control and cut and carry forage production for livestock, as well as the use of perennial/self seeding annual legumes as an understory in maize fields, to fix N and control erosion, and provide some high quality livestock feed. Due to strong interest in establishment of tree crops like coffee, longan and plum in these sloping lands, they are looking at ways to combine this with conservation cropping of maize in either strips across the slope (with understorey plantings) or as a way of changing land use while preserving soil. Using maize by-products for animal feed conflicts with the strong focus on residue retention of this project in order to minimize soil erosion risk in the early stages of each new wet season (personal communication with Dr. Michael Bell, m.bell4@uq.edu.au).

ACIAR project FST/2016/152, *Developing and promoting market-based agroforestry and forest rehabilitation options for northwest Vietnam*, implemented by ICRAF, aims to develop and promote market-based agroforestry options to improve livelihoods and enhance forest and landscape management. The project is in its second phase after establishing 50 ha of pilot models including forage grass hedge rows and various tree species in Thuan Chao, Mai Son, Bac Yen and Tram Tau in Son La province, as well as in Yen Bai and Dien Bien (La et al., 2016).

The *Gender-Responsive Equitable Agriculture and Tourism (GREAT)* program funded by the Australian government targets Van Ho and Moc Chau districts and has started as first initiative a clean vegetable project in Van Ho District early in 2019, linking smallholders to a local cooperative. The GREAT

program aims at empowering local women in the northwestern provinces of Son La and Lao Cai to engage in agriculture and tourism markets as well as economic decision-making. The project is partly based on a former FAO project, *Strengthening Vietnamese SPS Capacities for Trade: Improving safety and quality of fresh vegetables through the value-chain approach (Phase II)*” (2012-2016), implemented by the Fruit and Vegetable Research Institute (FAVRI).

JICAS currently carries out their *Project on Support for Farmers’ Income Improvement through the Revitalization of Integrated Agriculture in Hilly Areas*, which works with farmers in Tham Village, Chieng Sinh commune, Son La City and Tay Hung Village, Muoi Noi commune, Thuan Chau District in Son La. JICAS did not respond to inquiries about this project.

CIRAD is starting a new regional agro-ecological project, hopefully early in 2020. ALISEA members will decide on project site locations, but all must be in the uplands. Estelle Bienabé is responsible for the project development.

An upcoming project from ADDA is aiming at enabling farmers to develop a sustainable management plan for their village and use successful examples as guide for policy makers. The work is implemented in collaboration with farmer cooperatives (Mr. Hung Nguyen Ngoc, ADDA national manager, nn.hung@adda.vn).

7 Opportunities and Constraints

Identified Constraints

- Permits are required and take time, making spontaneous trips impossible
- Son La is not representative for other parts of the northern mountainous area: Living standards and prices are generally higher, many off-farm employment opportunities
- Local authorities see no benefit in work on pasture restoration, as they don't believe it can be done
- Son La has no clear livestock market: It is in a disadvantage compared to provinces that are closer to Hanoi, such as Hoa Binh, increasing transport cost, and has no cross-border trade. Only premium products might be an option but development and marketing takes time (Dr. Quang, IPSARD, personal communication)
- Large scale development projects (FAO, IFAD, etc) focus more on the Northeast

Identified opportunities

Topics

- The National Agriculture Extension Center of Vietnam (NAEC) recommends cattle raising, cassava production, and safe vegetable production for Son La. (Ha Thuy Hanh, NAEC, 2017)
- The elevated terrain and high rainfall allow for specialization in a number of high-value crops, tree and livestock products, that require a more temperate climate. Here though lies also a disadvantage for livestock compared to specialty crops.
- There is high demand for manure to fertilize fruit trees and coffee plantations. Livestock is normally not available though as these systems are more specialized already (Melanie Blanchard, CIRAD, pers. comm.)

- Geographic branding for traditional products and tastes for Vietnam and elsewhere in Asia. Specialty product promotion from ethnic minorities; such as traditional smoked meat and sausages which are well liked by urban consumers (Cesaro, 2016, p. 281)
- Ban pigs are a restaurant specialty at premium prices often produced by minority communities, frequently with insufficient supply and hampered by feed constraints
- Overcoming conditions which lead to death of livestock under cold stress
- Linking with VNU under the *Science and technology for sustainable development of northwest Vietnam* program, who provide feed processing machines for buffaloes in the cold season to produce biomass pellets from agricultural byproducts
- Integration of leguminous forages and fodder grasses combined with other plants into expanding tree plantations to increase plantation ecosystem services
- Finding synergies or sweet spots for the management of biomass contributing to intensification of livestock and agroecological practices (e.g. mulching, soil erosion prevention etc)
- Local authorities at village and communal level need to be targeted to address the overgrazing of communal areas and improve the availability of forage and fodder (Le et al., 2018)
- Government agencies are lacking tools and capacity for developing integrated farming approaches. Policies often don't support integrated management and policy support work is required to achieve changes in land management (Melanie Blanchard, CIRAD, pers. comm.)
- Acting as a trailblazer for not yet started projects (CIRAD) or contribute additional components to established components (ACIAR)

Collaborations

- The ACIAR Maize project (SMCN/2014/049), seems to offer good opportunities to interact at the intersection of crop and livestock systems with a specific focus on environmentally sustainable biomass use.

- The ICRAF led AFLI-2 project might offer similar opportunities but their approach aims more at changing landscapes and farming systems profoundly, which might allow for testing of more radical out-of-the-box approaches.
- The beef intensification project (LPS/2015/037), is in terms of topic closest to the Livestock CRP but would most likely require choosing one project site in Dien Bien, where their main activities are located.
- CIRAD is just in between projects, which might offer the opportunity to bridge and trail-blaze for their upcoming project establishing thus a solid foundation for future collaboration.
- ADDA, GREAT and JICAS projects might be useful as service receivers or amplifiers, as their focus is more on the development than research side. They might be able to spread suitable approaches quickly through their farmer networks.
- If work with upland smallholders is a mandatory focus, A4NH seems the least attractive partner, as neither is a solid body of interventions available on which to build or to which to contribute nor is there a clear and natural contribution pathway. For LH and LLAFS this collaboration offers opportunities though.

Selection of potential options for different flagships and Cross-cutting initiatives

Objective: provide a basket of applicable tools of high confidence level that can be handed over to development agencies. Contributions of each Flagship should be based on past research while laying the foundation for further work in the future. The listed items are discussion points more than suggestions and must be scrutinized as to their feasibility within each flagship.

Livestock Genetics

- Small yellow cattle seems well adapted and is more suitable for conditions in the highlands. Can smaller breeds be improved to become more competitive (shorter cycles, faster growth, better conversion rates etc)?

- Meat quality testing for specialty value chains, determining if quality is more related to feeding, genetics, or other factors

Livestock Health

- Disease prevention at farm level, including improved management, infrastructure and understanding of infection pathways
- Use and access to veterinary drugs, especially with view on FMD, which constrains cross border trade with China and AMRs
- Identify gaps in access to veterinary products, services and knowledge and find ways to close them

Livestock Feeds and Forages

- Environmental topics on farm level, including forage grasses as erosion control measures, assessing GHG emissions, water contamination and soil loss from farming systems with and without strategic, integrated forage use
- Offering new forage opportunities to farmers to address the feed gap during the winter months (pure extension)

Livestock and the Environment

- Communal resource management, including land use planning, farm resource assessment and planning, re-organization of integrated systems, integration of isolated activities
- Environmental topics on all level, including landscape approaches to restore or improve communal grazing areas while providing additional ecosystem services
- Erosion control on steep hill sides, following and expanding on models tested in the AFLI projects

Livestock Livelihoods and Agri-Food Systems

- Livelihood transformation opens opportunities for those farmers who remain in farming and intensify: Taking advantage of growing demand, competition with imports, providing on-farm employment opportunities, intensification of land use, marketing
- Finding opportunities for those who do not intensify but stay in farming
- Labor related issues, due to labor migration and changing farmhand : land area ratio
- Specialization and development of niche product markets, such as Bac pics or fumed meats
- Financing, market integration, institutional adaptation of integrated more sustainable farming approaches

Gender

- Smaller livestock is more likely to have a stronger impact on gender roles in ethnic minorities
- Strong gender roles in many ethnic societies

Capacity development

- Necessary on all level, but especially for local government agencies

Monitoring, evaluation and learning

- Could guide the process especially in the initial phase, based on comprehensive knowledge of past and current research

Open data, open access and communications

- If a product and service provision course is taken as indicated, adequate delivery mechanisms need to be put in place

8 Additional information and data

Basic population, climate, livestock, crop, production, minority rate, and poverty rate data are available in the file SonLaData_2016_English_190507.xlsx.

Though outdated with livestock data from 2003, the *Atlas of Vietnam animal husbandry.pdf* provides ample information on livestock breeds in the country that might still be of value.

Table 4: Communes assessed for situational analyses by different sources. For farming system analysis see Table 17 in Staal et al. 2016.

District	Commune	Data collected
Thuan Chau	Ching Bom	Staal et al. (2016): FGD, Farming system analysis,
	Ching Ly	Staal et al. (2016): FGD, Farming system analysis,
	Thom Mon	Staal et al. (2016): FGD
	Long He	Staal et al. (2016): Farming system analysis, ACIAR, LPS/2008/049: primary data, social/cultural analysis regarding livestock practices Ives (2018): Value chain analysis; sensory and meat quality analysis; Consumer choices; Marketing development
	Co Ma	Staal et al. (2016): Farming system analysis
Van Ho	Van Ho	Staal et al. (2016): FGD
	To Mua	Staal et al. (2016): FGD
Mai Son	Ta Hoc	ACIAR, LPS/2008/049: primary data, social/cultural analysis regarding livestock practices
Phu Yen	Muong Coi	Baltenweck 2017: Pig production and market assessment
	Bac Phong	Baltenweck 2017: Pig production and market assessment
Moc Chau	Dong Sang	Staal et al. (2016): FGD
	Muong Sang	Staal et al. (2016): FGD

Table 5: Further data available in the reviewed documents

Topic	Source
Crop varieties and cultivation technology	Staal et al (2016), Tables 18, A6,
Livestock breeding approaches	Staal et al (2016), Table A7
Land use	Staal et al (2016), pp. 19-20 47-48, 50-51, Tables A10, A13, A15, A18

Seasonal crop calendar	Staal et al (2016), Table A5
Yield, production area and volume of main crops	Staal et al (2016), Tables A2-A4, A9
Income, consumption and use per capita, demand	Staal et al (2016), Table 20, A1, A9
Water resources	Staal et al (2016), pp. 48 ff, Tables A20, A21
Agricultural inputs	Staal et al (2016), Tables A8, A24, A25
Living conditions	Staal et al (2016), Table A26
Biogas program statistics	Staal et al (2016), Table A27
Genetic resources and biodiversity	Staal et al (2016), pp. 51-52
Indigenous knowledge and local practices	Staal et al (2016), pp. 52-53
Institutions, civil society stakeholder landscape	Staal et al (2016), pp. 20-22
Maps and bibliography	Staal et al (2016), pp. 63-70, 82-83

Burra et al. (2019) collated a list of primary and secondary data sources in: VIETNAM food systems: Summary of available data, available in the repository. It is unfortunately not specified where these data can be found or accessed.

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