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Movement pathways and market chains of large ruminants in the Greater Mekong Sub-region

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Table of Contents

Executive Summary.....	1
Purpose	2
Background	2
Methodology.....	3
Snowball sampling	4
Interview technique.....	5
Constraints.....	6
Results.....	6
China	7
Movement pathways.....	7
Regulatory information.....	12
Lao PDR	12
Movement pathways.....	12
Regulatory information.....	21
Myanmar.....	21
Movement pathways.....	21
Thailand.....	27
Movement pathways.....	27
Regulatory information.....	32
Vietnam.....	33
Movement pathways.....	33
Viettel’s “cattle for the poor programme”	44
Overview of large ruminant trade pathways in the GMS.....	45
Price information	48
Recent changes in large ruminant trade in the GMS.....	50
China	50
Lao PDR	51
Myanmar.....	52
Thailand.....	53
Vietnam.....	54
Conclusions	54
Discussion/constraints.....	57
References	58

List of Appendices

Appendix 1 Checklist for the semi-structured interview

List of acronyms

FMD	Foot and mouth disease
GMS	Greater Mekong Sub-Region
PDR	People's Democratic Republic
OIE	World Organisation for Animal Health
FAO	Food and Agriculture Organisation of the United Nations
ACIAR	Australian Centre for International Agricultural Research
GDP	Gross Domestic Product
SEACFMD	South-East Asia and China Foot and Mouth Disease Campaign
CNY	Chinese Yuan
USD	United States of American dollars
PAFO	Provincial Agriculture and Forestry Office (Lao PDR)
THB	Thai Baht
VND	Vietnam Dong
SDAH	Sub-Department of Animal Health (Vietnam)
DVS	Department of Veterinary Services (Vietnam)
CIAT	International Centre for Tropical Agriculture
LW	Live-weight
LBVD	Livestock Breeding and Veterinary Department (Myanmar)
CASRAD	Centre for Agrarian Systems Research and Development
VAAS	Vietnamese Academy of Agricultural Sciences
IFAD	International Fund for Agricultural Development

Executive Summary

A study on movement pathways and market chains of large ruminants in the Greater Mekong Subregion (GMS) was conducted for the purpose of updating information about livestock movement in the region, with a focus on those movements destined for China. Since a previous study was conducted in 2009 (Cocks *et al.*, 2009), the demand for beef in China has risen sharply. The current study was conducted to review movement pathways for large ruminants in the region in light of the changing market situation.

It is intended that the results of this study be used to inform decisions on measures aimed at reducing the risk of spreading Foot and mouth disease (FMD), and other transboundary animal diseases, through trade related movement of large ruminants.

The field data collection for the study was conducted by consultants in each of the five participating countries: China, Lao PDR, Myanmar, Thailand and Vietnam. These countries were selected as they all lie on the pathway of livestock movement destined for China, with some sharing extensive land borders.

A methodology known as snowball sampling was applied for selecting participants for the study, and interviews conducted using a checklist and semi-structured interview technique. In some situations, these methods were modified to fit into the timeframe of the study or to allow for differences in data collection in the various country settings. In some cases, a snowball sampling approach was used to select areas to visit and then convenience sampling used to select interviewees within those areas.

The results of the study indicate significant and recent changes in the movement pathways of large ruminants in the region, with a notable shift towards strong markets in China. Information collected during this study indicates movement of almost one million head of large ruminants into China from neighbouring countries each year.

An important outcome of the study is identification of new sources of livestock entering the region, with reported movement of large ruminants from India and Bangladesh to Myanmar and Thailand. There is also reports of increasing numbers of cattle being imported from Australia into Vietnam and Malaysia.

Thailand and Lao PDR play an important role in the transit movements of livestock destined for China and, to a lesser extent, Vietnam. Vietnam is an important market for large ruminants in its own right, and is also a transit country for animals moving from Thailand, destined for China. In Vietnam, local cattle as well as livestock from Thailand and Australia are predominantly used to satisfy local beef demands. Many cattle and buffalo move through Vietnam towards Guangxi Province in China.

The vast majority of cross-border animal movement within the region continues to occur unofficially. There is some official movement, such as transit movements through southern Provinces of Lao PDR, and importation of cattle for slaughter in Vietnam (from Thailand and from Australia). Thailand operates a system whereby livestock which enter Thailand from Myanmar unofficially are then taken into an official system in which they are quarantined, vaccinated against FMD, provided with import documentation and ear tagged before they are permitted to move further within the country.

Livestock markets continue to be important components in the movement pathway of livestock across the region. The key markets identified during this study as important areas for gathering and mixing of livestock were: Photong Market in Tak Province, Thailand through which the majority of cattle move after entering Thailand from Myanmar; Tra Linh assembly market in Cao Bang Province, Vietnam

where many animals will be held before crossing into China; and Cho-U assembly market in Nghe An Province, Vietnam through which many animals will pass en-route from Lao PDR to Hanoi or China. Livestock markets also continue to be an important component of livestock trading in Myanmar and Mon State (near Mawlamyine) is an area where there appears to be a lot of livestock movements prior to entering Thailand.

An important change in the market chain of livestock in the region is the increasing presence of Chinese traders operating in the region and visiting neighbouring countries (particularly Thailand and Vietnam) to select livestock before transportation to China. Most of the market chains described during the study involved large scale traders organising cross border movement of livestock, and employment of local people, middlemen or agents to help source and move animals from place to place. The ownership of the animals tend to remain with the large scale traders from each country.

Comparison of the results of this study with results of previous livestock movement studies in the region indicated that there have been significant increases in price of livestock in the region in recent years and that several new pathways of livestock movements have developed.

The study concludes that there is extensive movement of livestock throughout the GMS, with large ruminants being transported vast distances and crossing country boundaries. This emphasises the importance of whole-of-region disease control programs and the need for improved regulation of livestock movements in the region. There should be a focus on improving the health status, and certifying the health status of transported livestock in order to reduce the risk of FMD being transmitted through trade movements of livestock. The importance of working in consultation with traders and other stakeholders in developing these regulations will be important to optimise support for any new regulations.

Purpose

The purpose of this study is to identify the major movement pathways and market chains of large ruminants in the GMS, with particular focus on cross border movement destined for China. It is intended that the results of this study be used to identify key points in the trading pathways where control measures may be targeted to reduce the risk of FMD being transmitted along the pathways of large ruminant trade in the region.

The information gathered during this study will also be compared to the results from a similar study funded by OIE and FAO in 2009 and conducted in Lao PDR, Cambodia and Vietnam (Cocks *et al.*, 2009). This will highlight any major changes in the movement pathways in recent years.

Background

Livestock movements are known to be a major factor in the spread of transboundary animal diseases, including FMD. In much of South-East Asia, where there are extensive land boundaries between countries and where demand and price differentials exist across those boundaries, cross-border movement of livestock is extensive. A number of studies have been conducted in South-East Asia in recent years in order to better understand the movement of livestock in the region (Cocks *et al.*, 2008; Cocks *et al.*, 2009; ACIAR, 2011). The results of these studies have highlighted the dynamic nature of livestock trade in the region and, therefore, the need to conduct further surveys periodically to review livestock movement pathways. This will be particularly useful in assessing the effectiveness of any measures that are implemented in order to better manage the disease risks associated with the trade.

Gleeson, 2002, stated that the distribution and movement of FMD viruses in South-East Asia is a reflection of the trade driven movement of livestock. As FMD continues to occur across much of the

region, and with emergence of strong markets such as China and Vietnam, the challenge of reducing the risk of FMD transmission through trade related movement of livestock continues. While any gathering and movement of livestock carries the risk of FMD transmission, trade related movement is paramount in terms of: the volume of animals moved and gathered; the distance over which those animals are moved; and, the short time frame over which they are moved long distances.

Given that there are several days between an animal becoming infected with FMD and displaying clinical signs of disease, it is possible for an infected animal to pass through a number of market areas, contact many susceptible animals and even cross country boundaries before it displays clinical signs of disease. Therefore, where countries rely only on clinical examination for detecting disease, or where cross-border movement of livestock occurs unofficially and without regulation, there is a risk of FMD being transmitted between countries.

With an increasing population, continued economic development and dietary transition towards a more meat-rich diet in China (Hansen and Gale, 2014), the rise in demand for beef is set to continue. The high demand for beef in the region, and its consequently high value, continues to drive movement of livestock towards China from throughout the region. At present, much of the movement destined for China is unregulated with livestock moving unofficially across country boundaries. The results of this study should be used to inform organisations working in the region, policy makers and other stakeholders of the situation as it exists today and therefore, assist them in considering measures aimed at reducing the risk of disease transmission through movement of livestock.

Methodology

The methodology used for this study was based on that applied to a previous, similar study in the region (Cocks *et al.*, 2009). The methodology is based on a non-probability sampling method known as snowball sampling (described in detail below) and use of semi-structured interview techniques.

A planning meeting for the study was held in January, 2015, during which the SEACFMD Campaign Coordinator, other staff from the OIE Sub Regional Representation for South-East Asia (OIE SRR SEA) and the regional consultant for this study briefed the national consultants from each of the participating countries on: the methodology to be used for the study; the information to be collected using a semi-structured interview technique; and the results of a previous study conducted in the region. During this meeting, the national consultants were given an opportunity to provide feedback on the content of the semi-structured interview checklist such that it could be adjusted to suit the needs of the participating countries. The checklist resulting from this workshop is provided in Appendix 1.

A key outcome of the planning meeting was agreement on the study sites to be included in this study. The criteria for selecting these sites was that they should lie within known or suspected pathways of livestock trade destined for China. Some of the sites were selected based on results from previous studies, others on more recent information provided by the national consultants during the planning meeting, and others were identified after the study had commenced. The study sites selected are shown in Table 1.

COUNTRY	STUDY SITE	BORDERING AREA
CHINA	Yingjiang County, Yunnan Province	Kachin State, Myanmar
	Ruili County, Yunnan Province	Shan State, Myanmar
	Gengma County, Yunnan Province	Shan State, Myanmar
	Menglian County, Yunnan Province	Shan State, Myanmar
	Jinghong County, Yunnan Province	Shan State, Myanmar
	Meng La County, Yunnan Province	Luang Namtha Province, Lao PDR
	JingXi County, Guangxi Province	Cao Bang Province, Vietnam
LAO PDR	Luang Namtha Province	Meng La County, China
	Bokeo Province	Chiang Rai Province, Thailand
	Bolikhamsai Province	Nghe An Province, Vietnam (to the East) Bueng Kan Province, Thailand (to the West)
MYANMAR	Central Myanmar (Bago, Mandalay, Magway)	China/Thai border areas could not be visited due to security concerns
	Mawlamyine, Mon State	Not border area – port in Myanmar
THAILAND	Chiang Rai Province	Bokeo Province, Lao PDR and Shan State, Myanmar
	Tak Province	Kayin State, Myanmar
	Petchaburi	Fattening area for cattle destined for China
	Kanchanaburi	Tanintharyi Division, Myanmar (also identified as fattening area for cattle destined for China)
VIETNAM	Cao Bang Province	JingXi County, China
	Lang Son Province	Ping Xiang County, China
	Quang Ninh Province	Dong Xing County, China
	Hanoi	Slaughterhouses – destination of animals crossing border

Table 1: Study sites identified during the planning meeting for the study, together with those identified after commencement of the study.

Snowball sampling

Snowball sampling is a non-probability sampling method whereby interviewed respondents are asked to provide details of other respondents: One subject gives the researcher the name of another subject, who in turn provides the name of a third, and so on (Vogt, 1999). In this way, snowball sampling can be used for reaching hidden, or hard to reach, populations. Snowball sampling has been applied in studies where it is difficult to identify the target population due to sensitivity of the issue being researched (Fitchenberg et al., 2009; Dumchev et al., 2009) or where the whole population cannot be identified, thus precluding the use of random sampling techniques.

In South-East Asia and China, much of the livestock trade activity is unofficial and therefore, by its nature, there is little centralised information relating to cross border movement of large ruminants or the stakeholders involved. Therefore, snowball sampling was considered to be a useful approach to identifying individuals operating within the trade, where only a small number of individuals could be identified from the outset.

Snowball sampling is also suited to this type of study given that it is useful for collecting relational data (i.e. how different stakeholders or geographical areas are linked to one another through livestock movements) and can be used where an incomplete sampling frame exists. In order to use snowball sampling it is first necessary to identify starting points which, in this case, are stakeholders known to

lie within the trading network of interest. These include: known/registered traders, slaughterhouses, livestock market owners, etc. These 'starting point' individuals are then interviewed using a semi structured interview technique to gather information, including: where and from whom they buy animals; where and to whom they sell animals; the nature of their involvement in livestock trade; and pricing information. The responses provided during these interviews are then used to select subsequent interviewees (figure 1).

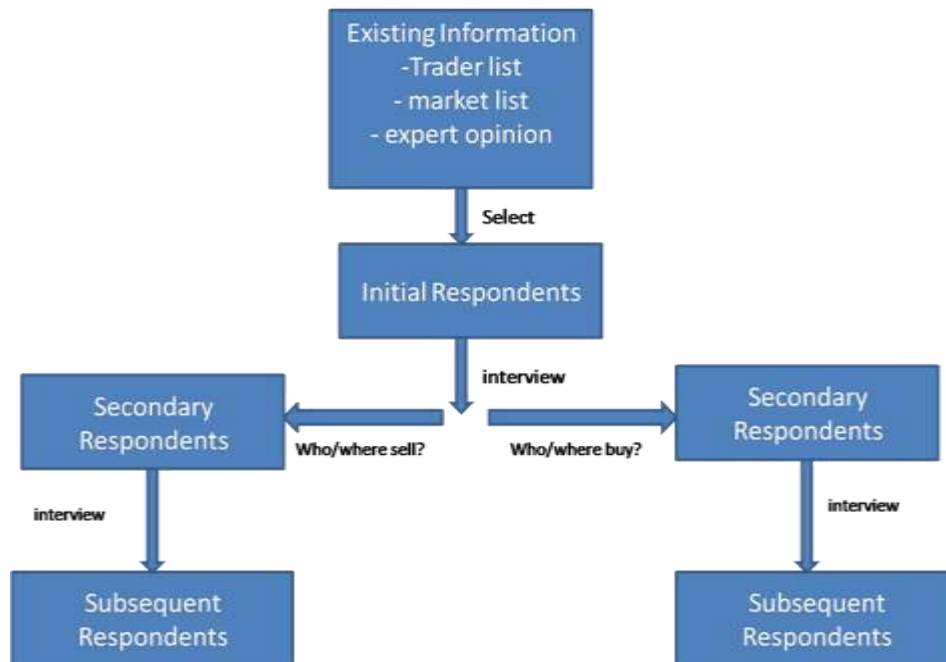


Figure 1: A flowchart showing sample selection of the initial respondents and then how these initial respondents elect secondary respondents, and so on, using Snowball Sampling methodology (Cocks et al., 2009)

In theory, this process allows the researcher to identify whole networks of livestock traders from just a small number of traders identified initially. However, in practice it is not always possible to obtain specific information such as names and exact locations of traders, due to the sensitive nature of cross border trade. This process can also generate massive numbers of secondary respondents, who may be located far away from each other, making follow up visits and interviews difficult within the limited timeframe of the study. In order to overcome these constraints, the methodology was modified such that more general geographical details of animal movements and types of traders were gathered. Based on the details provided, the researcher could then follow up with further interviews of stakeholders in those areas identified. Where information collected in one country concerned areas in a neighbouring country, the consultants shared information with each other in order to validate the information. In this way, the researchers were able to triangulate information gathered from different sources.

Previous livestock movement studies in the region (Cocks et al., 2008 and Cocks et al., 2009) describe similar constraints when applying this methodology to identifying livestock movement pathways. Some degree of modification was also used in these studies. Despite these limitations, each of the studies previously conducted were able to generate useful detail about livestock trading patterns by applying this methodology.

Interview technique

All national consultants were briefed on the checklist used as a basis for semi-structured interviews conducted under a previous study in the region (Cocks et al., 2009) and the checklist was modified

according to comments made by the national consultants for the current study. The final checklist is provided in Appendix 1.

The semi-structured interview technique was considered applicable to this study as it allows probing of answers in order to gather more detail on specific subjects, particularly useful when gathering information about market chains and pathways of livestock movements. It also provides a more relaxed, discussion type approach to gathering information rather than a structured interview which can appear more formal. However, some national consultants considered that semi-structured interview would not be suitable for use in their country and requested putting the questions into a questionnaire format.

In addition to the semi-structured interview designed for gathering data from stakeholders in the livestock trade industry, the study also involved gathering information and opinions from other people with knowledge of the livestock trade industry, such as local veterinary officers and border staff. This not only helped to triangulate information gathered from traders but it also provided a useful overview of livestock trade and regulatory details in certain areas.

Some official information has also been used to inform parts of the study, such as official livestock population figures, or volume of cattle traded through markets, etc. However, given that official information may be incomplete or inaccurate, where possible this information was further validated during interviews.

Constraints

A number of constraints were identified in this study. Most notable is that the study focuses on cross border livestock trade, the vast majority of which occurs unofficially. Therefore, by definition, there is minimal official data available and that which does exist may be incomplete or inaccurate. Therefore, the results of the survey rely heavily on oral information given by individuals. Confidence in the results can be improved through triangulation, but it is important to note that the results of the study are composed from information shared by individuals and based on individual opinions and therefore is subject to bias.

In some countries, the national consultants were either government employees themselves or were accompanied by government employees which could cause reluctance of individuals to share sensitive information about their business, particularly where unofficial trading was taking place. However, it was noted in the study conducted in Vietnam and personal observation by the author in China, that traders appeared to speak quite openly about cross-border trade of livestock, indicating that while still not officially recognised, there may be growing acceptance that it does occur, at least in some countries.

Despite the limitations noted above, the approach used in this study has been used previously and yielded useful results. Given the limited time and minimal official information available, it is important to work within these constraints rather than being prevented from conducting studies such as these in order to expand knowledge of this important issue.

Results

The results are presented on a per-country basis for the five participating countries in this study: China; Lao PDR; Myanmar; Thailand; and Vietnam. The combined information will then be presented and discussed prior to drawing conclusions. Given that similar studies were conducted in the region in 2008 (Cocks *et al.*, 2008) and 2009 (Cocks *et al.*, 2009), some of the major changes observed between the results of the previous study and the current study will be highlighted. All monetary information

has been converted to USD in order to standardise the data. Unless stated otherwise, the currency conversion is based on the exchange rate on the 17th August, 2015.

China

As a major market for large ruminants in the GMS, China has become a destination for cattle and buffalo moving throughout the region. This study focused on the cross border trade of livestock destined for China. The field work conducted in China focused on movement across the Myanmar-China border. However, further information about livestock movements into China was gathered during surveys in neighbouring countries.

Movement pathways

The major movement pathways described by this study include movement from Myanmar to China, from Lao PDR to China and from Vietnam to China. This component of the study focuses predominantly on the former pathway with the other movements described under the Lao PDR and Vietnam sections of the study, respectively.

Movement from Myanmar into China

The entry points for large ruminants entering China directly from Myanmar cross at Jinghong, Menglian and Menghai Counties. Further north there is movement from Mandalay in Myanmar, through Lashio to Muse, from where large ruminants cross the border to Ruili in China. There is also a border crossing further north of Muse which is located in Myitkyina in Kachin State of Myanmar. These border crossing points and the volume of animals estimated to cross at each point annually is illustrated in figure 2.



Figure 2: A map showing the major border crossing points between Myanmar and China and Lao PDR and China. The estimated annual volume of large ruminants crossing each point is indicated. The year in brackets is the date when the estimations were made (hence those estimated in 2011 may have since changed) (source of base map: Google Earth)

During a study conducted in January, 2015 local veterinary officers from Mengla, Jinghong and Menglian Counties were interviewed along with livestock traders operating in Menglong town of Jinghong City. The field work conducted in this part of the study focused on movement into Jinghong

from Myanmar and movement from Lao PDR to Mengla. A previous study conducted in the region in 2011 (Huachun *et al.*, 2011) also provides an insight into movement from Myanmar into Menglian and Ruili (although there may have been changes in this movement over the past four years). An additional field study was conducted in March, 2015 which examined movement into China at Muse-Ruili border crossing and at the crossing linking Myitkyina in Myanmar with Yingjiang and Lonchuan Counties in China. All these border crossing areas are described in greater detail in the following section.

Myanmar to Menglian

This area could not be included in the current study due to time constraints but was visited in 2011 by Huachun *et al.*, (2011) and again in 2013 by the same team. High volume movement of large ruminants from Menglian, through Lancang, destined for other areas of China was described. During this study, they described that approximately 30 lorries (each carrying approximately 20 cattle) would pass through Lancang daily. This trade was active from September to March, with only few lorries believed to move through this area between April and August. Even if there was no movement from April to August, this would still amount to just over 126,000 head of large ruminants entering China from Myanmar at this crossing point each year. These animals were believed to have come from Myanmar, across the border at Meng Xin and then gathered in Mengma Town of Menglian County. They were then moved through Menglian and transported to Lancang, before moving throughout China.

It was not possible to visit this area again for the current study, but when discussed with local veterinary officers during the current study, they believed that this trade remains active. However, the volume of livestock moving through this area in 2015 was not known.

According to Huachun *et al.*, 2011 there is a large market on the outskirts of Menglian where many cattle are aggregated after crossing the border. From here they are moved either for slaughter or to areas to be fattened. It appears that all transactions take place between large traders in each country and then the large traders employ collectors and local people to walk animals over the border. There appears to be a large profit margin for traders bringing animals into China from Myanmar. In 2011, the local price in Myanmar was CNY 2000 (USD 303 according to exchange rate on 1/1/11) per head. In the border area of Yunnan Province, the cattle could be sold for CNY 5000 (USD 750) per head and when moved to Kunming or other cities, cattle could sell for up to CNY 7000 (USD 1060). While it is likely that the price per head for cattle has increased since 2011, given the sharp increase in price of beef in China, these figures provide an indication of the high profits available when moving cattle across the border from Myanmar to China. The animals seen in Menglian were believed to be mainly from India, Myanmar and Thailand. During the current study, veterinary officers confirmed that movement from Kengtong area of Myanmar continues to occur into Menglian, though numbers of animals were not available. However, there is a cattle market in Menglian where 400-500 animals are traded weekly (26,000 head per year).

The large-scale Chinese traders generally make contact with large-scale traders in Myanmar and will often travel to Myanmar to see cattle and buffalo before purchasing them. It was not clear during this study where the actual transaction took place.

Myanmar to Monghai

Daluo, in Monghai County is also believed to be a busy crossing area between Myanmar and China and in 2011 there were understood to be ten large traders operating in this area. While there were no estimates on the number of animals crossing here, there is a market in Daluo which, in 2011, traded approximately 500 head of large ruminants each week. However, some animals moved directly from the border area to traders' premises, and so may not have passed through the market.

Myanmar to Jinghong

The current study identified an active movement pathway between Chiang Rai in Thailand and Menglong in Jinghong City of Yunnan Province, China. The large ruminants are moved by boat up the Mekong River from Chiang Saen in Chiang Rai to Soley Port in Myanmar (figure 3). From here, cattle are unloaded from boats and gathered in Myanmar ready to cross the border. They are collected by locals in groups of 100-200 before crossing. One of the traders estimated that 1000 head per day enter China via this route (approximately 365,000 head per year). It is understood that Chinese traders visit Thailand to select animals but as they cannot purchase the animals within Thailand, Thai traders must buy cattle in the Thai markets and then transport them to the border area in Chiang Rai, at which point they are sold to the Chinese trader. The Chinese trader arranges movement into China and will then sell on to traders in other areas of China. When asked about the source of these animals, the Chinese trader explained that the main source of large ruminants travelling by this route originate in Myanmar or from India/Bangladesh. He had heard that mainly buffalo are transported from India by boat to Mawlamyine Port in Myanmar. The Chinese trader believed that this movement was arranged by traders in Myanmar and is believed to have started in the last 3-5 years.

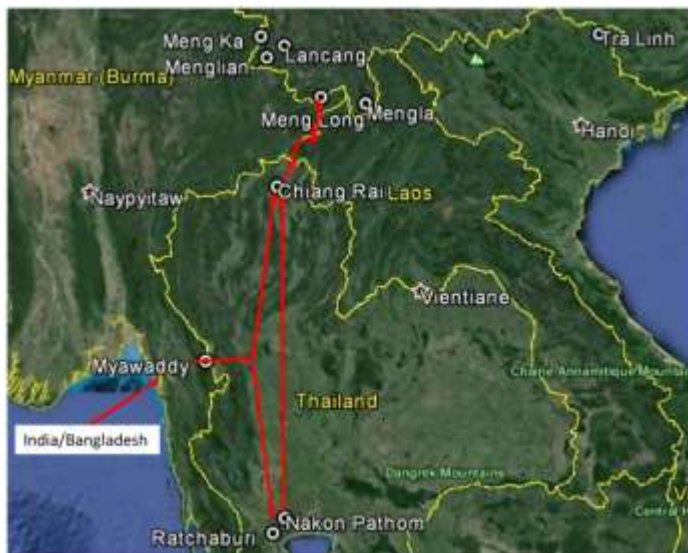


Figure 3: Movement pathway described by Chinese traders in Jinghong for cattle moving into Menglong in Jinghong

The interviewed Chinese traders described that from Myanmar, cattle and buffalo travel to Myawaddy, Myanmar (arranged by Myanmar traders) and then they cross the border to Mae Sot in Thailand. Once in Mae Sot, it was explained that most animals will move through a large livestock market believed to trade 5000 head of cattle and buffalo per market session, with two market sessions each week (520,000 head per year). The figures collected in Thailand suggest that the market volume may be as much as 100,000 cattle per month (25,000 head per week). Chinese and Vietnamese traders will attend this market to select animals but they will not take ownership until the animals leave Thailand. From Mae Sot market some animals will be moved directly to Chiang Rai, destined for the border area, while others will be moved to farms in Nakhon Pathom or Ratchaburi (possibly other Provinces in western and central Thailand) to be fattened. This area is known to have a ready supply of crop bi-products which are utilised as animal feed. One of the traders mentioned a farm in this area of Thailand with capacity for 40,000 head of cattle/buffalo. However, this could not be verified and the Lao PDR component of the study described farms in this area as having a capacity of up to 3000 to 7000 head. Once fattened, the animals are moved up to Chiang Rai, destined for cross-border movement.

The movement pathway and market chain from Myanmar, India or Bangladesh to Menglong in China, as described by a Chinese livestock trader, is illustrated in figure 4:

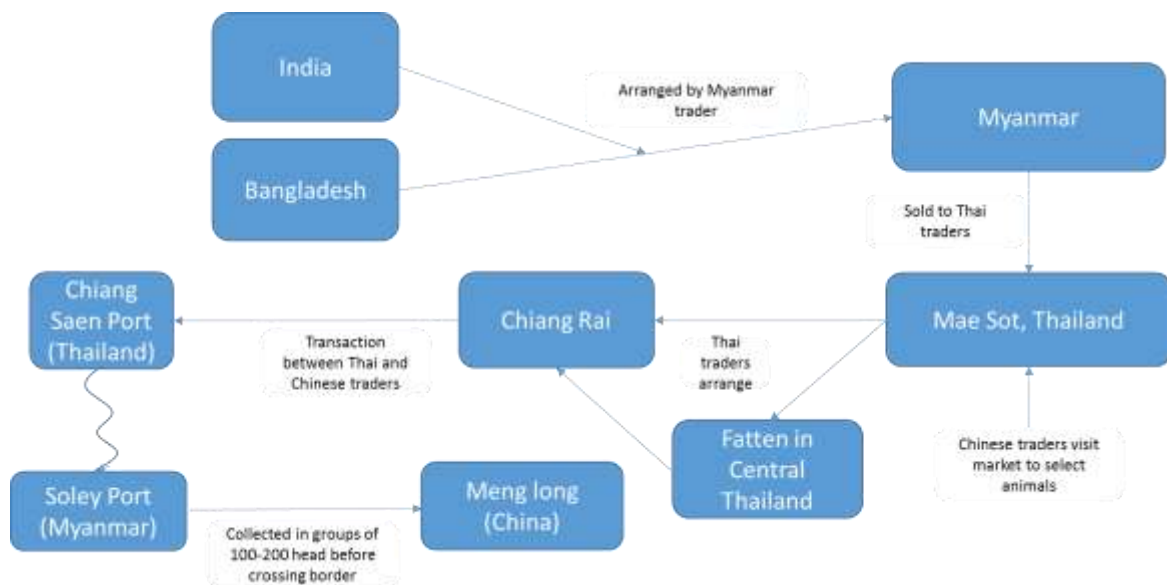


Figure 4: The movement pathway and market chain from Myanmar, India or Bangladesh to Meng Long in China, as described by a Chinese livestock trader

Myanmar to Ruili

The border crossing between Muse in Myanmar and Ruili in China has been an active crossing point for large ruminants for many years. According to information gathered during a field study conducted in March, 2015 approximately 200,000 head of cattle enter Ruili County each year. A trader interviewed at a cattle market in Mangshi, Yunnan Province in March 2015, stated that cattle and buffalo which crossed the border in this area were purchased by Chinese traders for CNY 4000 (USD 630) to CNY 6000 (USD 940) (depending on the weight of the animal) in Mandalay, Myanmar. Local people were then employed to transport the cattle to the China border. The cost for transportation is around CNY 3000 (USD 470) per head. This would mean that cattle could cost up to approximately USD 1400 on arrival in China (including transport) but with selling prices described in Jinghong as approximately USD 2000 per head, there is still significant profit to be made despite the high cost of transportation.

Myanmar to Yingjiang/Lonchuan

During the study conducted in March, 2015 a trader described how cattle and buffalo from Mandalay were transported to Myitkyina in Kachin State of Myanmar by train and then moved to Yingjiang and Longchuan Counties in China. 50,000 to 100,000 head per year are estimated to cross in the Myitkyina area. During this visit, traders also described that Indian cattle and buffalo from Ledo in the Indian-Myanmar border area may also come to Myitkyina (figure 5). However, the actual pathways and number of cattle being moved by this route requires further clarification. It may be significant that there have been moves to renovate sections of the Ledo, or Stilwell, Road which links Ledo in India, Myitkyina in Myanmar and Kunming in China, in recent years (BBC, 2011) (figure 6).

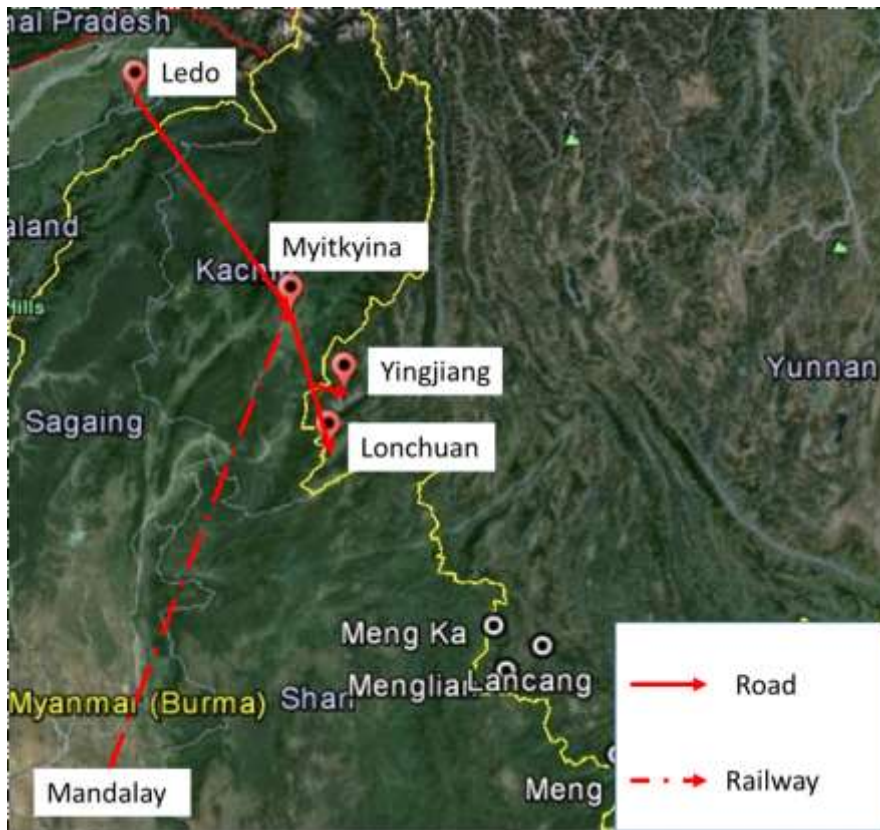


Figure 5: Map indicating the route taken by large ruminants to the Chinese border near Yingjian and Lonchuan (source of base map: Google Earth)



Figure 6: The route of the Ledo Road (otherwise known as Stilwell Road) which links India, Northern Myanmar and Yunnan Province of China (map source: Asia Times)

Movement from Lao PDR to China

A pathway described by other parts of the study outlined movement from Chiang Rai to Bokeo and Luang Namphtha Provinces in Lao PDR and then over the border at the Boten/Mohan crossing area into Meng La in China. This was mentioned by traders in China and by the study conducted by Huachun *et al.*, 2011. It was estimated by local veterinary officers in China that 50,000 to 80,000 head of cattle

per year enter via the Boten-Mohan border crossing, estimates provided during the Lao PDR study estimate similar figures in the region of 58,000 head of cattle taking this route each year. This route is outlined in greater detail under the results from the Lao PDR study.

Regulatory information

All cross-border movement of large ruminants from neighbouring countries into China is unofficial. China's regulations prohibit import of cattle and buffalo from FMD-affected countries. However, during discussions with livestock traders and local veterinary officers in China, they spoke quite openly about the trade and acknowledged that this trade occurs. There has been discussion regarding establishing zones in the border areas within China, in order to control further movement of livestock within China. Livestock in such zones would be prohibited to move beyond the zone, and would be slaughtered before being moved throughout China as product. However, even if this was successful in reducing the spread of FMD into China, the movement of livestock towards China still presents a risk to the border areas of China as well as to the countries through which these animals transit.

One trader described that, due to the unofficial nature of cross-border movement in China, he is forced to use a small truck to carry only six head of cattle/buffalo along small roads in order to move them from the unofficial border crossing. The trader must pay several unofficial fees during this journey and make many more journeys than necessary due to the small size of the truck. He felt that his business would benefit financially if the movement were legalised, even if he had to pay official fees to import livestock.

Lao PDR

The fieldwork conducted in Lao PDR focused on the movement of large ruminants to China from the two northern Provinces of Luang Namtha and Bokeo, and provided some description of domestic cattle movement within Lao PDR and movement from Lao PDR to Vietnam.

Movement pathways

According to Phonvisay (2013), three main trade movements were identified for live cattle in Lao PDR: (i) trade between districts within a Province (mostly from remote districts to the capital district of the Province); (ii) trade between Provinces (mostly from the low demand Provinces to Vientiane); and (iii) cross-border trade. These channels have been largely shaped by the trade rules and regulations imposed by the provincial and district authorities in Lao PDR.

Overall, transboundary trade movement of large ruminants using Lao PDR as a transit, and from Lao PDR to neighbouring countries can be categorized into five main channels: local large ruminant movement from Lao PDR to China; local large ruminant movement from Xieng Khouang to Vietnam; importation of cattle from Thailand into Vientiane Capital, Champasak and Savannakhet Provinces; Transit of large ruminants from Thailand to Vietnam through the southern Provinces of Lao PDR; and transit of large ruminants from Thailand to China through the north-western Provinces of Lao PDR.

There are two main markets for transboundary trade of local large ruminants from Lao PDR: via Xieng Khouang Province into Vietnam (since early 2000s); and via Luang Namtha Province into China (since 2009). These trades have not been formally recognized by the two destination countries, and the trade volumes fluctuate during the year, being greatest leading up to the Chinese/Vietnamese New Year. High demand for beef in the domestic markets and live breeding cattle for farm enterprises in Vientiane Capital, Champasak and Savannakhet Provinces have recently led to increasing importation of live cattle from Thailand.

The various trade pathways are described in more detail below.

Local large ruminant movement from Lao PDR to China

There is an increasing trend towards trading large ruminants, especially buffalo, from Cambodia and southern Lao Provinces, to Luang Namtha Province in Lao PDR and then informally to China. According to local traders interviewed in Champasak Province, livestock traders from Vientiane with connection to Luang Namtha went to source large ruminants from the southern Provinces. These traders had official documentation for animal movement which indicated the final destination as Luang Namtha Province. It is expected that the animals would be unofficially transported to China after arriving in Luang Namtha.

Local traders operate this trading route, and source the animals from the Cambodian-Lao border area to Luang Namtha Province and then informally to China. These traders also sourced animals from other northern Provinces such as Xieng Khouang, Luang Prabang and Houaphan to sell through the same route. This movement pathway is summarized in Figure 7.

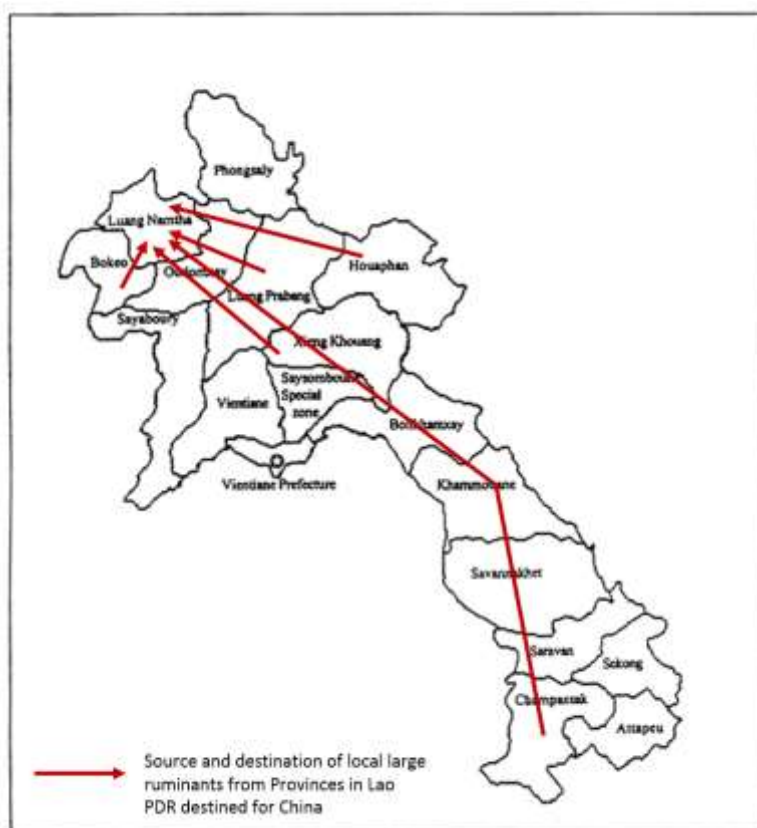


Figure 7: A map indicating the source and destination of local large ruminant trade from Lao PDR, destined for China via Luang Namtha Province (map source: <http://www.fao.org/docrep/004/ac146e/AC146E01.gif>).

Interviewed traders explained that there is unofficial trade in large ruminants from Bokeo Province to Luang Namtha Province prior to cross border movement into China. Trade of large ruminants out of Bokeo Province (either to other Provinces or for export) has not been permitted by the Lao Government since 2009 due to depletion of animal stocks resulting from the strong inter-provincial and international trade since the early 2000s. The interviewed local traders and livestock officers in Bokeo suggested that local cattle in the Province may be smuggled into China through a place near the Boten border check-point (in Luang Namtha Province). They estimated that 20% of the total large ruminants traded in the Province were informally traded to China. This is equivalent to approximately 2,400 head per year.

Based on a previous study in Xieng Khouang Province in December 2014 (personal communication, Phonvisay, 2014) traders in Xieng Khouang Province also sourced large ruminants, particularly buffalo, from within the Province and the near-by Provinces to sell to China through the informal route near the Boten border check-point of Luang Namtha Province. Document fees for movement of large ruminants from Xieng Khouang to Luang Namtha cost 6-7 million Kip (USD 740 – 870) per truck. One truck can transport up to 30 buffalo (or 40-45 local cattle). The interviewed trader in Xieng Khouang estimated that about 1 truck per week was transported to Luang Namtha and then China. This equals 2,080 large ruminants per year. This trade is believed to have started one to two years ago.

The trader in Xieng Khouang also estimated that about 5 trucks of large ruminants per month were sold to Vietnam. For Chinese New Year in February, almost 20 truck-loads were transported to Vietnam. Overall, about 3,000 head of large ruminants per year were traded to Vietnam.

Local large ruminant movement from Xieng Khouang to Vietnam

Most large ruminants are exported to Vietnam from Lao PDR unofficially. The animals are generally moved to Nong Het district, which borders Vietnam, and then cross through unofficial border points. The traders in Xieng Khouang Province source animals, to a greater extent (estimated 80% to 90% of exported cattle) from neighbouring Provinces of Luang Prabang, Sayabouly, and Vientiane, or from southern Provinces of Saravan, Savannakhet and Khammouan. Vientiane capital is an important transaction point in the supply chain for large ruminants moving to Xieng Khouang. Cattle are purchased in the southern Provinces by collectors who then sell to traders from Xieng Khouang. These movements are illustrated in figure 8.

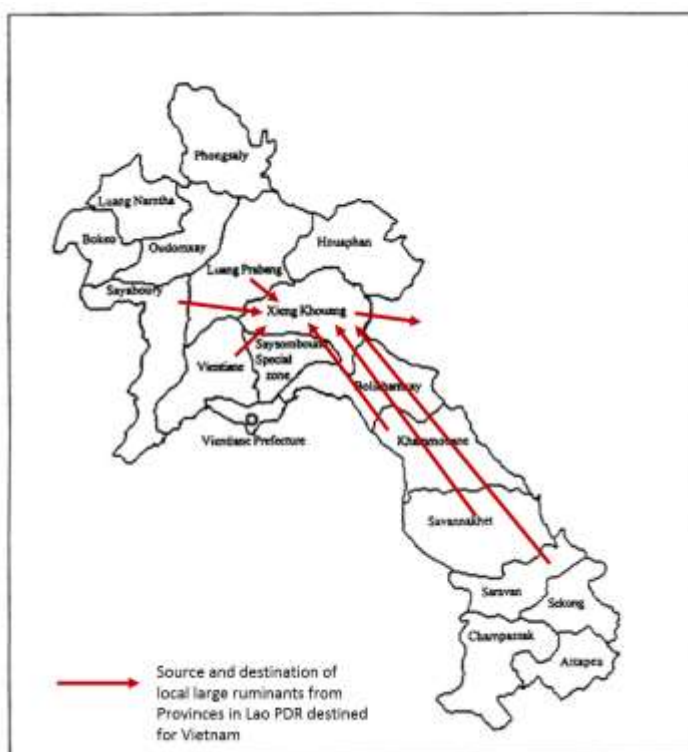


Figure 8: A map indicating the source and destination of local large ruminant trade from Lao PDR, destined for Vietnam via Xieng Khouang Province (background map source: <http://www.fao.org/docrep/004/ac146e/AC146E01.gif>).

Importation of cattle from Thailand into Vientiane Capital, Champasak and Savannakhet Provinces

The license, or quota, for importation from Thailand has often permitted import of large ruminants for consumption within Vientiane Capital, Champasak and Savannakhet Provinces. The traders

operating this movement hope to gain future permission to expand their trade to supply Vietnam. They negotiated the importation with the provincial authorities by acquiring quotas. Thai traders generally facilitate all sale documents and transport large ruminants (particularly cattle) to the Lao-Thai border while Lao traders select the animals and send them to slaughterhouses within Lao PDR.

Due to the significant increase in beef prices in Lao PDR over the last few years, there is an increasing demand for live breeding cows (e.g. white Brahman) from Thailand to supply emerging farm enterprises within Lao PDR. Although the Thai authority stipulate that only cattle destined for slaughter are allowed for export, there is evidence that breeding cows from Thailand are being used in many Lao farms.

Transit of large ruminants from Thailand to Vietnam through the southern Provinces of Lao PDR

There is an officially recognized movement of livestock from Thailand to Vietnam, which transits through the southern Provinces of Lao PDR, particularly Savannakhet Province, and recently Khammouan Province (see figure 9). There is no movement reported through Bolikhamxay Province, despite having borders with both Thailand and Vietnam. Veterinary officers interviewed in the region believe this was due to the lack of bridge in this area.

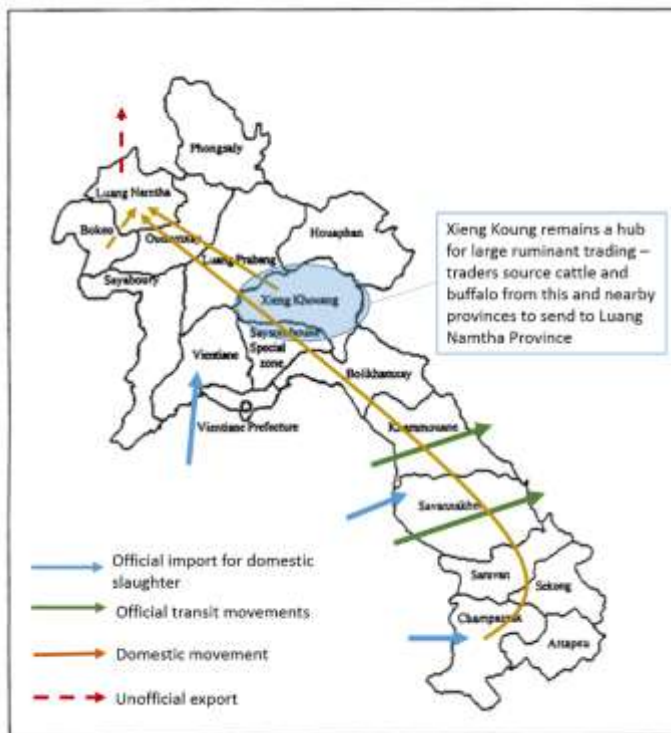


Figure 9: Map showing the main official transit routes through Lao PDR; official importation of livestock for slaughter and domestic movement of cattle and buffalo destined for China.

Most animals being transited through Lao PDR follow officially recognized pathways, but the number of animals being moved is generally underreported by the companies facilitating the movement and by the officials responsible for checking the animals, certification and collecting taxes. The cattle move through three main border gates, including: Na Phao - Cha Lo gate (between Khammouan Province in Lao PDR and Quang Binh Province in Vietnam), Densavan-Lao Bao gate (between Savannakhet Province in Lao PDR and Quang Tri Province in Vietnam), and Phou Kheau-Bo Y border (between Attapeu Province in Lao PDR and Kon Tum Province in Vietnam).

According to the official statistics of the Provincial Agriculture and Forestry Office (PAFO) of Savannakhet Province in 2014, there were 3,125 large ruminants from Thailand traded to Vietnam via Savannakhet. The provincial authority also recognized that 172 local cattle and 150 buffalo from the Province were sold to Vietnam in 2014 (PAFO Savannakhet 2014).

Thai cattle have also been sold to Vietnam via Khammouan Province. Based on the transit data from PAFO Khammouan from October 2014 to June 2015, 31,831 large ruminants from Thailand were sold to Vietnam using the Khammouan route with the total value of USD 7.5 million. This equals to 118 large ruminants traded per day. The average weight of cattle is 262 kg while the average weight of buffalo is 320 kg. The average values per cattle and buffalo are USD 235 and USD 242, respectively

Transit of large ruminants from Thailand to China through the north-western Provinces of Lao PDR

One of the major routes from other GMS countries into China is through north-western Provinces of Lao PDR, namely Bokeo and Luang Namtha. From the study conducted in this area, it was estimated that 160 head of cattle and buffalo per day or 58,000 head in 2014 were transited from Thailand to China via this route. Cattle and buffalo entering this trade pathway reportedly come from various sources including Malaysia, Myanmar, Bangladesh and India.

Large ruminants which enter Lao PDR from Chiang Rai in Thailand are sourced from Malaysia, southern areas of Thailand, Tak Province of Thailand, Myanmar, Bangladesh and India. Indigenous cattle and buffalo (e.g. from Bangladesh and Myanmar) are sourced and transported directly to China, via Chiang Rai in Thailand, to Bokeo Province in Lao PDR, then to Luang Namtha Province from where they cross into China at the Boten-Mo Han border crossing.

Cross-breed cattle (Brahman, Hindu Brazil, Charolais) from Malaysia and Tak Province in Thailand (entry point from Myanmar) are generally transported to quarantine and fattening farms near Bangkok, where they remain for approximately three months before being moved to Chiang Rai and then taking the same route to China as described above. This information supports that found during the study in China, where similar sources of livestock and pathways were described.

According to interviewed traders in Lao PDR, each of the fattening farms near Bangkok has capacity for up to 3000-7000 head of cattle/buffalo and animals are held there for approximately three months. As described under the China and Thailand components of the study, this area is used for fattening large ruminants due to availability of animal feed (crop bi-products). The interviewed trading companies in Lao PDR have a trading network with three Chinese-Malaysian businessmen who live in Bangkok and run several cattle fattening farms (figure 10). These businessmen also source the animals from Bangladesh and India using cargo ships. The businessmen in Bangkok and the traders in India/Bangladesh are said to know each other through Muslim trading connections. The cargo ships from India and Bangladesh are believed to travel directly into Thailand but the port of entry is not known.

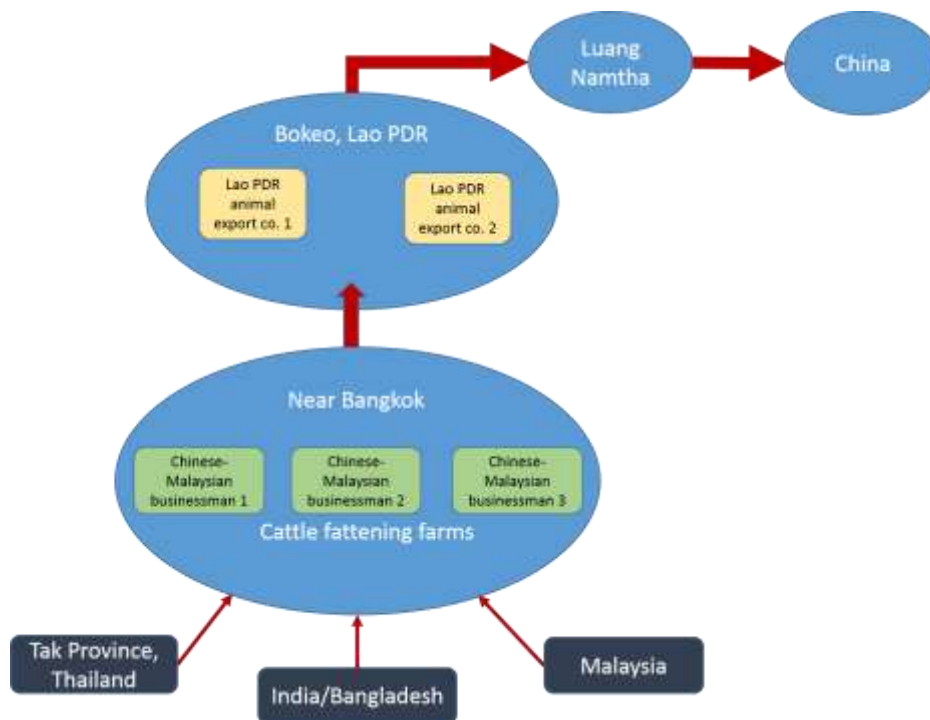


Figure 10: market chain for cattle moving through Lao PDR destined for China

As well as the animals transiting from Chiang Rai Province (Thailand) to China via north-west Provinces of Lao PDR, fattened cattle are also traded from the fattening farms near Bangkok, through Mukdahan Province (Thailand) to Savannakhet Province (Lao PDR) and then on to Vietnam. When they reach Vietnam, some are transported by road to Guangxi Province (China). These movements are summarized in figure 11.



Figure 11: map showing the source and movement of animals which transit through Luang Namtha destined for China (source of base map: Google Earth).

A trader interviewed in Lao PDR described that some Malaysian traders had attempted to ship cattle directly from Malaysia to China. The voyage takes about two weeks and in many cases, this route is less profitable due to high transaction costs including shipping (at least 5,000-7,000 head per ship and shipping costs THB 8 million (USD 225,000 per trip or USD 32 to 45 per head), and cost of quarantining at Ka Jung Port (Guangxi) at CNY 800 (USD 130) per animal. Furthermore, the cattle are not fattened enough if they are shipped directly from Malaysia to China. Therefore, many international traders will use Thailand as a quarantine and fattening area before the animals are sold to their final destination. The fattened animals in Thailand are also sold at local markets in Thailand as well as at regional markets in Lao PDR, Vietnam and Cambodia as breeders or for slaughter.

There are two main routes by which large ruminants are moved to China through northern Lao PDR: A road channel and a river channel (figure 12).



Figure 12: A map indicating the approximate routes taken from Thailand to China, through the northern Provinces of Lao PDR (source of base map: Google Earth)

The road channel from Chiang Rai Province (Thailand), through Bokeo Province and Luang Namtha Province to the Chinese Border.

Two Lao companies based in Bokeo Province were interviewed. These companies have a business licence to provide a logistic service to transport animals from Bokeo Province to the Boten border check-point with China in Luang Namtha Province. Each company agrees to rotationally provide the transportation service on alternate days. The companies have operated this business since 2009.

A livestock trader (Chinese but using a Lao name) sources large ruminants from Thailand and uses the transport companies (described above) to transport the animals and to assist the trader in sourcing animals from Thailand. Over the last six months, Livestock and Fisheries Division of Bokeo Province recorded the transit of 20,946 cattle and 7,738 buffalo from Thailand to the Boten border check-point. This is equivalent to almost 160 head of large ruminants per day (73% cattle, 27% buffalo) or 58,000 head per year. The Provincial Finance Office in Bokeo Province charged USD 15 per head of cattle and USD 20 per head of buffalo. This equals USD 2,600 per day or USD 951,000 per year. The two companies also paid tax of 2-3 billion Kip per year (USD 250,000 – 370,000) with 1% profit tax (150-200 million Kip or USD 18,600 – 24,800).

At the international border checkpoint of Chiang Rai-Bokeo on the Thai-Lao PDR border, transportation of animals by truck through the border is not permitted due to hygiene concerns. Therefore, near the border check point, the animals are loaded into boats to cross the Mekong River.

The animals are normally loaded into trucks in Bokeo in the afternoon and then arrive near the Boten border check-point on the Lao PDR-China border around 6am the following morning. Approximately 500 metres from the Boten border check-point, there is a field where the animals are unloaded (figure 13). Around 20-30 local people per day provide a service for walking the animals into Mengla District in China. A fee of CNY 100 (USD 16) per 3 animals is paid to the local people who take animals over

the border. It takes about 2 hours to reach a field in China where the animals are loaded into trucks destined for a quarantine site approximately 5-10 km away.



Figure 13: Photograph showing one of the routes by which large ruminants are walked over the border to China near the Boten border check point. The motorbikes in the picture belong to local people who walked animals over the border that morning

The river channel from Chiang Rai Province (Thailand) to China.

The river channel is used by Thai and Chinese traders, but using Lao boats to transport large ruminants to the Chinese border. Thai boats do not operate in this river route. According to the interviewed livestock officer, this trading route started in 2008.

Initially, the animals are transported by the same route as the road channel from Chiang Saen to Bokeo Province in Lao PDR. Once in Bokeo Province, the river transit starts from the local river border check-point at Mom Village in Ton Pheung District of Bokeo Province to Xieng Kob (the local river border-check-point) at Sing District of Luang Namtha Province, and then to Sob Lauy (the local river border-check-point) in Mengla District in Yunnan Province, China (figure 12). It takes about two days to reach the destination. One Lao boat can carry up to 60 head of large ruminants. The boat operator receives transportation fees of THB 35,000 (approximately USD 980 per trip).

The livestock officer at Mom Village in Ton Pheung District estimated that about 1,000 head of large ruminants per week were transported to China from August to February (i.e. 7 months). From March to July, the trade dropped to 500-600 head per month. This equals to about 39,000 head of large ruminants per year which may be traded through this river channel. Similarly, the interviewed traders of the two companies in Bokeo Province estimated that about 100 head of large ruminants per day were transported to the river channel. This equals to 36,000 head per year. The similarity of the two estimates provides useful triangulation of this data.

The Lao transportation companies in Bokeo Province explained that they have requested the provincial government to control the river trading channel because the Thai-Chinese traders using this route do not pay tax, in contrast to companies that transport the animals by road.

Regulatory information

Inter-provincial and trans-boundary trade requires movement permits consisting of documents obtained from different offices against the payment of fees and taxes. Taxes are variable (per head), while fees are fixed (per set of documents). Moving animals in larger groups thus helps reduce permit costs. The latter vary between districts. Taxes and fees are collected by respective District Agriculture and Forestry Offices.

For those animals transiting from Thailand to Vietnam, and for those passing from Chiang Rai, Thailand into Lao PDR, all legal procedures and documents for quarantine and fattening are approved by the Department of Livestock Development in Bangkok.

Exportation of large ruminants from Bokeo Province is no longer permitted. This ban was implemented in response to increased trade of large ruminants out of the northern Provinces of Lao PDR in recent years and is due to depletion of large ruminant stocks in the Province. However, it is understood that animals continue to move out of the Province unofficially.

Myanmar

Myanmar is a critical point in the pathway of livestock movement, representing a source of large ruminants from its large domestic population of cattle and buffalo. Myanmar is also a potential gateway for movement of livestock from outside the region (namely India and Bangladesh) to the rest of South-East Asia. There is both risk and opportunity in this situation, in that there is a high risk of transboundary diseases moving into Myanmar from outside the region, if livestock enter from other countries, and also a risk that diseases will spread from Myanmar to other GMS countries given the high volumes of livestock now moving from Myanmar to neighbouring countries. There is opportunity in the fact that improvements in FMD control in this area has the potential to significantly reduce the risk of FMD entering the trade pathways destined for China.

Movement pathways

The study conducted in Myanmar described large numbers of smaller traders operating at various livestock markets throughout Central Myanmar. Large-scale traders were not identified during the study in Myanmar and, although interviewed traders described pathways leading to border areas with China and Thailand, the traders involved in those movements could not be identified. However, the existence of large-scale traders operating in Myanmar was described by traders in other parts of the current study. Given that the cross-border movement of livestock from Myanmar to Thailand and from Myanmar to China is not officially recognised in Myanmar, it is a highly sensitive subject and thus difficult to obtain information about these movements. There little information available on the volume of livestock movements in Myanmar, which is likely due to reluctance of those involved in the trade to disclose details of the number of animals moving. However, some detailed information on livestock movement pathways was provided during the interviews conducted in Myanmar.

During the study conducted in China, traders mentioned that cattle and buffalo were entering Myanmar from Bangladesh and India. During the study in Myanmar, some information was found to validate these comments. It was described that some cattle and buffalo moved from both India and Bangladesh into Rakhine State of Myanmar, and then south towards Ayeyarwady and Yangon Divisions. In addition to this specific information, it was also noted during the study that there was an increased volume of cattle and buffalo movement from western areas of Myanmar into Central Myanmar. This movement may indicate a new source of cattle entering Myanmar from the west. The most likely route for large ruminants moving from Myanmar to China is believed to be from the livestock markets in Central Myanmar to the Thai border crossings at Myawaddy/Mae Sot and, to a

lesser extent, Three Pagodas Pass/Kanchanaburi. This supports information provided by the studies conducted in China and Thailand.

Movement through Mon State to Thailand

The study team in Myanmar visited Mawlamyine Port area in Mon State to investigate information provided from Chinese traders about large ruminants from India and Bangladesh entering this area by boat before transiting to the Myawaddy-Mae Sot border crossing. During the visit to this area, boats carrying large ruminants were identified. The boats were identified as coming from Yangon Division and Ayeyarwady Delta area in Myanmar (figure 14).

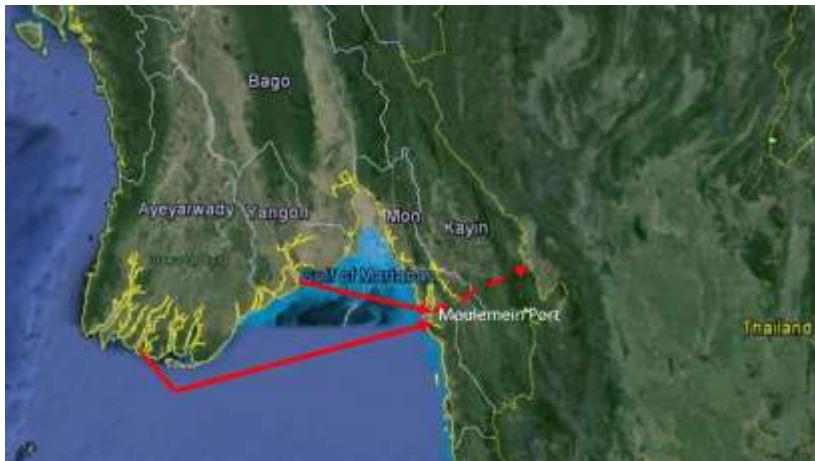


Figure 14: Map showing movement pathways of livestock from Yangon and Ayeyarwady Divisions to Mawlamyine Port (solid arrows) and the suspected onward movement to the Myawaddy-Mae Sot border crossing (dotted arrow) (source of base map: Google Earth).

Although the boats destined for Mawlamyine Port and the surrounding area set out from Ayeyarwady and Yangon Divisions, some information gathered during the study indicated that animals originated from further afield, including: India or Bangladesh, Central Myanmar or Bago Division of Myanmar.

A movement pathway was described whereby cattle are moved from Rakhine State by foot or by boat to Ayeyarwady Division. The movement by foot takes approximately 2-3 days along mountain paths. Once in Ayeyarwady, the cattle are moved by boat to Mon State, close to Mawlamyine. From Mon State, Cattle and buffalo are moved to Kayin State which borders Thailand. In most cases, the large ruminants will cross into Thailand close to the Myawaddy-Mae Sot border crossing or the Three-Pagoda's Pass-Kanchanaburi crossing. The movement of animals from Rakhine State to Ayeyarwady Division is believed to include animals which have entered Rakhine State from India or Bangladesh. This information, therefore corroborates that provided by Chinese traders that some animals arriving in Mawlamyine originate from India or Bangladesh. However, the volume of animals entering by this route is not known.

During interviews conducted in Mon State, detailed information was collected on movement pathways from Yangon Division, through Mon State and into Kayin State before onward movement to the Thai border. The main movement pathways described are illustrated in figure 15.



Figure 15: A map showing the major movement pathways from Central Myanmar and Bago to the border between Kayin State in Myanmar and Thailand. The general movement between different locations are described in this map, but there are many routes by which animals will move between the places described (source of base map: Google Earth).

The movement of livestock through Mon State and Kayin State are largely controlled by local people in these areas, and a number of villages along the movement routes (such as Bilin, Kawkreik and others) have a large number of local residents involved in trading of livestock. The information presented here is a summary of details provided from a number of interviews conducted in Mon State, specifically in Mawlamyine and Bilin.

Large ruminants are brought from Central Myanmar and Bago livestock markets to Yangon. Many of these animals will be transported to Yangon with licenses which state that they are intended for slaughter in Yangon City. However, the animals are collected in areas south of Yangon City in preparation for being shipped across the Gulf of Martaban to Mon State. Interviewees described that there are a number of routes which may be taken across the Gulf depending on the location of security efforts at the time of the movement. Each boat carries approximately 25 large ruminants, but the number of boats crossing this area was not known. The most common destinations by boat are Thaton, Mawlamyine and Mudon in Mon State. From here, animals are moved east through Hlaingbwe or Kawkreik to Myawaddy, where they pass into Thailand. Alternatively, some animals will move from Mudon and then travel south-east to the Three-Pagoda Pass which borders Kanchanaburi Province of Thailand. Although these are the major pathways described from Mawlamyine to the Thai border, 22 different routes were described and the movement may take place on foot, by truck or by boat.

There are also livestock movements from Central Myanmar and Yangon to Mon State by road (not involving crossing the Gulf of Marbaton). In general, this involves movement of animals from Central

Myanmar (Sagaing, Mandalay and Magwe Divisions) as well as Bago Division, to Mon State, through Kayin State to the Thai border. A number of different routes were described, the details of which are as follows (the pathways described here are also illustrated in figure 15):

- A movement pathway for large ruminants from Yangon to Myawaddy was described. Some of the movements by truck along this route involve people from near the border with India and some of the animals are believed to originate from India (moved via Rakhine State to Yangon). It was described here that cattle could be moved from India to Rakhine State by vehicle, but there was no information about how the onward movement to Yangon took place. An estimate of the volume of movement from Yangon to Myawaddy was approximately 1000 head per month. However, it was not clear what proportion of these animals originated from within Myanmar, compared to those originating from India. The movement of cattle from Yangon to Myawaddy by truck was said to cost approximately 65,000 Kyat (USD 50) per 2 head of cattle.
- Movement of cattle and buffalo by truck from Sagaing and Bago Divisions to Kaikto and then on to Thaton before being moved on to the Thai border. Traders based in Kaikto described visiting Bago livestock markets or Yangon to source cattle before bringing them back to Kaikto. On foot it takes approximately 4 days to move from Bago to Kaikto, and from Yangon it will take 5-6 hours.
- A pathway was described from Magwe to Bago and then from Bago to Myawaddy in Kayin State. Interviewees explained that this movement was conducted using a permit issued by the Chief Minister of Kayin State, thus allowing the traders to use trucks to move the animals to Myawaddy.
- Bilin is an area where there is extensive livestock trading activity, and many of the residents are involved in animal movement activities. Bilin lies along the pathway between Central Myanmar, Bago or Yangon and the Thai border.
- A movement pathway was described from Yangon to Kawkreik (figure 16). Interviewees described that when this route is travelled on foot, Yangon to Kawkreik is a 5 day walk and local people are employed to walk groups of 40-50 cattle. Kawkreik to Myawaddy is a 3 day walk. Sometimes animals will be moved from Mawlamyine to Kawkreik in a small boat (4 head capacity).
- Some cattle will be moved from Yangon to Mudon in Mon State, either by car or by boat.



Figure 16: A map showing the route of cattle taken by foot from Yangon to the Thai border via Kawkreik. The arrows show the general movement between locations and does not indicate the actual pathway taken (source of base map: Google Earth)

The movements described in this component of the study indicate that many of the cattle destined for the Thai border area originate from Central Myanmar. However, there is also information about movement of cattle from India and/or Bangladesh into Myanmar, prior to onward movement to the Thai border. Mon State appears to be an important area in the movement pathway of livestock moving towards Thailand.

Livestock market networks

Livestock markets are understood to be the main method by which large ruminants are traded within Myanmar, with 47 livestock markets located predominantly in Central Myanmar. In order to trace movement pathways of livestock, the study team asked traders and local veterinary officers to describe the movement pathways taken by large ruminants moving from one market to another. This information was then used to generate network diagrams to represent how markets are linked to one another through movement of large ruminants (figure 17)

contagious disease such as FMD if it were to enter the livestock market network, than would less connected markets. Any market receiving animals from a large number of other markets would be more vulnerable to incursions of FMD, whereas a market which supplies livestock to large numbers of markets, were it to become affected with FMD, would cause wider dissemination of disease.

Another market which stands out in these network diagrams is Pyay market which is located in Bago Division and appears to represent a 'gateway' between the more southern States and Divisions of Bago, Mon and Kayin and the Central Myanmar Divisions of Magway and Mandalay.

While these network diagrams provide an insight into movement between the markets, there is potential for considerable bias. Only some of the markets were visited and therefore, more information may have been available about the markets which were visited, compared to markets not visited, given that people generally have greater knowledge of their own locality. The data used to generate the networks are based on individual opinions and experience and not on actual movement data. Therefore, these biases and constraints should be acknowledged when drawing any conclusions from this information.

According to official figures for the number of cattle trading through markets in Shan State and Mandalay Division in 2015 and in 2005, there has been a significant change in the number of animals moving through markets in Mandalay Division. All markets in Mandalay Division run on a five day cycle, with a market day held every five days. From the 2005 figures, the total number of animals passing through all markets in one week was calculated and the same for 2015 figures. It was found that the number being traded each week in 2015 was 40,000 head less than in 2005. For Shan state, there was a reduction of only 600 head every five days across all markets from 2005 to 2015. These market figures are official numbers which are subject to certain biases as the number of animals may be under-reported at each market for tax purposes (Cocks *et al.*, 2009). However, the biases affecting these figures would be similar in 2005 and 2015 and so it might be assumed that the difference seen is a real indication of change. It is not clear from the results of the field study why this reduction may have occurred, but it could potentially indicate a change in movement pathways of livestock and/or a change in trading behaviour with less reliance on livestock markets.

Thailand

The results of this component of the study, and those from Lao PDR and China, all indicate that Thailand has become a key area for transit, quarantine and fattening of cattle and buffalo. There appears to be a good level of awareness of animal health amongst traders in Thailand. Most of those interviewed described use of quarantine, disinfection and vaccination to some extent. Thailand lies between Myanmar and Lao PDR and as such lies within one of the major pathways of large ruminant movement identified by this study.

Movement pathways

A number of traders and other stakeholders from three study sites were interviewed during the Thai component of the study. The following study sites were included: Mae Sot in Tak Province, which was previously identified as the main large ruminant entry point into Thailand from Myanmar; central and western areas of Thailand, an area identified during the China component of the study as a key area for fattening cattle prior to export; and Chiang Rai Province which was identified as an important

export area from the outset of the study. The results presented here are a summary of the information gathered from interviewed traders.

The results of this study indicate a major movement pathway for large ruminants in Thailand, which is supported by information gathered in Lao PDR and China. This pathway is summarised below and illustrated in figure 18.

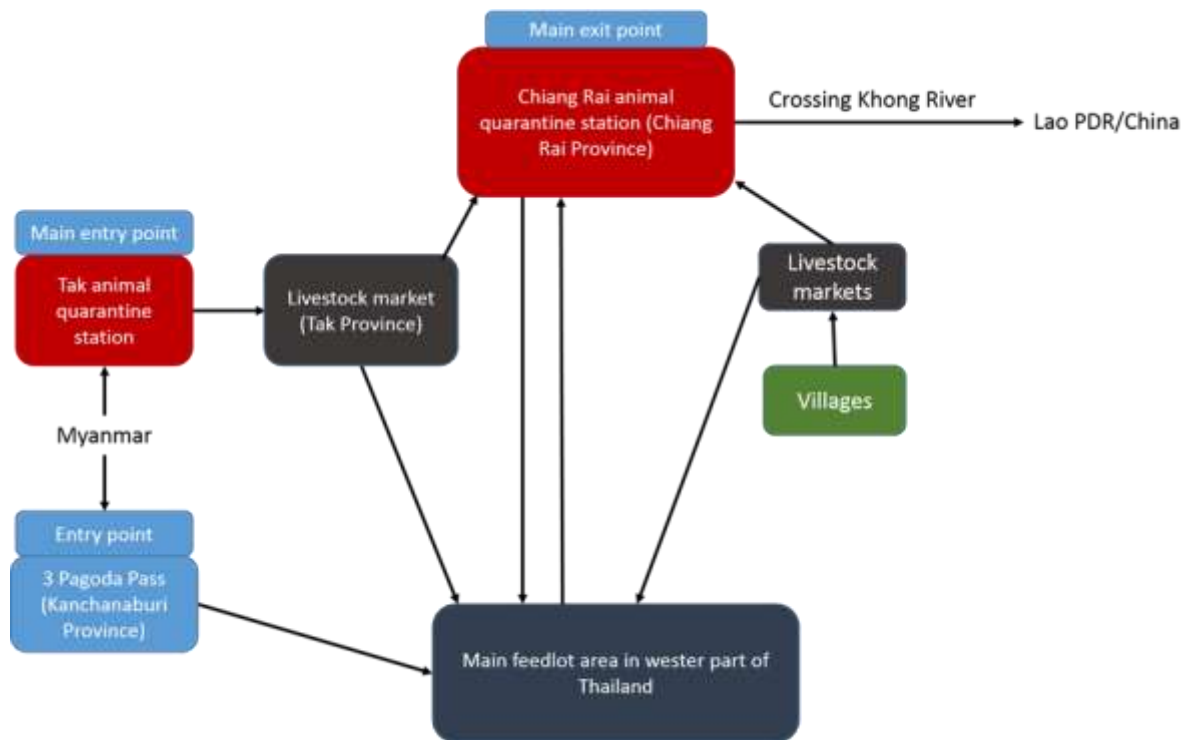


Figure 18: A flow diagram showing the movement of animals through Thailand from import to export

1. **Entry/import:** Cattle and buffalo enter Thailand from Myanmar (mainly via Myawaddy/Mae Sot entry point but also through Three Pagoda pass/Kanchanaburi). One trader explained that of the animals entering at Mae Sot, cattle predominate whereas of those entering via Kanchanaburi, buffalo predominate.

2. **Direct export:** On entry to Thailand, any cattle which are large enough will be moved directly to Chiang Rai for export to Lao PDR, destined for China.

3. **Fattening:** Animals which are not large enough for export will be moved to central/western regions of Thailand (eg. Petchaburi, Ratchaburi, Kanchanaburi, Suphan Buri, Prachaup Khiri Khan) for fattening. This area is used for fattening cattle as there is a ready supply of crop bi-products which can be utilised as animal feed. Again, information about this route is triangulated by results from China and Lao PDR.

4. **Export:** Once fattened, animals are then moved up to Chiang Saen, Chiang Rai for export to Lao PDR destined for China. Some domestic movement of animals from central/western Thailand to Bangkok for slaughter was also described, though the majority of cattle move up to Chiang Rai.

This large scale trade from Thailand to China appears to have started relatively recently with most traders describing that they started operating this trade between 2008 and 2010. Although some of the traders have had cattle trading businesses for much longer than this, they were previously operating trade in a different direction (eg. importing buffalo from China). In the past, cattle and

buffalo were imported from Lao PDR and China to raise in Thailand and then sent back to Lao PDR. There was also a trade in fattened cattle from central/western Thailand to Malaysia (Cocks *et al.*, 2008). In the feedlot area, an owner of a cattle fattening business said that in the last two years she exported cattle to Malaysia, but she does not currently do so due to price constraints. She now sells cattle to domestic clients and exports to China.

The high density of cattle fattening farms in central and western regions of Thailand and their importance in the pathway of livestock for export to China is further demonstrated in figures 19-22 which show the suppliers of cattle and buffalo to exporters based in Chiang Saen, Chiang Rai Province. Almost all of the cattle come from central and western areas of Thailand, with only a small number of Buffalo coming from North-Eastern areas of Thailand. Some animals move directly from Tak Province to the exporters.

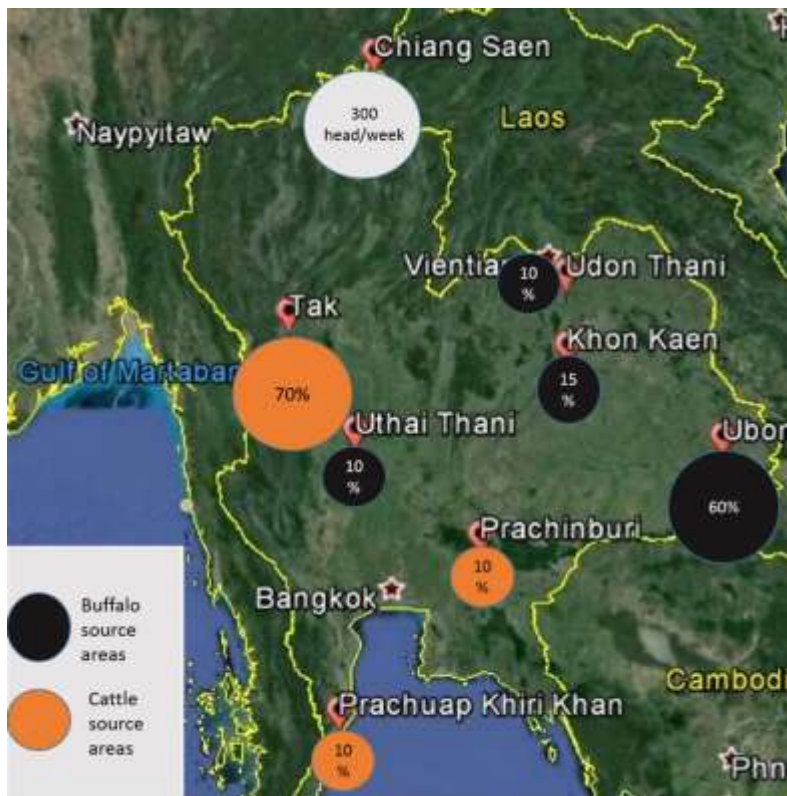


Figure 19: Map indicating the number of cattle traded per week for trader (A) based in Chiang Saen, Chiang Rai Province. The circles indicate the source and % of large ruminants from each source that supply trader (A). Note that the source of buffalo is quite different to the source of cattle. All other traders (figures 19-22) source cattle from central and western areas of Thailand (source of base map: Google Earth).



Figure 20: Map indicating the number of cattle traded per week for trader (B) based in Chiang Saen, Chiang Rai Province. The circles indicate the source and % of large ruminants from each source that supply trader (B) (source of base map: Google Earth).

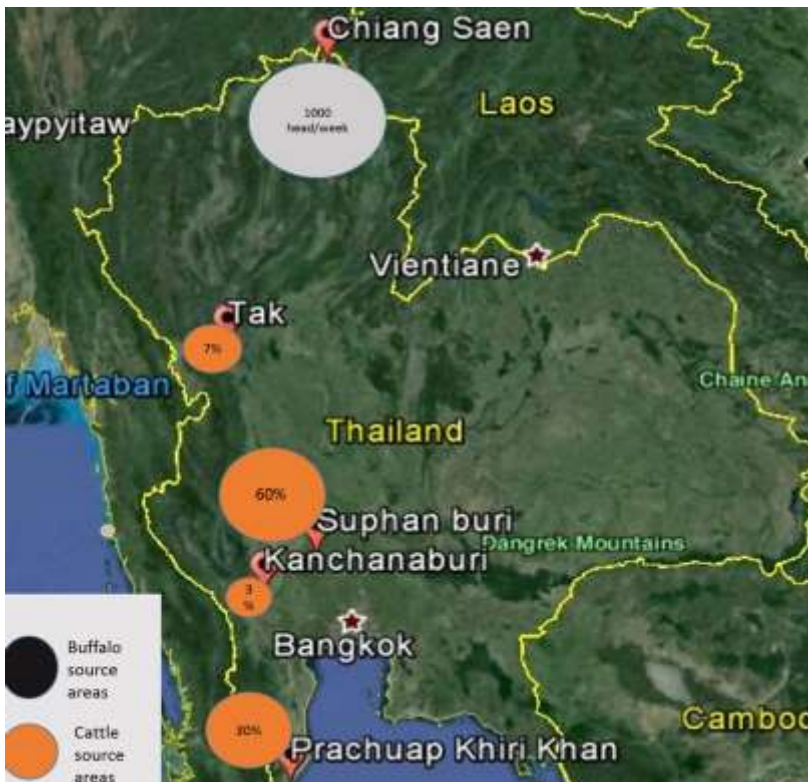


Figure 21: Map indicating the number of cattle traded per week for trader (C) based in Chiang Saen, Chiang Rai Province. The circles indicate the source and % of large ruminants from each source that supply trader (C) (source of base map: Google Earth).

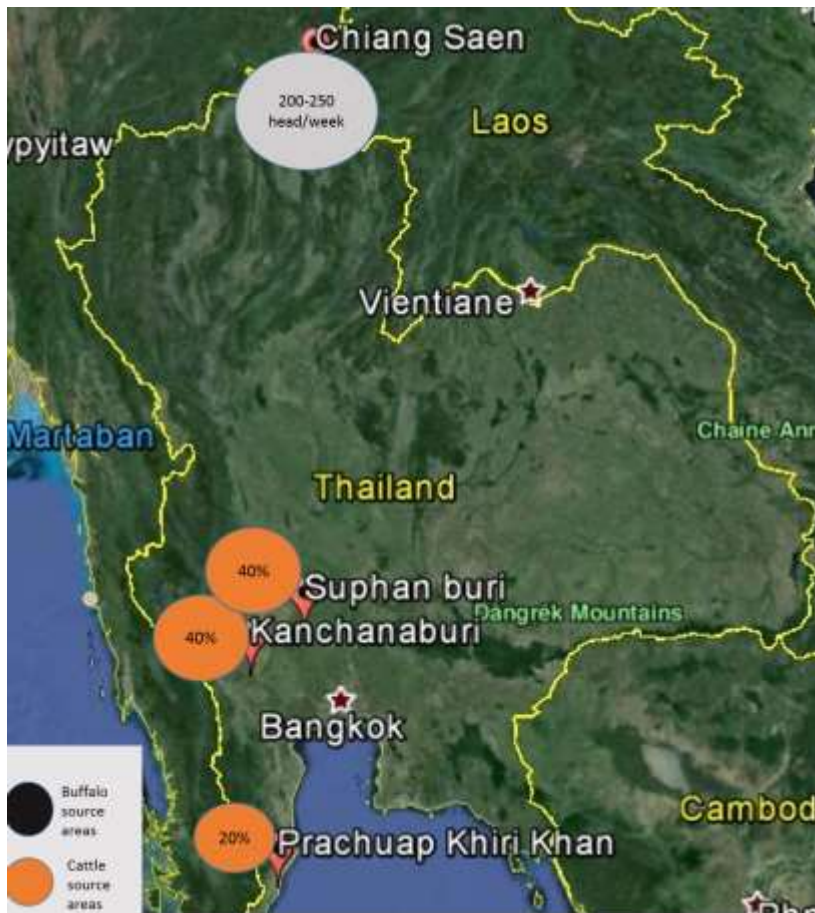


Figure 22: Map indicating the number of cattle traded per week for trader (D) based in Chiang Saen, Chiang Rai Province. The circles indicate the source and % of large ruminants from each source that supply trader (D) (source of base map: Google Earth).

There is an active trade in large ruminants in Thailand throughout the year but there are seasonal fluctuations in price and volume of cattle traded. In the rainy season, the number of animals traded declines but in the winter, especially before Chinese New Year, the number of animals traded is highest and, similarly, the price is higher at this time. Some of the traders explained that during the winter, farmers have space to hold animals and therefore they are not in a hurry to sell and can demand higher prices. Conversely, in the rainy season, more area is required for rice growing and, therefore, farmers need to sell animals more quickly and prices tend to be lower.

A number of different financial arrangements were described for large ruminant trade in Thailand. Most of the arrangements described involved Chinese or Lao PDR traders (large scale) ordering cattle and buffalo from large scale Thai traders. Sometimes a deposit would be given to help the Thai traders purchase the animals, but other times the Thai trader would fund the purchase themselves. While the transactions are mainly between large scale traders: small scale traders, agents or middlemen will often be employed to help source the animals from villages or, more often, from livestock markets. The large Thai traders may purchase from Photong livestock market in Tak Province or they may purchase animals directly from a trader in Myanmar. According to research conducted in 2008 (Cocks *et al.*, 2008), some Thai traders operate between Myanmar and Photong Market in Tak Province. However, it is not clear from the current study whether this situation remains the same to the present day.

Some traders interviewed in Thailand described their business as exporters, which means they work as agents between Thai traders/fattening farm owners and clients in neighbouring countries. They often use photographs of animals to show the cattle and buffalo to the foreign client before money is transferred. One trader described using social networking sites to make contact with clients and to show photographs of animals and their weight prior to money being paid by bank transfer.

Despite a number of people being involved in the movement of livestock through Thailand, it appears that the trade is generally built upon connections between large scale traders/business people operating in Thailand and in neighbouring countries. Chinese buyers will also visit markets in Thailand to select animals prior to export (described under the China component of the current study).

The flow chart in figure 23 illustrates the financial arrangement described by one of the traders operating in Thailand. This appears to be quite typical of others described during interviews.

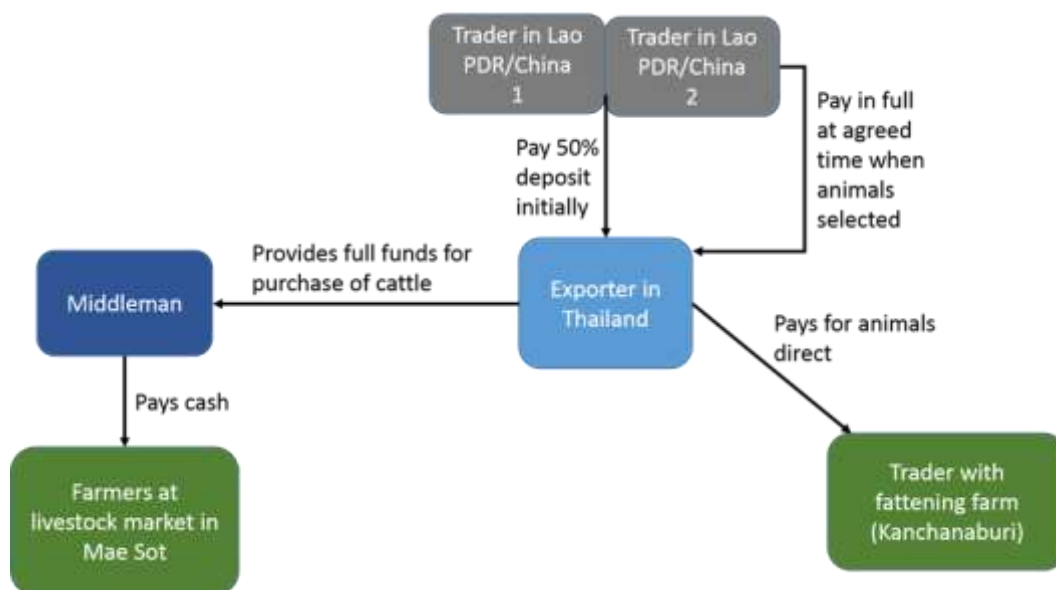


Figure 23: Flow diagram showing payment arrangements described by one exporter based in Thailand

Regulatory information

There are quarantine facilities in Tak Province which process animals entering Thailand from Myanmar. It is not clear, from the information provided, what proportion of animals coming from Myanmar actually pass through the quarantine stations and what proportion circumvent this system.

At the Mae Sot crossing area between Myanmar and Thailand, the importation is regulated on the Thai side of the border. Animals enter at the border and are taken into quarantine facilities (both private quarantine stations and government quarantine stations are used). While in quarantine, the cattle and buffalo are vaccinated against FMD. They then move to the livestock market in Mae Sot where they are inspected, provided with an import permit and an ear tag is applied. They can then be purchased at the market and moved on to different areas of Thailand. The importation process at Kanchanaburi/3 Pagoda pass appears less organised and Thai traders must select the animals on the

Myanmar side of the border and then pay tax and shipping at a cost of THB 280 (approximately USD 8) per head.

There are a number of taxes which must be paid to the DLD when cattle are moved through official systems, these are as follows:

- Import tax: THB 350 (USD 10) per head
- Import fee: THB 30 (USD 0.9) per head
- Livestock market fee: THD 55 (USD 1.60) per head
- Ear tag fee: THB 15 (USD 0.42) per head
- Export tax plus fee: THB 150 – 300 (USD 4.2 – 9.0)

Some interviewees mentioned unofficial fees that could help enable them to trade but the price of these fees and to whom they are paid was not described.

Vietnam

The study conducted in Vietnam focused on the border area between northern Vietnam and Guangxi Province of China, with a focus on how the trade in this area has changed since a previous study was conducted in 2009 (Bourgeois Lüthi *et al.*, 2009). The current study was conducted in Cao Bang, Lang Son and Quang Ninh Provinces, as well as in Phu Xuyen district in Hanoi.

Movement pathways

This study focused particularly on movement of large ruminants from Vietnam to China, but also includes some information about movement of livestock from neighbouring countries into Vietnam.

Cao Bang Province

Cao Bang Province is an historically important pathway for cross-border trade of cattle and buffalo in northern Vietnam. Indeed, the bulk of cattle and buffalo trade between northern Vietnam and China

has occurred through Tra Linh district in Cao Bang Province for decades (Young *et al.*, 2000). The Province shares a 333 km long border with China (figure 24).



Figure 24: location of Cao Bang Province (shaded red) in Vietnam (source: adapted from http://en.wikipedia.org/wiki/Cao_B%E1%BA%B1ng_Province)

According to an official report given by Cao Bang’s SDAH, the current type and direction of cross-border trade pattern between Cao Bang Province and China is illustrated in figure 25, and includes the following:

- Informal export of cattle, buffalo, weaned pigs and local chickens from Vietnam to China
- Informal import of horses, goats, pigs, live chicken and ducks (breeding stock and fattened birds), as well as frozen poultry meat from China into Vietnam

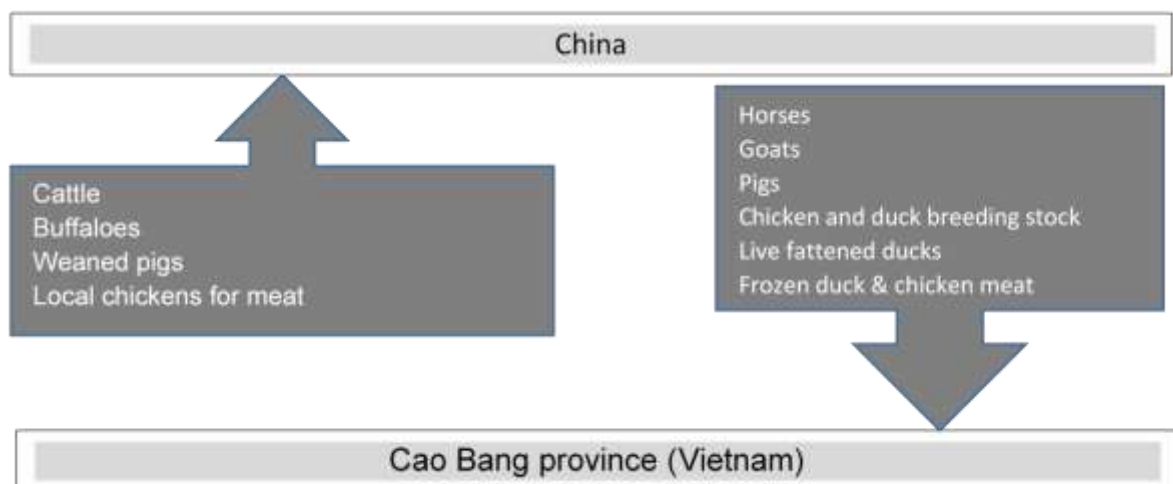


Figure 25: Cross border trade pattern of livestock and animal products between Cao Bang Province and China as of January, 2015

All border districts of Cao Bang Province are affected by informal cross-border livestock trade (listed here from East to West): Thach An, Phuc Hoa, Ha Lang, Trung Khanh, Tra Linh, Ha Quang Thong Nong, Bao Lac and Bao Lam. During a survey conducted in 2009, livestock markets in Ha Quang, Tra Linh, Trung Khanh and Phuc Hoa districts were surveyed. During the present survey, only three market places, one each in Ha Quang, Tra Linh and Phuc Hoa districts were surveyed. Trung Khanh district is not considered to be a major area for cross-border livestock trade at present. The cross-border livestock trade near each of the livestock markets visited is detailed below:

Ha Quang district

1. Tong Cot commune market

Tong Cot is a commune of Ha Quang district situated between Ha Quang and Tra Linh districts. A provincial road (No.210) runs through the commune. Until two or three years ago, Tong Cot commune hosted a livestock market held on regular market days at Cot Pho, the commune's main village, every five days.

The commune animal health worker interviewed during the present survey confirmed that up to 500 head of livestock were previously traded at each market session in Tong Cot. At that time, cattle and buffalo sold to Chinese traders were "walked" from the village directly to China across the "green border". Presently, cattle and buffalo are transported or walked to Tra Linh, where they are assembled at the buffalo market, sold to Chinese traders and walked further to China.

Cattle and buffalo trade activities moved to Tra Linh market two or three years ago. This resulted in a lower income for Tong Cot commune, as market fees are no longer collected. The main reasons described for the move to Tra Linh were: the road to Tra Linh was upgraded; the presence of a large number of Chinese traders in Tra Linh market; and that cattle and buffalo attract higher prices in Tra Linh.

2. Lung Nam commune market

Lung Nam livestock market, situated in Ha Quang district, was visited in 2009 (Bourgeois Lüthi *et al.*, 2009). It previously functioned under the same pattern as Tong Cot market (held every 5 days). However, discussions held at the Sub-Department of Animal Health (SDAH) in Cao Bang indicated that this cattle, buffalo and horse market no longer exists. All trade activities revolving around large

livestock moved from Lung Nam to Tra Linh two or three years ago, at the same time as Tong Cot livestock market.

Tra Linh district

Tra Linh district is situated in the north-eastern part of Cao Bang Province (red circle in figure 26) on the main South-North road axis running from Vietnam to China.



Figure 26: location of Tra Linh district in Cao Bang Province (red circle) (source: <http://www.threeland.com/CaoBang-Province-adminastrative-map.html>)

Tra Linh has been a major route for cattle and buffalo cross-border trade for at least 30 years. It is understood that cross-border trade between Cao Bang and China through Tra Linh gained momentum after *Doi Moi* (the Renovation) in 1986 (Bourgeois Lüthi *et al.*, 2006). In May 2006, the cross-border trade was bi-directional: from China to Vietnam for cattle and from Vietnam to China for buffalo. According to information gathered during the current study, and previous studies, the trade became unidirectional (from Vietnam to China) both for cattle and buffalo in 2006 to 2007 (Bourgeois Lüthi *et al.*, 2009 and Bourgeois Lüthi, 2010).

In Tra Linh district there is one official border gate, Hang Pao, and one large livestock market held in Hung Quoc, the district main town.

1. Hang Pao border gate

Hang Pao is the official border gate between Vietnam and China in Tra Linh district. It is one of the four official border gates in Cao Bang Province. The trade of goods and commodities in Tra Linh takes place along one of three different pathways: Formal (through Hang Pao border gate); semi-formal (on a small road under construction beside the border gate); or informal (along numerous footpaths over the green border). In order to follow the official pathway, traders need a permit from the provincial People's Committee (not assessed if from provincial, district or town). Any other goods, not falling under official agreements, follow the informal pathway. This is the case for live animals, such as cattle and buffalo, which are "walked" across the green border on small footpaths. Trade of live animals rarely takes place at official border gates in Vietnam, except for trade in poultry breeding stock or specific fish species. Live cattle and buffalo traded through official border gates are usually only traded by official companies (e.g. a company operating in Quang Binh Province, described in more detail later

under slaughterhouses in Hanoi). Hang Pao border gate in Tra Linh district does not record any trade of live animals, only meat from foreign countries transiting in containers.

During the visit to Hang Pao, a horse trader was interviewed. He previously traded cattle and buffalo. He used to buy cattle from local markets in Cao Bang and other Provinces to fatten them and sell to China. However, he stopped trading cattle a few years ago, stating the following reasons: the supply of cattle and buffalo in Vietnam decreased; the competition among traders increased; farmers became more aware of transaction conditions; and his farm was often affected by FMD. The first large FMD outbreak occurred in 2003, and outbreaks intensified from 2005 onwards.

2. Tra Linh (Hung Quoc) buffalo and cattle assembly market

According to information gathered in the current study, Tra Linh district hosts the largest cattle and buffalo assembly market in the North of Vietnam and the second largest assembly market in Vietnam, after Cho U market in Nghe An Province. Cattle and buffalo moved through Tra Linh district are believed to originate from different countries of the GMS: Thailand, Lao PDR, Cambodia and Myanmar. Tra Linh therefore acts as a centralised exit point to China for buffalo and cattle trade from the GMS countries through Vietnam.

The number of cattle and buffalo traded to China through Tra Linh assembly market is estimated to reach 2000 head per market session. With six market sessions per month, the total annual “export” volume is estimated to reach 100,000 to 150,000 head. It is estimated that two thirds of livestock traded through Tra Linh assembly market are buffaloes and one third are cattle. The cattle and buffalo trade pattern observed in Tra Linh is illustrated in table 2. The type and quality of animals sold at Tra Linh assembly market are heterogeneous and range from young local cattle to large-sized, fattened, black-coat buffalo, imported mostly from Thailand. The latter predominate. The information gathered about movement of large ruminants from Tra Linh in Vietnam to China could not be verified on the

China side of the border. Veterinary officers interviewed in JingXi County of Guangxi Province of China, could provide little information about the large ruminant trade from Tra Linh.




	<p>Cattle and buffaloes are transported by trucks to Tra Linh market place in Hung Quoc town 1 to 3 days before each market session.</p> <p>On the picture: buffaloes transported to Tra Linh market, on the main road between Cao Bang City and Tra Linh. This truck carrying 20 heads (19 buffaloes and 1 cattle) bears a number plate registered in Nghe An province. According to one of the truck staff interviewed, most animals originate from the Lao PDR and some were procured from Cho U market in Nghe An province.</p> <p>Date: 30.01.15</p>
	<p>One of the three main sections of the Tra Linh cattle and buffalo market.</p> <p>Cattle and buffaloes are assembled by lots for further trade with Chinese traders.</p> <p>The cattle and buffalo market session takes place over 1 full day and one following morning, before the regular market session (where vegetables, clothes etc. are sold).</p> <p>Date: 30.01.15 (11th day of the 12 lunar month)</p>
	<p>Trade with Chinese traders, transactions are made in Tay language, the common language on both sides of the border. Chinese traders cross the border to attend the market in Tra Linh and to buy livestock.</p> <p>Date: 30.01.15</p>

Table 2: An illustrated description of cross-border trade of cattle and buffalo through Tra Linh District, Cao Bang Province in Vietnam

3. Ma Phuc pass

Ma Phuc pass coincides with the road junction towards Tra Linh district and Hang Pao border gate in the North and towards all eastern districts of Cao Bang Province: Trung Khanh, Ha Lang, Quang Uyen and Phuc Hoa districts. In 2009, the survey identified two retail sale points for beef along the road near the road junction. Meat retailers interviewed in 2009 stated that they started slaughtering cattle at Ma Phuc Pass in 2004 or 2005. Initially these were cattle traded from China and destined to slaughterhouses in Hanoi. After 2007, beef retailed at Ma Phuc Pass originated from cattle traded from Vietnam (or other countries) to China. Cattle slaughtered at Ma Phuc were mostly animals which were rejected for further import into Vietnam or export to China due to physical problems (weakness, sickness or lameness).

Between 2009 and 2015, the slaughter point in Ma Phuc has been upgraded with support from the commune. There are now six beef (cattle and buffalo meat) retailers and one pork retailer. Each stall selling beef retails approximately one head per day. Beef is retailed at prices ranging from VND 100,000 (USD 4.50) per kg (grade 3, e.g. fat) to VND 150,000 (USD 6.80) per kg (grade 2) and VND 200,000 (USD 9) per kg (grade 1, sirloin). These prices are considerably lower than prices collected at Cao Bang main retail market (*Cho Xanh*, Green market), where grade 1 beef was sold for VND 280,000 (USD 12.7) per kg. According to the retailer interviewed during the present survey, cattle are now procured directly from villagers and are not bought from trucks or from Tra Linh market. Meat is sold to passers-by.

Phuc Hoa district

Phuc Hoa district contains six communes sharing a border with China, which extends over 29 km. Beside Ta Lung international border gate, there are a number of small border posts. Official trade through Ta Lung border gate concerns mainly machinery and fertiliser. Breeding poultry stock (chicks and ducks) are the only live animals occasionally traded officially from China. Poultry breeding stock is cheaper and easier to obtain from China than from Hanoi or Cao Bang City. According to district staff interviewed in Phuc Hoa, informal cross-border movements of live cattle, buffalo and pigs observed in the vicinity of Ta Lung border gate in 2009 (Bourgeois Lüthi *et al.*, 2009) has stopped. Current observations around the town and on the road did not show any livestock movements across the

border. District staff confirmed that all cattle and buffalo cross-border movements previously occurring in Phuc Hoa district, as well as in Trung Khanh district, shifted to Tra Linh assembly market.

Figure 27 provides an overview of the general pathway for cross-border trade of cattle and buffalo between Cao Bang Province and China.

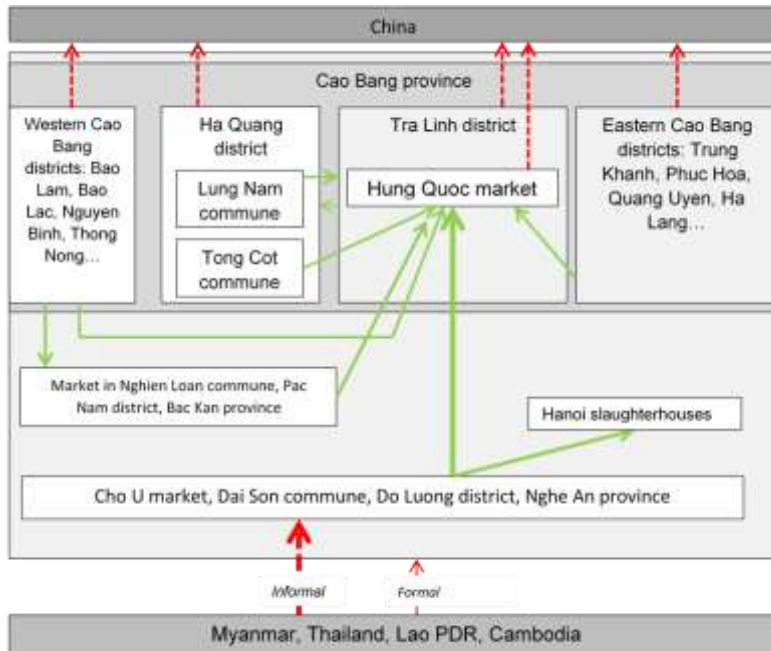


Figure 27: Schematised trade pathway for cattle and buffalo from Vietnam and other GMS countries to China through Cao Bang Province

Lang Son Province

Lang Son Province shares a 232 km long border with China. Five districts, with twenty communes, comprising 247 villages and one town are located in the border zone in the north-east of the Province. Lang Son Province is surrounded by five other Provinces (Cao Bang, Bac Kan, Thai Nguyen, Bac Giang and Quang Ninh Provinces) as shown in figure 28.



Figure 28: Map showing Lang Song Province in Vietnam (Source: <http://www.threeland.com/LangSon-Province-administrative-map.html>)

Cross-border trade of cattle and buffalo in Lang Son Province

In 2009, cross-border trade of cattle and buffalo across Lang Son was occasional (Bourgeois Lüthi *et al.*, 2009). According to official staff from the SDAH, there is no cross-border trade of cattle and buffalo in Lang Son at present. This official statement was supported by information collected informally from restaurant staff, wet market retailers, as well as by information collected formally from two slaughtermen interviewed in Lang Son. Direct observations made while driving between Cao Bang and Lang Son, as well as driving along the border did not show evidence of any cattle and buffalo transport. A lady met in Tra Linh market claimed that buffalo are occasionally traded from Tra Linh assembly market to Mong Cai in Quang Ninh Province through Lang Son City. However, this information could not be verified. Staff from Lang Son City DVS reported that cattle and buffalo transit through Lang Son to Tra Linh. They count approximately two trucks every three to four days, with number plates registered in different Provinces, but mainly in Nghe An Province. If cattle and buffalo are traded to China from Lang Son Province, it mainly concerns local animals traded in small volumes.

Mong Cai (Quang Ninh Province)

Mong Cai is a commercial City of Quang Ninh Province, bordering China in the north-eastern part of Vietnam. It is Vietnam's busiest trade hub along the Vietnam-China border. Quang Ninh Province is not a significant producer of cattle and buffalo and the consumption of beef in the Province is relatively low. In 2014, the Province had a population of 45,500 buffalo, 19,000 cattle and 352,000 pigs.

The survey carried out for the OIE and FAO in 2009 did not include Quang Ninh Province as one of its study sites, as there was no evidence of any significant cattle and buffalo cross-border trade occurring in this Province prior to 2009. The first indication of cross-border trade in Quang Ninh Province emerged during the course of the survey 2009 (Bourgeois Lüthi *et al.*, 2009), but could not be verified at that time. Registers consulted at road checkpoints in Ha Tinh and Quang Binh Provinces during the time of that survey carried showed that Quang Ninh was indicated as the major destination for buffalo crossing the two Provinces. Moreover, the survey on regional cattle and buffalo trade carried out by the consultant in 2010 for the University of London and CIAT highlighted an important pathway for buffalo trade between Thailand and China through Quang Ninh Province (Bourgeois Lüthi, 2010). This pathway revolved around two large traders, two brothers from Hai Duong Province. In 2010, these two traders procured large-sized, black-coat buffaloes from Nghe An Province, mostly from Cho U assembly market, the largest cattle and buffalo assembly market in Vietnam and one of the largest in Southeast Asia. Buffalo were temporarily kept near Lai Vu Bridge in Lai Vu Commune, Kim Thanh District, Hai Duong Province (figure 29) before being transported further to Mong Cai City for cross-

border trade to China. In Mong Cai City, buffalo were allegedly brought across the Ka Long River, but this statement could not be verified (Bourgeois Lüthi, 2010).



Figure 29: buffalo procured from Cho U market in Nghe An Province and re-loaded near Lai Vu bridge in Hai Duong Province (2010)

Investigations carried out in 2010 indicated that cross-border cattle trade in Quang Ninh, and more specifically in Mong Cai City, was an extremely sensitive issue due to the nature of the different parties involved in the trade (Bourgeois Lüthi, 2010). The present survey did not identify any informal cross-border trade of cattle and buffalo or pigs across Mong Cai City. Official authorities recognise that the main issues pertaining to informal cross-border trade in Mong Cai City at present relate to poultry. According to them, cross-border trade of buffalo in Mong Cai City no longer exists. This statement was confirmed by staff at the road checkpoint situated at the entrance of Mong Cai City, who also stated that transport of large livestock through Mong Cai City stopped in 2010.

Information gathered in Cao Bang, as well as in Lang Son Province, however indicate that cross-border trade of buffalo still exists in Quang Ninh Province. On the last day of the survey in Quang Ninh, the owner of a restaurant explained that cross-border trade of large animals (cattle, buffalo and pigs) now occurs near Bac Phong Sinh border gate, located to the West of Mong Cai City. As this information came at the end of the survey and the distance to Bac Phong Sinh was too far, the team could not go there to verify this piece of information.

Cattle and buffalo slaughterhouses in Hanoi

Two slaughterhouses were visited in Hanoi during the present survey. The first one, a large private slaughterhouse, is situated in Tri Thuy commune, in Phu Xuyen district of Hanoi Municipality. The commune is located approximately 40 km away from Hanoi City centre.

The private slaughterhouse visited within the commune is the second largest in Hanoi. The largest slaughterhouse is found in Dong Anh district, closer to Hanoi City centre. The owner of the slaughterhouse slaughters an average of 20 to 30 head of large ruminants per night. It is estimated that 40 head were slaughtered on the night of the team's visit. The slaughterhouse owner specialises in cattle and only slaughters a few buffalo. During the visit only cattle were seen: both large-sized Zebu from Thailand (brown-black coat) (figure 30) and Red Angus from Australia (figure 31). The owner of the slaughterhouse started slaughtering both Thai and Australian cattle in 2013. Since 2014, he has

procured more Australian cattle, as their meat is of better quality. The slaughter volume is higher during the wedding season (from October to March) and at weekends.

Thai cattle destined for this slaughterhouse are imported through Cha Lo border gate in Quang Binh Province. Thai cattle are imported by a Vietnamese company. In 2009, only one company in Quang Binh Province had an official license to import live cattle from Thailand, for “breeding purposes” (Bourgeois Lüthi *et al.*, 2009), so there now appears to be additional companies approved. During the present survey, Thai cattle were procured at a price of VND 90,000 (USD 4.07) per kg live weight.



Figure 30: Thai zebu at a private slaughterhouse in Phu Xuyen district, Hanoi

The slaughterhouse owner also purchases Australian cattle from a company in Haiphong for VND 75,000 (USD 3.39) per kg LW. The live weight of Australian cattle ranges between 500 kg and 600 kg, while the live weight of Thai cattle ranges between 700 kg and 800 kg. According to him, the meat of Australian cattle is of better quality, he therefore tends to increase the number of Australian cattle slaughtered. The slaughterhouse owner did not disclose the sale price of the meat.

According to an article published online in 2014, this company started retailing Australian beef in Hai Phong and Hanoi from Australian cattle slaughtered at its abattoirs. The same company has imported

75,000 head of cattle and 5000 head of buffalo from Australia since 2012 (ABC Rural online, 21.12.2014).



Figure 31: Red Angus Australian cattle at a private slaughterhouse in Phu Xuyen district, Hanoi

Viettel's "cattle for the poor programme"

Selected poor households in Cao Bang, Lang Son and Quang Ninh Provinces recently benefited from a programme supported by Viettel Group, Vietnam's military run telecommunication group. The programme aims to alleviate poverty in border areas throughout Vietnam through the distribution of breeding cattle, known as "cattle for the poor programme".

Cattle distributed as a gift to poor households are young, non-pregnant Laisind heifers (figure 32). In Cao Bang, 50 heifers were distributed in December 2014; in Lang Son, 50 heifers were distributed in August 2014, with a further 159 heifers distributed in the same Province in December 2014. A number of these cattle were affected by FMD shortly after they were transported to Lang Son Province from Ninh Binh Province. The survey team visited one household in Bao Lam commune, in Cao Loc district, which benefitted from this programme. Bao Lam commune did not register any FMD outbreak in 2014, the cattle distributed under the Viettel Group's programme were healthy. Although cattle were reported to be already vaccinated against FMD, they were re-vaccinated by the commune staff when they arrived in Bao Lam commune.



Figure 32: Laisind heifers distributed to poor households in Bao Lam commune, Cao Loc district, Lang Son Province under the Viettel Group's programme distributing cattle to poor households

Overview of large ruminant trade pathways in the GMS.

The following section provides a summary of the results of this study pertaining to geographical pathways of livestock movement in the GMS, with a focus on those destined for China. Figure 33 indicates the main pathways of livestock movement in the region identified by the current study.



Figure 33: A map showing the main pathways of livestock movement in the GMS countries identified by the current study. The arrows indicate a direct and approximate path between source and destination and do not represent the actual route taken between these two points. The red arrows represent general movement pathways for cattle and buffalo, grey arrows for buffalo only and dotted arrow represents a movement which was reported but the actual route is not known.

The livestock pathways identified by this study appear to be largely shaped by the high demand for beef in China. Since previous studies were conducted, the demand for beef in China has risen sharply and, with domestic supply unable to keep pace with demand, the price for beef in China has similarly increased. This high price for beef and for large ruminants is driving movement of livestock into, and across, the region towards the high value markets in China.

Some countries from outside the GMS region have emerged as new sources of large ruminants. Movement of large ruminants was reported from India and Bangladesh into Myanmar and Thailand during this study. This new source of live cattle and buffalo is particularly concerning given that the movement is un-regulated and from an area where FMD is endemic. This could be a potential source of future FMD incursions, potentially involving strains exotic to South-East Asia and China. Increasing numbers of cattle have also been imported into the region from Australia, particularly into Vietnam and Malaysia, according to information provided in this study.

Based on the results from the current study, the different countries in the GMS each hold a unique position in the livestock trading pathway: Myanmar continues to be a major source of large ruminants in the region (though it is also a transit country for livestock entering from Bangladesh and India).

Myanmar has a large population of cattle and buffalo and a relatively low demand for beef. Therefore, there continues to be a surplus of large ruminants which can be exported to other areas within the GMS. Despite there being no officially recognised movement of large ruminants from Myanmar to Thailand or China, large numbers of cattle and buffalo appear to move unofficially from Myanmar to Thailand, and from Myanmar to China.

Myanmar shares a number of border crossings with Thailand and China. Large volumes of livestock move from Myanmar to Mae Sot in Thailand, which appears to be one of the most active border crossings with an estimated 10,000 to 25,000 head of large ruminants passing through the main market in Mae Sot each week. It is not known whether some livestock enter at this point but do not pass through the market, or whether the number of animals passing through the market is a true indication of the number crossing the border. Further south is another border crossing from Myanmar into Kanchanaburi Province of Thailand. While no estimate of numbers is available, this is not believed to be as busy as the Mae Sot crossing.

Once within Thailand, much of the livestock entering from neighbouring Myanmar will be taken into the official system whereby quarantine, import papers, vaccination and ear tagging are conducted before onward movement within the country. In this way, Thailand is a key area for livestock quarantine and documentation. Animals crossing from Myanmar to Thailand will often remain in Thailand for some time for the purpose of fattening before onward movement to China. Thailand is thus an important hub for processing and fattening livestock destined for China. Some animals, however, will be moved directly from the border area in Mae Sot to Chiang Rai prior to movement to China. Thailand is predominantly a transit country for large ruminants.

Similarly, Lao PDR is predominantly a transit country between Thailand and China and between Thailand and Vietnam. This study identified an active trade in large ruminants through the northern Lao PDR Provinces of Bokeo and Luang Namtha destined for China (shown in figure 33). This movement is thought to have developed only in the last two to three years and now involves movement of large numbers of livestock throughout the year. Large ruminants destined for Vietnam also transit through Lao PDR, mainly via officially recognised transit routes through Savannakhet and Kammouane Provinces. The latter pathway has recently developed following completion of the third Thai-Lao friendship bridge.

Vietnam and China are the main importing countries in the region, though there is also some transit through Vietnam, destined for China. A number of interviewees from the current study described competition between Chinese and Vietnamese traders for sourcing animals from other GMS countries. Both Vietnam and China rely heavily on imports to satisfy domestic demand for beef and while both countries have some cattle production, it is not sufficient to meet demands of the local population. This study indicates that Vietnam imports livestock from neighbouring countries and, in addition, the number of cattle imported from Australia has risen sharply in recent years.

Figure 34 indicates the main cross-border movements identified by this study into China and the number of animals estimated to be moving through each border area annually.

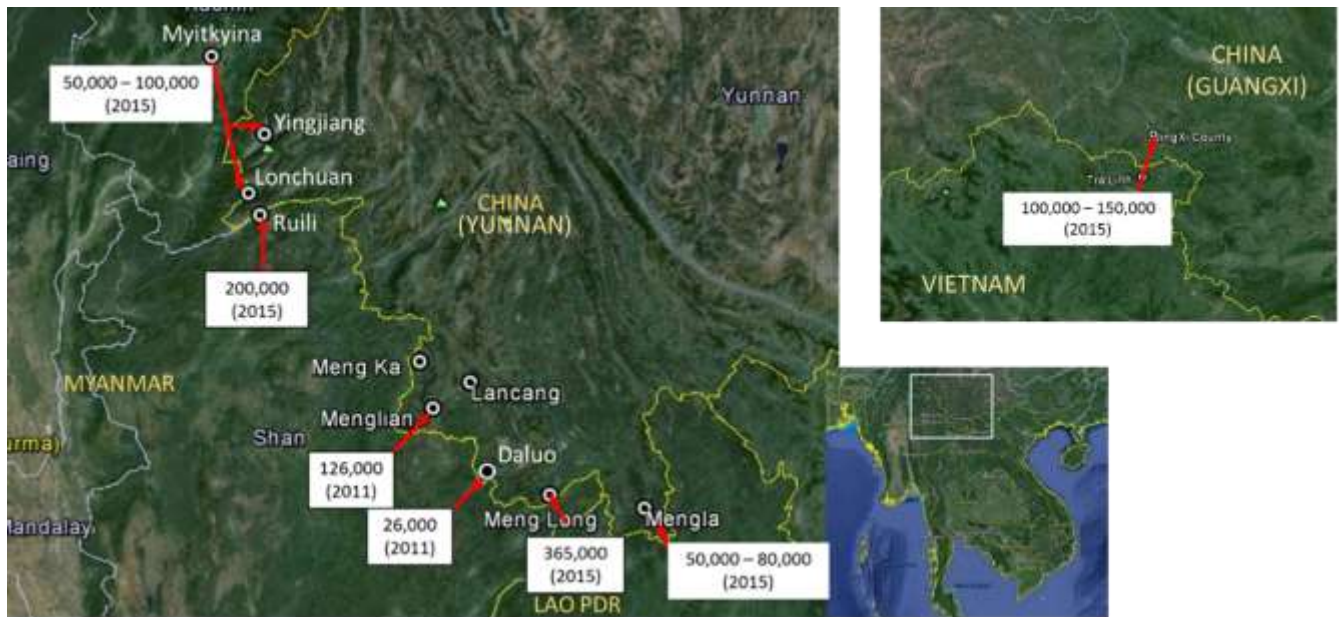


Figure 34: A map indicating the approximate locations of border crossing areas for large ruminants entering China from neighbouring countries, and the number of animals estimated to be crossing at each point, annually. All those numbers labelled (2015) are based on data from the current study. The figure labelled (2011) is based on a study by Huachun et al., (2011).

Within the pathways of large ruminant movement described above, some key areas were identified where high volumes of large ruminants are known to gather (i.e. markets or collection points). These are shown on the map in figure 35. There are likely to be more, smaller collection areas within the main transit areas for livestock movement, for example, areas where cattle are held before loading into trucks, boats, etc. However, the points indicated on the map are those which have been identified as major gathering areas along some of the main pathways of large ruminant movement.



Figure 35: A map indicating the main collection areas along the movement pathways destined for China and estimated numbers of large ruminants passing through those areas each year.

Price information

During this study, livestock traders and other stakeholders were asked to comment on the price of large ruminants and of beef in different areas and at different stages of the market chain. Price can be a useful predictor for movement of livestock as they will generally move from areas where price is lower to areas where price is greater, providing there are no other barriers (regulatory or physical) to movement. Price will usually be determined by discrepancies in supply and demand.

The beef prices in China have shown a marked increase with the price of beef tripling between 2007 and 2014 (Francis, 2014). This increase in beef price has similarly driven up the price of large ruminants in the region, with results from this study indicating significant increases in the price of cattle throughout the GMS. In Thailand, the price of cattle has almost doubled since a previous study was conducted in 2008 (Cocks *et al.*, 2008) and prices in Lao PDR and Vietnam have also shown marked

increases. In Myanmar, official figures suggest that there has been little increase from 2008 to 2015. However, data concerning cattle prices in Myanmar which was collected during the study in China and Myanmar suggests that cattle prices have increased in recent years.

Price information can be quite sensitive to collect as traders are often reluctant to reveal prices for which livestock are bought and sold as this provides information about their profit margins. However, some traders were willing to provide this information, and details of prices collected are summarised in figure 36. These prices should be taken as approximations as some of the information has been extrapolated from a per head price estimate to a per kg LW estimate. In this case, it was assumed that a non-fattened adult Brahman cross weighed 400kg and a fattened animal of the same class weighed 500kg.

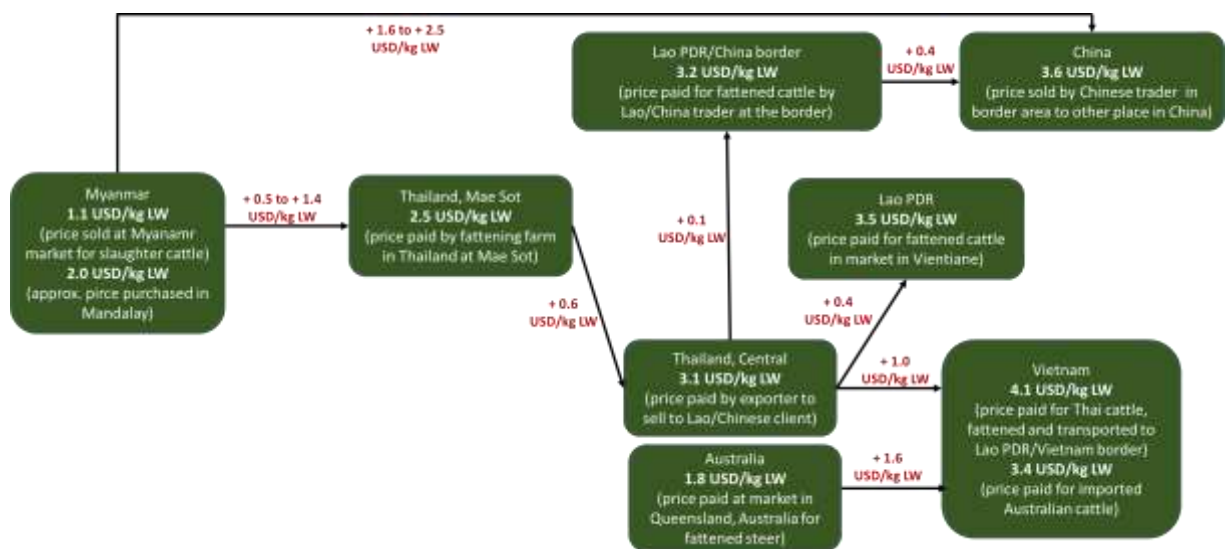


Figure 36: Approximate prices paid for large ruminants in the market chain from Myanmar to China/Vietnam (including details of imports from Australia to Vietnam). This market chain mainly concerns Brahman cross types, rather than the smaller indigenous breeds. Australian price data from MLA, 2015.

Each step of the pathway indicates the difference between buying and selling price (per kg LW), in order to demonstrate how the value of livestock changes along the movement pathway towards China. Some steps in the pathway appear to indicate low profits per kg LW but where cattle are fattened, the per-head profit can increase significantly, an increase which is not clear when showing per kg LW figures.

The high prices in Lao PDR likely reflect its position in the transit movement of livestock to China and Vietnam as there is relatively little demand within Lao PDR for beef, thus prices are driven up by the demand in neighbouring countries. The situation is likely similar for Thailand. Myanmar, on the other hand shows much lower prices for cattle and therefore traders operating between Myanmar and neighbouring countries are likely to make considerable profits. This could indicate that the benefits of accessing high value markets for beef is not filtering down to the farmer level in Myanmar and therefore, developing systems for official export from Myanmar to China may help to bring benefits to producers in this country. A number of sources have described the competition between Vietnamese and Chinese traders when sourcing large ruminants from within the GMS, which will also drive up the price as they try to secure a source of large ruminants.

A trader in Vietnam described how farmers had become more aware of the value of livestock in Vietnam, making trading less profitable for him. Therefore, there is some evidence that the strong markets for beef in the region are benefitting farmers at least in some countries in the region.

Recent changes in large ruminant trade in the GMS

There have been some significant changes in the large ruminant trade pathways and price of large ruminants in the region since previous, similar studies were conducted (Cocks, *et al.*, 2008; Cocks, *et al.*, 2009; Bourgeois Lüthi, *et al.*, 2009). The key differences noted from 2008/9 to 2015 are described below on a country by country basis.

China

China was not included in previous livestock movement studies conducted in the region, but information gathered during the current study about livestock movement pathways destined for China indicates that some of the major trade pathways have either commenced or increased in volume in the last few years. Several events have been described during this study which have occurred recently, and likely in response to the increasing price of beef in China. Figure 37 shows a graph of beef prices in China from 2000 to 2015 with some significant dates, described during this study, overlaid onto the graph. This demonstrates how new trade pathways have developed recently and the number of new events (traders starting to operate along certain trade pathways, change in market sizes, new sources of livestock entering the region, etc.) have occurred since the rapid rise in beef prices began. This also suggests that despite not having previous studies regarding cross border animal movement in China, that there have been significant changes in recent years.

Another recent change identified during this study is the increased presence of Chinese traders at livestock markets in neighbouring countries. This was not seen during previous studies in the region and has been described during this study for markets in both Thailand and Vietnam.

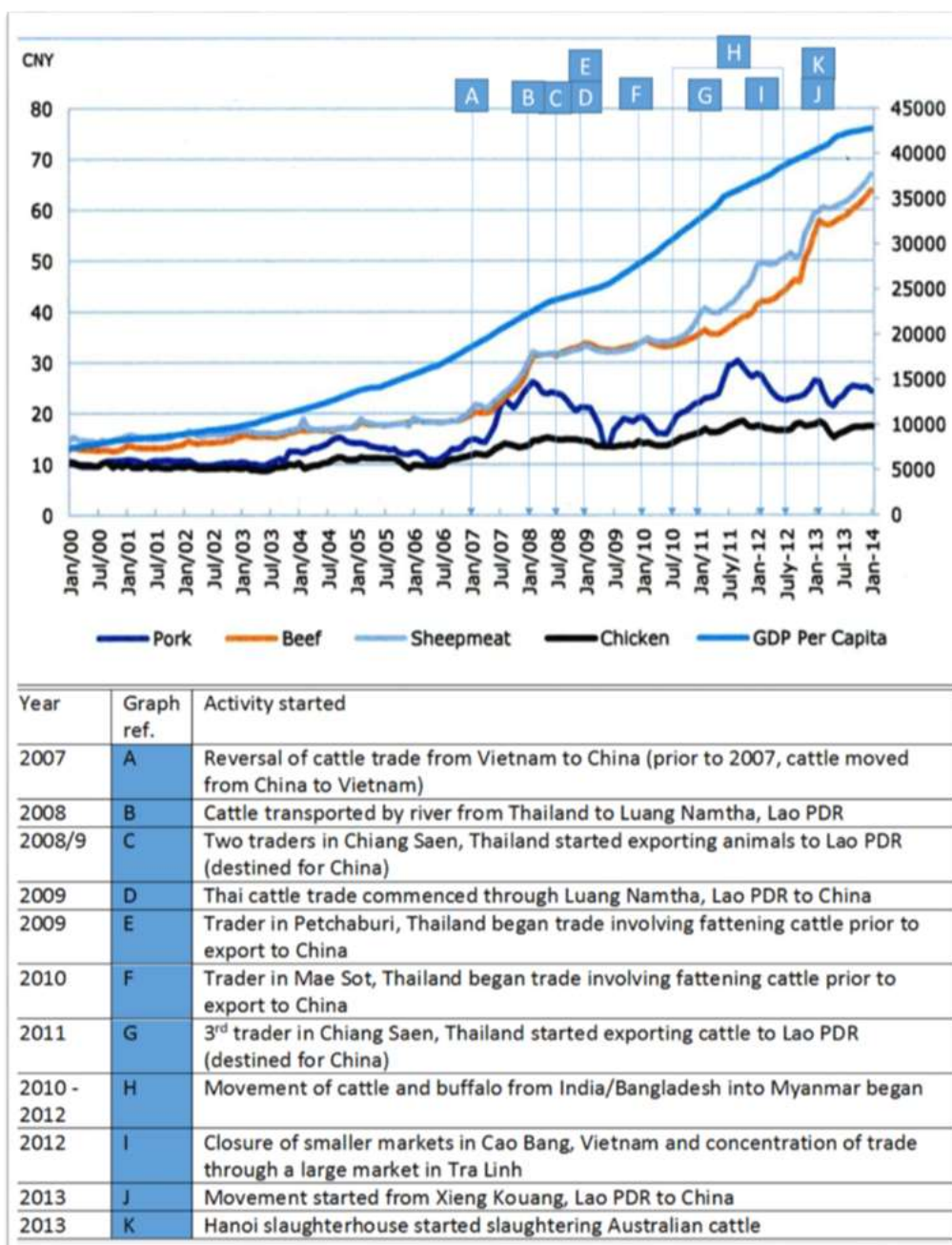


Figure 37: A graph indicating the increasing price for beef in China (source: <http://www.moffittsfarm.com.au/wp-content/uploads/2014/11/Beef-prices-versus-other-meats-China-1990-to-2013-Rabobank.jpg>) together with key events in large ruminant trade in the region.

Lao PDR

In Lao PDR, Xieng Kouang Province remains an important hub for livestock trade. However, where previous studies described most of the movement from Xieng Kouang going towards Vietnam, there is now also a pathway leading from Xieng Kouang to Luang Namtha Province in north-west Lao PDR, on the border with China.

Exportation of large ruminants from Bokeo Province to other Provinces is now prohibited (this movement was permitted in the 2009 study), due to increased large ruminant movement out of the Province and subsequent depletion of livestock populations within the Province. However, despite the

change in regulations, it is understood that large ruminants continue to move unofficially out of Bokeo, towards China.

Since the previous study in 2009, the third Thai-Lao friendship bridge was opened in 2011 between Nakhon Phanom Province in Thailand and Khammouan Province in Lao PDR. Since the opening of this bridge, an active transit trade has commenced between Thailand and Vietnam across Khammouan Province.

The number of large ruminants transiting through Savannakhet Province from Thailand to Vietnam appears to have reduced. In 2009, it was estimated by local villagers in the area that 500-1000 animals per day were moving along this route (approx. 180,000 to 365,000 per year) compared to official figures stating that 3,125 head moved through this route in 2014. However, as official figures often under-report the true extent of movement, it cannot be confirmed that this is a true change in movement volume.

In the study conducted in 2009, there was no mention of the transit pathways from Thailand, through Bokeo and Luang Namtha towards China, or the domestic movement of livestock from other Provinces of Lao PDR to Luang Namtha. However, a summary of another project in the region (ACIAR, 2011) mentions that during investigation of livestock movement patterns in 2008-9 they had identified this 'fast track' route from Thailand and Myanmar through the north-west Provinces of Lao PDR (this is supported by traders who stated during the current study that they started trading through this route in 2008/2009). However, during follow up investigations conducted by ACIAR in 2011, this trade was found to be stopped. It is not clear when this trade re-commenced but results of the current study suggest that it is very active at present.

There has been a marked increase in the price of livestock in Lao PDR in recent years. A component of the study conducted in 2009 (Scoizec, 2009) presented prices as per kg of expected meat yield. For Thai cattle entering at the Thai-Lao PDR border, the price was estimated at approximately USD 3 per kg meat yield. The current study provided estimates on a live-weight basis. For a fattened animal at the Thai-Lao border, the current price is US 3.13 per kg LW. If this is converted into meat yield (assuming carcass weight is 60% of live-weight, and meat yield is 60% of carcass weight) a price of USD 8.70 per kg meat is expected. While these are approximations, it does indicate a significant increase in price between 2009 and 2015.

Myanmar

Myanmar was not included in the study conducted by OIE and FAO in 2009 (Cocks *et al.*, 2009) and therefore, the results from the current study were compared with results of a similar study conducted in 2008 in which large ruminant trade pathways were studied in Myanmar (Cocks *et al.*, 2008).

From the results of the current study, there appears to be more movement from western regions of Myanmar, through central Myanmar towards Thailand. Previously, movement was understood to originate in Central Myanmar. This may indicate a new source of livestock entering Myanmar from the west.

Based on official data from LBVD, there appears to be a marked reduction in the number of livestock moving through livestock markets in Mandalay in 2015 compared to 2005. The data suggests that livestock markets run on a five day cycle in both 2015 and 2005, but in 2005 a total of almost 50,000 head of large ruminants passed through livestock markets in Mandalay (every 5 days), compared to just over 10,000 in 2015. In contrast, the number of animals moving through markets in Shan state have remained similar, with only approximately 600 head less in 2015 compared to 2005. The reason for this change is not clear but it could indicate a change in movement pathways or a change in trading

behaviour, perhaps with less reliance of livestock markets. While official figures may have inaccuracies, often under-estimation of livestock numbers (Cocks *et al.*, 2008), the figures being compared come from the same source and therefore would be expected to be similarly biased.

Reports of cattle and buffalo movement from India and Bangladesh into Myanmar by boat have emerged since the previous study was conducted. It was described by traders in China during the current study that cattle and buffalo are shipped from India/Bangladesh into Mawlamyine Port in Mon State of Myanmar. Information that cattle and buffalo are entering Myanmar from India and Bangladesh was also provided under the Myanmar component of the study.

The prices of cattle in livestock markets in Mandalay Division provided from official figures in 2015 suggest there has been little change in the price of cattle since 2008. Current prices were recorded as 300,000 Kyat – 600,000 kyat (approx. USD 240 – 470) per head for slaughter cattle and between 200,000 and 1,000,000 kyat (USD 160 – 790) for draft cattle. In 2008, a trader at Myitthar market in Mandalay stated that he paid 300,000 Kyat (USD 240) for slaughter cattle 400,000 kyat (USD 320) for draft cattle (Cocks, *et al.*, 2008). However, figures provided from a trader in China suggests that higher prices may be paid for cattle in Myanmar. The trader described purchasing cattle from Mandalay for between CNY 4000 – 6000 (USD 630 – 940) which would suggest a significant increase compared to 2008. Similar prices were described under the Myanmar component of the study, whereby cattle are said to sell in Bago and Magwe cattle markets for approximately USD 500 to 700 per head, with some cattle selling for up to USD 1000 per head.

Thailand

Thailand was not included in the previous study conducted by OIE and FAO (Cocks *et al.*, 2009), but a similar study was conducted in Thailand in 2008 (Cocks *et al.*, 2008), the results of which are compared with the results of the current study in order to identify recent changes in the large ruminant trade industry in Thailand.

The number of animals trading through Photong market in Tak Province appear to have increased significantly since 2008. Data collected at that time suggested that 800-1000 head of large ruminants passed through this market each week. Today, Chinese traders described that 10,000 animals pass through this market each week (5000 head per market session, with two market sessions per week). Thai government vets stated that the number may be even higher, with an estimated 100,000 head of large ruminants passing through each month (25,000 per week). This indicates at least a ten-fold increase in the number of animals passing through this livestock market each week. This is likely to reflect a similar increase in the number of animals crossing the border between Myanmar and Thailand at the Mae Sot crossing area, though the proportion of animals which cross the border but bypass the market is not known.

The price of large ruminants in the Mae Sot area of Thailand has also increased significantly since 2008. Today, cattle will sell in Mae Sot border area for THB 40,000 (USD 1130). In 2008, large cattle would sell in the same area for THB 18-19,000 (USD 610 – 640 (exchange rate on 1/1/2008)). The price has approximately doubled in the last seven years.

In 2008, the feedlot areas around western and central regions of Thailand were visited and, at that time, it appeared that many of the farms in that area were approved to export cattle to Malaysia. Today, the majority of movement from this area appears to be to the north of Thailand, destined for China. Some traders from this area, interviewed under the current study, stated that the price for sending cattle to Malaysia was no longer favourable.

Some movement of cattle from central Thailand to Chiang Mai was mentioned during a traders meeting held as part of the study conducted in 2008 (Cocks *et al.*, 2008). However, there was no indication of the volume of trade moving through this pathway at that time.

Vietnam

A number of differences were noted between the results of the study in 2009 and the results of the current study. The consultant operating in Vietnam noted that there is now better and more extensive road infrastructure in districts near the China border. There has been a concentration of trade, with closure of smaller markets in Cao Bang Province (Tong Cot and Lung Nam), and cattle and buffalo channelled instead towards a large market in Tra Linh District. Higher prices are now paid in Tra Linh district, compared to other districts in the Province. This price difference was not apparent in the previous study, and may indicate a higher competition rate in this area. More Chinese traders were observed at Tra Linh buffalo market in 2015 compared to 2009.

Another trade which was not apparent in 2009 is that some Vietnamese traders reportedly buy cattle and buffalo from Tra Linh assembly market, take them home and fatten them or wait until prices have increased, before selling them again at Tra Linh assembly market a few days, weeks or months later.

The national consultant for Vietnam noticed that there were more open discussions with traders involved in informal cross-border trade in 2015 compared to 2009: Traders now mention Myanmar, Thailand and Lao PDR as the original source of cattle and buffalo, whereas in 2009, they used to mention the Province of import into Vietnam as the place of origin. Official authorities also appeared to discuss informal cross-border trade more openly in 2015, compared to 2009.

Na Phac cattle and buffalo market in Ngan Son district of Bac Kan Province used to be a traditional assembly market gathering cattle and buffalo procured from the western districts of Cao Bang (Nguyen Binh, Bao Lac and Bao Lam districts), as well as districts from Bac Kan Province and neighbouring Provinces (Tuyen Quang, Thai Nguyen etc.). Na Phac cattle and buffalo assembly market have been superseded by a market in Nghien Loan commune in Pac Nam district in Bac Kan Province (north of Ba Be lake).

The premium beef value chain linking H'mong beef producers and Big C supermarket in Hanoi seems to have stopped. This value chain was supported by the Centre for Agrarian Systems Research and Development (CASRAD), the Vietnamese Academy of Agricultural Sciences (VAAS) and IFAD. According to a slaughterman interviewed in Cao Bang City, Big C can import better quality beef at similar prices from Australia and prices paid by Chinese traders in Tra Linh are higher than prices paid by Big C in Hanoi. Moreover the demand from Big C was only for premium cuts (grade 1), the rest of the meat (grade 2 and 3) had to be sold at Cao Bang wet markets.

In Hanoi slaughterhouses, the foreign origin of cattle slaughtered (e.g. from Thailand) does not seem to be a taboo subject anymore. Also, Australian cattle are now slaughtered in Hanoi and Modern, large scale slaughter facilities can be seen, where cattle are killed with a stunning gun rather than with a hammer, as was done traditionally.

Conclusions

The movement pathways described throughout this study provide a snap-shot of the large ruminant trade pathways and market chains as they exist at the time of the study. The degree of change seen since previous studies were conducted in the region highlights the dynamic nature of trade pathways and demonstrates how they are shaped by market forces acting in the region.

As the results of this study demonstrate, large ruminants are now being moved vast distances across the region to reach the high value markets of China and Vietnam. This extensive movement of livestock highlights the importance of whole-of-region disease control programs where live animals, and thus livestock diseases, spread across the region irrespective of national boundaries. A part of such programs should include development of criteria and protocols to support the movement of animals of an appropriate health status that minimises the risk of dissemination of disease.

Much of the cross-border movement that occurred throughout the region, at the time of this study, was unofficial and without regulation. This means that animals are able to move across borders with no checks or controls on health or vaccination status. There is, therefore, a need for improved regulation and control of animal movement in order to reduce the risk of FMD and other transboundary animal diseases spreading through movement of livestock. There is a need for improved control of animal movement, identification and methods of ensuring and documenting vaccination against FMD in animals being moved. While it is necessary to improve regulation and control of animal movements, it is also important that planning of livestock movement regulations includes consultation with stakeholders in the livestock trade industry. Implementing strict controls at borders without the support of traders, could result in alternative, unofficial movement routes being used to circumvent the official and regulated pathways.

Traders interviewed during this study described how unofficial taxes and poor roads over unofficial border crossings limit their trade and therefore, increased regulation could bring financial benefits to traders as well as reducing the risk of disease transmission through unofficial movement. One trader also mentioned that he has seen less FMD since the value of cattle had increased. With higher value animals comes the opportunity for higher gains but also greater losses for traders, should disease outbreaks occur. Therefore, opportunities might be explored into private sector contributions to disease control measures from large scale traders or other high level stakeholders involved in this trade.

When considering regional control of livestock diseases, addressing disease at its source is a fundamental approach to disease control. Preventing disease entering, and moving along, the livestock market chain in the first place is clearly preferable to controlling disease once it occurs. Such an approach may be based on elimination of disease from source populations and/or controlling the health status of animals that are permitted to move. The latter approach would target a smaller population of livestock and would also be effective at preventing disease in animals being moved through endemic areas, rather than just ensuring livestock are free from disease at the start of their journey. For example, in Myanmar, there has been no reported cases of FMD serotype A, yet this serotype has been isolated from each of the other GMS countries. This would suggest that there is maintenance of some FMD serotypes within the GMS which do not originate from Myanmar (believed to be the main source of livestock movement in the region). Therefore, controlling the health status of animals which are moving would be an effective measure at reducing spread of FMD through animal movements.

The major sources of livestock to the GMS identified by the current study are: Myanmar, Bangladesh, India and Australia. Australia is free from FMD and Central Myanmar is the focus of a SEACFMD vaccination pilot study at present. However, further work will be needed to consider the risks and possible mitigation strategies for cattle and buffalo entering from outside the region, namely India and Bangladesh.

Wherever live animals are being moved from an area where FMD is endemic, there will be a risk of FMD transmission, even where official measures are followed. Therefore, exploration of options for

movement of animal product rather than live animals should be considered. While there is still likely to be a demand for live animals (due to preference for freshly-killed product and limited refrigeration in some areas), this demand may be met from safer sources (FMD free countries or FMD free zones).

Establishment of export zones may help to develop a safer source of livestock from within the region. Development of these systems and official recognition of the trade may allow producers within the region to benefit directly from the higher value export markets of China and Vietnam. At present, it appears that the major profits from the sale and movement of livestock in South-East Asia and China accrue to the traders who move animals unofficially across borders in the region, rather than to the livestock producers. The price of beef and, subsequently the price of large ruminants is now so high in destination markets in South-East Asia that cattle from FMD free sources such as Australia are competitive price-wise with local cattle in the region. This further highlights the importance of improving the animal health status in South-East Asia to ensure continued access to these valuable markets

A concerning development in recent years, from an animal health perspective, is establishment of a trade in large ruminants from India and Bangladesh. This trade would appear to be unregulated and may result in entry of exotic strains of FMD, or other transboundary animal diseases, into the region. Even though some information was gathered about this trade during the current study, very little is known about it and further investigation is needed to understand the scale of the trade and the risks involved.

The largest markets for cattle and buffalo in South-East Asia are China and Vietnam. China has emerged as a major market for live cattle in recent years, which has driven some significant changes in animal movement patterns throughout South-East Asia. There has been a massive increase in demand for beef in China in recent years driven by factors including: population growth, increased per capita GDP and urbanization, all of which lead to increased overall beef consumption (Hansen and Gale, 2014). Given the large population in China, even small increases in per capita consumption of beef will have a massive impact on the total demand from the population. Domestic production of beef has been unable to keep pace with the increasing demand, causing the price of beef in China to soar. According to Hansen and Gale (2014) China's livestock sector is under pressure from rising costs, disease, environmental regulations and resource constraints.

The gathering of livestock in markets (particularly Photong market) and fattening farms in Thailand present both risk and opportunity for FMD control. There is already a process in place in Thailand for taking unofficially-imported animals into an official system, thus providing some level of control in terms of registration, vaccination and quarantine of animals. It is not known what proportion of animals circumvent these official procedures in Thailand, but if they are effective at capturing most animals then this should provide an opportunity to implement control measures relatively early in the livestock trading pathway. Other key points (in terms of mixing and gathering of livestock) along the livestock trading pathway identified by this study are: large assembly markets in Vietnam (Tra-Linh and Cho-U); trading and movement 'hubs' such as Xieng Kouang and Luang Namtha in Lao PDR and Chiang Saen in Thailand. However, these hubs are more likely to represent high volume movements but not necessarily areas where animals are held for extended periods.

A Chinese trader interviewed in Jinghong County in China noted that vaccination and quarantine in Thailand resulted in less FMD infected cattle entering China. It was also noted during the Lao PDR study that the Department of Livestock Development in Thailand provides documentation for cattle moving from Thailand, through Lao PDR, into Vietnam. There may, therefore, be future potential to develop regionally-accepted documentation for vaccination, thus providing greater confidence in the

vaccination status of livestock as they pass between countries. However, the success of this approach would depend upon, inter-alia: vaccination being delivered effectively; animals are appropriately identified; traders purchasing the animals would select vaccinated animals in favour of un-vaccinated animals; and regulations to support vaccinated animals entering the movement pathways and crossing international borders.

This study provides a useful addition to knowledge of livestock movements and market chains in the region. Although the study only represents a snapshot of large ruminant movements and market chains, it provides a baseline from which to monitor trends over time (by comparing the results of the current study with past and future studies). The study also provides a reference that documents the scale of large ruminant movement, and therefore the extent of the disease risks associated with such movements. It also enables us to define sources of livestock moving within the region, in order to better target control programs and provides a focus for member countries to develop effective policies to minimise the disease risks associated with livestock movements. While providing information for targeting control measures, the study also provides a reference that can be used to monitor the effectiveness of future control measures implemented by member countries.

Livestock trading patterns will continue to change in the future and be shaped by such things as: currency exchange rates; changes in policy and regulation (note initiatives in China to develop international economic corridors including: Bangladesh/China/India/Myanmar and China, and the Indo-China Peninsula (Yini, 2015); changing sources of livestock brought into the region or changes in the volume of livestock from existing sources; economic development within the region (potentially resulting in changing dietary preferences); and changes in livestock production systems. Therefore, it is likely that the information gathered from this study will need to be reviewed periodically in order to assess these changes. Alternatively, more investigation into methods for regular data collection which could help to follow changes in livestock movement patterns should be considered. Using information about prices to predict livestock movement patterns was previously investigated under the ACIAR project on Understanding Livestock Movements (ACIAR, 2011).

While the livestock pathways may change in the future, the results of the current study suggest that many of the stakeholders working within the trade have continued to operate through changes in the movement pathways, and have adjusted their trading patterns to suit current demands. Therefore, identifying traders operating within the livestock trade pathways could have a more enduring benefit. This could be particularly useful where dialogue is established between large-scale traders and government authorities in an attempt to explore measures to reduce the risk of disease spread through trade movements.

Discussion/constraints

By its nature, unofficial movement of live animals is not easy to study given that those involved in the trade can be difficult to identify and even when identified, they may be reluctant to disclose details of their activities for fear of repercussions. This situation may be exacerbated where government officers are involved with data collection activities. Despite this constraint, it was noticed by some of the consultants that government officials and traders in some regions speak quite openly about unofficial movement of livestock and that there appears to be greater acceptance that this occurs.

As described under the methodology section of this report, snowball sampling does have some constraints when applied in the context of large ruminant trade in the GMS. Given that the trade occurs over large distances some of the potential respondents identified through snowball sampling can be located very far from the initial respondents, thus making follow up difficult within the time constraints of the study. In some countries, the consultants felt that traders would not provide details

of their contacts and therefore snowball sampling could not be used as planned, but instead traders were asked more general details about the location of their contacts and then follow up studies were conducted in those locations. In this way, the trade pathway could still be followed but without traders having to disclose information that they did not feel comfortable providing.

The semi-structured interview technique was used very successfully in some parts of the study but was not considered applicable in all settings. Therefore, the semi-structured interview was replaced by a questionnaire in certain countries. Although questionnaires were suitable for some of the data collection, this approach does limit the information which can be collected and tends to prevent any kind of probing of trade pathway information.

Price information is very useful when looking at livestock trade patterns as it is a major driver of movement. It may also be used as a predictor of livestock movement directions if it could be collected routinely between studies such as this (ACIAR, 2011). However, the results of this and previous studies highlight the diversity of price information and the importance of collecting standardised measures of price, for example, whether prices are given on a per-head, per kg liveweight or per kg meat yield basis. If on a per-head basis it is important to know the type of animal (cattle/buffalo/breed), the stage of production (fattened or not) and the weight of the animals. Prior to the study, these factors were not taken into account and so the resulting data on prices was not easily comparable.

As with previous studies, this study only provides a snap shot of livestock movements at the time of the study and does not provide any detail about possible changes. While it is likely that the strong demand for beef in China and Vietnam will persist, other factors may influence the movement pathways, as described under the conclusion of this study.

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Appendix I

Checklist for Semi-structured interview

Movement pathways and market chains of large ruminants in the Greater Mekong Sub-region

Revised on 12th January, 2015

1. Key informant profile

- Gender
- Age
- Type of farm/trader: species, purpose, full-time or part-time operation
- Position of interviewee: trader/farmer/owner or farm manager
- Export and/or domestic trade of livestock
- Holding capacity or volume of livestock traded (either per week/per month/per year)
- How long has the business been established
- How has the business evolved over time

2. Procurement system

- How and from where does the trader source animals
- Use of Agents/middlemen/other traders/farmers (Names, contacts, location)
- Are these sources regular or do they change
- Estimate of number of animals from each source (use of flow diagram)
- Seasonal variation in number of animals traded/sources of animals/price – give reasons
- Market chain of livestock coming into this trader operation – probe back as far as possible to find original source of animals.
- What is the payment process between trader and suppliers Does the trader order certain numbers of animals from suppliers
- Do the suppliers have holdings or do they bring animals directly from where they purchase
- Does each supplier cover a specific area (province/district etc) or is there cross over between suppliers.
- Who buys animals from the village – what is the process of purchase from the village level farmer
- Confirm all routes coming in to the farm/trader
- Is there use of a livestock market or equivalent in procuring animals
- What is the process of bringing animals into the trader holding area/farm etc. (Probe regarding quarantine, treatments, examination to determine if any is done and whether sick animals are avoided or sought).

3. Distribution system

- Establish a picture of the structure and the system by which cattle are sold.
- How and to where do they sell animals

- Who are their clients – type of client (other trader (same country or neighbouring country), slaughterhouse, farm, etc) (names, contacts, location)
 - Do they use middlemen/agents etc to sell – how do they find their buyers?
 - Are these clients regular or do they change?
 - Estimate the number of livestock distributed to each client (use flow diagram)
 - Seasonal variation in number of animals traded/clients/price – give reasons
 - Market chain of livestock leaving this trader operation – probe forward as far as possible to find eventual destination of animals.
 - Confirm all routes of distribution from the trader and stakeholders/locations involved.
 - How long are animals kept with the trader (holding time)
 - How are the animals transported, does the trader transport himself or use a different company
4. Other traders known to this trader but not directly connected
- Do they know who are their competitors/others doing similar work (names/locations)
 - Do they know of other traders, even if doing different level of trading (names/locations)
5. Trader operations
- Biosecurity measures used on the farm/trading area/vehicle
 - Method of transportation: own vehicle/rented/shared and size of vehicle
 - Vaccination: what, when, where
 - Disinfection: what, when, where
 - Collection and distribution of animals – by trader or collected/dropped off by buyer/seller.
 - If they think animals are sick what do they do
 - How do they detect fever
 - Is it a continuous or an all-in-all-out system
 - If quarantine is used what are the costs/fees and for how long are they held
6. Animal health
- What are the main animal health issues they experience
 - Have they experienced any outbreak of disease in their farm/business - describe
 - What did they do
 - How were they affected in terms of business: improve profits, increase losses, stop trading for a time? Other impacts?
 - Information on suspected cause/source of outbreak
7. Pricing
- How do they monitor price of animals
 - Who and what determines the price of animals
 - How does price change according to area and what is the reason for the difference

- How does price change according to season and what is the reason for the difference
- How have prices changed in recent years
- How much they pay for livestock/for how much do they sell
- Try and get prices and financial arrangements at the different levels of suppliers/distributors (use of credit, paid employees, commissioned agents, traders, farmers, etc)
- What funds are available to traders and how does availability of funds affect their business
- Taxes and fees to enable them to trade
 - Official cost
 - Unofficial cost



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