FAO Regional Office for Asia and the Pacific
Animal Production and Health Commission for Asia and the Pacific

GMS Regional Trade in Livestock: Animal Flows and Disease Risk

A Preliminary Assessment of the Movement of Livestock and Livestock Products

Prepared by: Manoj Potapon, Chiang Mai University
David Roland-Holst, University of California, Berkeley

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
REGIONAL OFFICE FOR ASIA AND THE PACIFIC
Bangkok, 2013

Table of Contents

Page

List of Tables

List of Figures

Summary

Background

The official and unofficial movement of livestock and livestock products is a major risk factor in the spread of disease. Specifically in the Greater Mekond Sub-Region (GMS), where borders are extensive and powerful market forces move livestock across and within countries, the potential for trans-boundary spread of disease is great. However, with limited enforcement of regulation and information on these cross-border movements of livestock and their products, several challenges to proper disease management arise.

Methods and data

Governmental departments collect data on the official movements of livestock and their products. These sources include the Ministry of Commerce and the Department of Livestock Development in Thailand, the Lao PDR Statistics Bureau, the General Statistics Office of Vietnam and the National Institute of Statistics of Cambodia. FAOSTAT was also used as a supplement for official data. Interviews were conducted with traders and anecdotal evidence was collected in certain provinces of Thailand to obtain information on unofficial livestock movements.

Results

The majority of the available information on livestock and livestock product trade within the GMS is centered on Thailand (Tables 5-14). While data on livestock production is available for Thailand, Lao PDR, Vietnam and Cambodia, only the Thai government has truly invested in broad data collection thus far. This is evident in the trade statistics between Thailand and other GMS member countries provided in this report.

Conclusions and recommendations

Thai trade data can assist in inferring trade movements into other countries within the GMS, and these current trends are provided in the discussion and conclusion section. However, this is not sufficient for cost-effective disease risk management.

Because of these large information gaps on livestock trade within the GMS, more investment into surveillance and information gathering is necessary. Without this information, both governments and related organizations are unable to fully assess and manage the trans-boundary disease risk posed by livestock and animal product movements.

Introduction

Livestock trade is driven by a complex interaction of supply and demand. Overlaid on these market forces are administrative and cultural systems that regulate the movements of animals and people, which combine to form a mosaic of economic incentives. These interactions stimulate everything from large agri-food companies to impoverished peasant households who seek opportunity in livestock markets.

As livestock supply chains continue to grow, governments generally encourage animal trade for economic growth. However, livestock movements have several negative externalities, one being disease spread. Even though the potential harm of disease spread is significant, there is little consistency in animal health regulations or in the governing of livestock movement within and between countries. In addition, conditions of disease risk vary significantly in a given region, especially with regards to habitat, production and trading practices. Because of this heterogeneity, disease transmission across a particular boundary often occurs in both directions. This persistent source of disease risk is especially true in the GMS, where health standards vary greatly, in addition to the variations in production and movement of livestock between countries. These conditions may be challenging for public health agencies, but they provide a great and mutually beneficial opportunity for multilateral cooperation. While national control measures may be ineffective due to the vast trading networks within the GMS, all member countries can gain from coordinated management of the livestock trade.

To address these public health concerns, governments usually devote their attention and resources to registering formal animal trade. While this may be easier to observe and monitor, it is still necessary to address the informal trade of animals. Regardless of the market size of informal trade, the contagious nature of many animal diseases proves its importance. To better support the understanding of informal animal trading, a survey of trans-boundary activity was conducted in the GMS. This region reveals the fundamental economic drivers of the trade, the risk factors involved, and the potential for economically and socially effective policy.

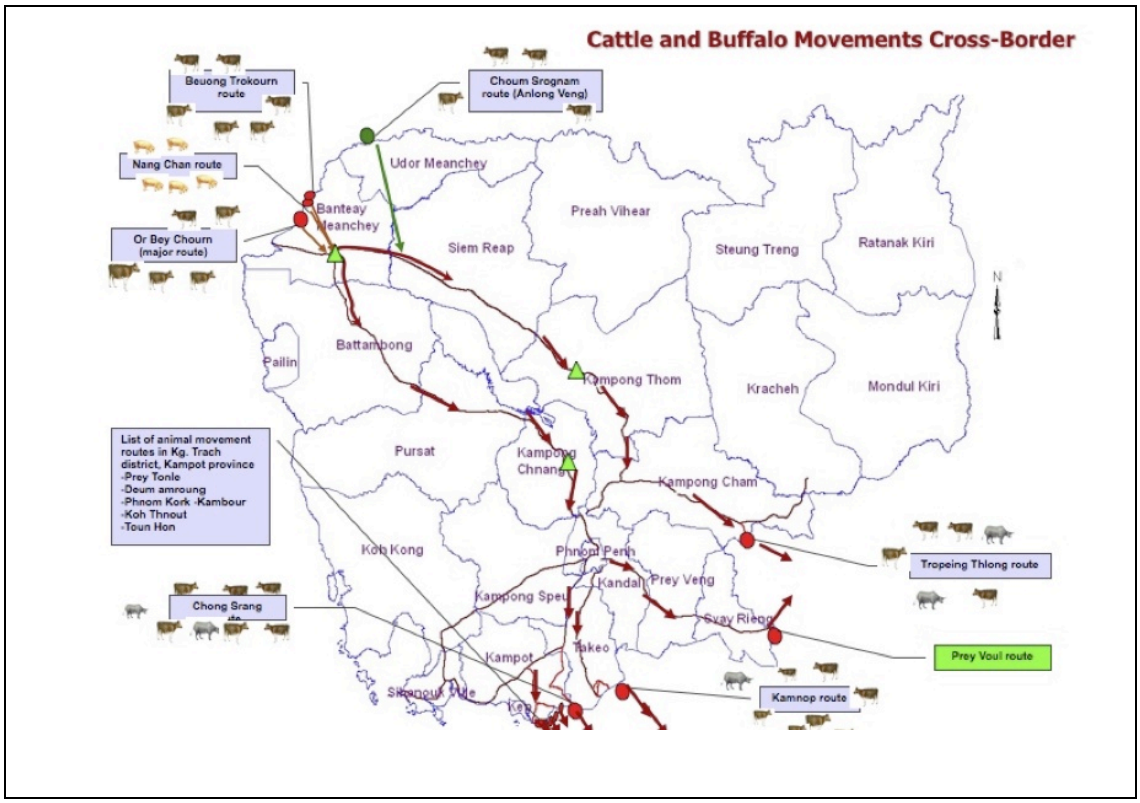
Literature Review

Animal trade flows are deep-rooted in several parts of Africa and Asia, and these trading cycles still remain active. Despite its history, however, official and independent research on these patterns within the GMS has been limited, and the data is fragmented and inconsistent. A few early examples (Cheva-Isarakul, 1995 and Cleland et al., 1996) were confined to data compilation and descriptive statistics. These authors recognized the importance of informal activities, both in terms economic growth and disease risk, but authoritative contributions to the region were limited until recently.

With the rapid growth of regional agri-food markets in recent years, there have been a few large and well-executed studies. The most robust of these is Cocks et al. (2009), which was the product of collaboration between the Food and Agriculture Organization of the UN (FAO), the Asian Development Bank (ADB) and the World Organization for Animal Health (OIE). This study focused on the risk of disease spread, and set a new standard for regional scope and rigor. A combination of official data synthesis and original surveys, this report offers a solid basis for regional risk assessment and best practice standards for more refined policy.

Among bilateral institutions, AusAID and the Australian Centre for International Agricultural Research (ACIAR) have been prominent supporters and contributors to regional livestock research. Several other institutions, such as the Danish International Development Agency (DANIDA), UKAID and the Japan International Cooperation Agency (JICA), have provided livestock sector development support across the GMS. However, apart from poultry sector work on HPAI, this support has yet to produce a significant body of research on trade or disease risk.

Figure 1: Mapped Cattle and Buffalo Trade Routes Thailand-Cambodia-Vietnam



Source: ACIAR (2010)

Several publications of independent research have also emerged. These include studies focused on an individual country, such as Kyaw (2009) on Myanmar, Perry et al. (2002) on Lao PDR, Cleland et al. (1996) and Cheva-Isarakul (1995) on Thailand, as well as surveys, such as Gleeson (2002). A promising recent development is a new line of research using genetic inference to trace patterns of historical infections (Di Nardo et al., 2011). However, this literature still remains in the early stages of development.

As the GMS continues its rapid growth within Asian agri-food supply chains, the priority should be to gather and improve evidence on animal trade flows and their implications for disease risk origination and transmission. The present study aims to make several contributions to this agenda, including a synthesis of the most current official data, a variety of original approaches to estimate informal trade flows, and an initial examination of the linkage between animal trade flows and disease risk.

Economics of Informal Trans-boundary Trade

Trade in livestock at the informal level is largely spontaneous and market driven, particularly between rural farm communities and urban consumers. When the forces of excess supply or demand cross national boundaries, it is typical to find informal traders exploiting national market disparities, while attempting to reduce transactions costs. Public institutions generally seek to regulate or even prohibit the resulting trans-boundary trade, which can undermine the livelihood potential of these activities. Alternative policies, focused more on promoting higher product quality and lower trade and transport margins, could instead achieve both public health goals and the improvement of living standards. In this section, the salient points of these market dynamics are discussed.

Livelihood Perspective

Those taking part in the informal livestock trade are motivated to obtain economic reward from local resource and market conditions. Market access is the primary gateway out of poverty for the majority of rural poor, and livestock are relatively high value agri-food products that can contribute to poverty alleviation. Farmers directly benefit from their livestock, but they are also linked to urban consumers across large supply chain networks comprised mostly of small or low-income intermediaries that can share in the benefits of this value chain.

Market Dynamics

Demand side forces in the livestock trade are generally dominated by population density and purchasing power. Because of similar demographics and economic fundamentals, livestock markets have been growing faster in Asia over the last two decades than in other parts of the world. The supply capacity in Asian markets arises from a wealth of natural resources and a commitment to investment in animal production, processing, and distribution.

Risk Management

Informal livestock movement is spread out geographically and has some clandestine roots, creating potential safety hazards and difficulties for cost effective monitoring.

At one end of the spectrum, smallholders living near mountainous borders may transport animals through areas defined by kinship networks, with limited regard for national boundaries. Potentially thousands of animals move daily through the GMS in such a fashion, each one with the potential to transmit disease. At the other end of the spectrum, organized syndicates might manage informal livestock trade. They would have a strong incentive to avoid surveillance, and possibly even to exploit animal disease for personal gain.

Most commonly, however, informal livestock trade in the GMS consists of networks of small enterprise and individual agents. Their behavior suggests that the net risk of informal livestock trade is in fact quite low. Since these private agents are not deterred from current surveillance and enforcement mechanisms, and are unlikely to be internalizing the cost of disease transmission, policy makers need to re-evaluate their position. Currently, clandestine border trade in the GMS is a place where punishment dominates strategic interactions, and the institutional environment in such areas is not conducive to positive growth. Many researchers have concluded that the most cost effective way to reduce the risks of informal trade should not be punitive, but instead provide incentives to divert animals into formal channels. These would include domestic processing, certification or traceability systems, and pooled transport and distribution resources.

Methodology for Data Gathering and Data Sources

Many characteristics of informal livestock trade make it challenging to gather data about its functions. An empirical evaluation of informal trade is necessary to better understand this phenomenon. In order to overcome any potential challenges, a variety of direct and indirect approaches are being developed.

Official Statistics

Official statistics have the advantage of authority and are generally the most convenient to obtain. However, their dependability and quality vary widely across the GMS. Additionally, while they may capture a significant part of the total livestock trade, it is difficult to know what proportion of disease risk it represents for two reasons. The size of the unobserved or omitted trade remains unknown, and informality has a leverage effect on disease transmission risk. Disease can make an individual animal a source of risk, but many systemic aspects of informal trade can amplify this threat. These include, but are not limited to, evasion (where animals are traded due to their illness), minimal sanitary and phytosanitary measures (SPS), information failures along the supply chain and high animal stress. For these reasons, it is essential to allocate appropriate resources into managing the risks of informal trade, regardless of its market size.

FAOSTAT and the Department of Livestock Development, Thailand (DLD)

Livestock data on domestic stocks and regional trade flows for Thailand was compiled from FAOSTAT and the Department of Livestock Development (DLD). The report from the DLD (2010) includes detailed import and export information for cattle, buffalo, swine, goat, sheep, and horses by trading partner, as well as by disease and death information. An overview of the available trade and disease data is provided in Table 1. In addition, data from the DLD statistical database (DLD 2009) provides provincial animal stock levels from 1999-2009 and regional stocks from 1989-1999. Collectively, this data provides an official and comprehensive picture of the trading networks and livestock development over the past twenty years.

Table 1: Overview of Official Live Animal Trade & Disease Data in Thailand

	Import by origin	Export by Destination	Total Imports	Total Exports	Dead Animal from Disease	Incidence of Animal Disease
Cattle	2004-2008 1987-2009*	2007 1987-2009*	1993-2007	1994-2007	1996-2007	2007
Swine	1986-2009*	2004-2008 1986-2009*	1993-2007	1994-2007	1996-2007	2007
Buffalo	1986-2009*	2007	1993-2007	1994-2007	1996-2007	2007
Poultry	2007	2007	1993-2007	1994-2007	---	2007

*Sources: DLD (2010); * FAOSTAT (2012)*

Ministry of Commerce (Thailand), Lao PDR Statistics Bureau, General Statistics Office of Vietnam, National Institute of Statistics (Cambodia)

Although the majority of the official data contained in this report is of Thai origin or in relation to trade with Thailand, a clearer picture of the trade and movement of animals, animal parts and animal feed within the GMS can be established through collection of unofficial data. The latter efforts are summarized below.

Unofficial Data

Representative Sampling

When official data is scarce or when certain conditions of livestock trade need to be clarified, a direct sampling of the trading community may prove beneficial. This is not only cost effective, but can improve the understanding of deeper behavioral mechanisms.

In order to broaden the view of animal trade, interviews were conducted with livestock market participants. These interviews focused on the border regions where trade is most likely to be under-represented in official statistics and where there is an elevated risk of disease transmission.

Network Based Sampling

Because of a particular interest in trading systems, it is useful to leverage the network characteristics of trade for sampling, which is known as snowball, breadth first, or respondent-driven sampling. This method decomposes and surveys trading networks, which begins with individual participants and moves out along their bilateral linkages. In order to fully assess the informal livestock trade along the border between Thailand and Myanmar, a team of local researchers was deployed to conduct a network sampling survey. Currently, an advanced version of this method is being implemented for large animals along the borders between Thailand and Myanmar and Thailand and Lao PDR. After an assessment of their results, other border crossings in the GMS should be analyzed.

Results

An overview of trans-boundary livestock movement in the GMS is provided and divided into two parts. The first part consists of official data from government sources. The results are presented on a per-country basis for livestock populations in Lao PDR, Cambodia, Vietnam and Thailand. The rest of the official data section involves information on imports and exports of Thailand from/ to Vietnam, Thailand, Cambodia, Lao PDR and Myanmar. The second part is unofficial data, which mostly consists of anecdotal evidence and informal conversations with traders.

Official Data

Livestock Populations

Table 2: Livestock Population of Lao PDR ('000 head)

	2006	2007	2008	2009	2010	2011
Cattle	1,324	1,353	1,499	1,426	1,474	1,538
Buffaloes	1,108	1,123	1,155	1,178	1,183	1,197
Pigs	2,032	2,186	2,548	2,947	2,753	2,650
Goats and Sheep	211	268	289	367	366	433

Source: Statistical Yearbook, Lao PDR Statistics Bureau

Table 3: Livestock Population of Cambodia ('000 head)

	2009	2010	2011
Cattle	3,768	3,052	2,787
Buffaloes	711	669	582
Pigs	1,860	1,435	1,415
Sheep	5	5	1
Goats	58	35	15

Source: National Institute of Statistics, Cambodia

Table 4: Livestock Population of Vietnam ('000 head)

	2006	2007	2008	2009	2010	2011
Cattle	6,511	6,725	6,338	6,103	5,808	5,437
Buffaloes	2,921	2,996	2,898	2,887	2,877	2,712
Pigs	26,855	26,561	26,702	27,628	27,373	27,056
Goats and sheep	1,525	1,778	1,483	1,375	1,288	1,268

Source: The General Statistics Office of Vietnam

Table 5: Livestock Population of Thailand ('000 head)

	2009	2010	2011
Cattle	9,079	6,956	7,144
Buffaloes	1,389	1,191	1,234
Pigs	8,538	8,347	9,682
Goats	3,838	3,800	4,276
Sheep	40	43	58

Source: Department of Livestock Development, Thailand

Cocks et al. (2009) determined that both Cambodia and Lao PDR are transit countries for large ruminants moving from Thailand to Vietnam. Domestically, Cambodia can meet its demand for these animals, and generally is an exporter of livestock. However, the domestic production in Lao PDR is insufficient, and the country must import large ruminants to satisfy domestic demand. This trend is only exacerbated by higher prices in the export markets to China and Vietnam. Table 2 shows that the livestock population of Lao PDR has increased almost every year since 2009. Tables 3, 4 and 5 provide the livestock populations of Cambodia, Vietnam and Thailand, respectively.

Thai Imports and Exports of Live Animals

The most recent data from the Ministry of Commerce in Thailand reveals that there is a large movement of swine from Thailand to Cambodia and Lao PDR (Table 6). Although the quantity of swine exports to each country fluctuates annually, Cambodia and Lao PDR consistently have a combined share of at least 97% of the entire swine export market in Thailand. While the movement of bovine animals from Thailand to Lao PDR is also relatively high, the data suggests that Thai cattle exports are generally diminishing within the GMS (Table 7).

Table 6: Thai Exports of Live Swine (head)

Destination	2009	2010	2011	2012
Cambodia	286,529	185,165	233,646	273,227
Lao PDR	146,383	100,514	150,777	290,853
Vietnam	546	468	35	3,130
Myanmar	2,098	3,180	1,160	2,215

Source: Ministry of Commerce, Thailand

Table 7: Thai Exports of Live Bovine Animals (head)

Destination	2009	2010	2011	2012
Cambodia	3,497	220	1,329	1,650
Lao PDR	100,004	86,835	13,033	85,654
Myanmar	33,409	52,574	1,738	4,720
Vietnam	5,602	713	0	322

Source: Ministry of Commerce, Thailand

Thailand continues to import the majority of its bovine animals from Myanmar, and the quantity has increased yearly since 2009 (Table 8). Thailand has also begun to import live sheep and goats from Myanmar (Table 9).

Table 8: Thai Imports of Live Bovine Animals (head)

Source	2009	2010	2011	2012
Myanmar	20,653	40,119	71,680	102,644

Source: Ministry of Commerce, Thailand

Table 9: Thai Imports of Live Sheep and Goats (head)

Source	2009	2010	2011	2012
Myanmar	0	0	100	24,000

Source: Ministry of Commerce, Thailand

Thai Imports and Exports of Livestock Feed

The Harmonized Commodity Description and Coding System (HS) classifies animal feed as the "preparations of a kind used in animal feeding," or Code 2309. Thai exports and imports of this type of animal feed are found in Tables 10 and 11, respectively. As seen in Table 10, a considerable amount of feed is being exported to Cambodia in comparison to other GMS countries. In recent years, Lao PDR has also required significantly more animal feed.

Table 10: Thai Exports of Animal Feed (HS Code 2309) (tonnes)

Destination	2009	2010	2011	2012
Cambodia	91,449	81,546	102,367	125,063
China	910	990	1,196	1,166
Lao PDR	37,991	41,592	48,133	68,201
Myanmar	6,082	5,495	8,581	9,780
Vietnam	11,087	12,593	14,879	14,262

Source: Ministry of Commerce, Thailand

Table 11: Thai Imports of Animal Feed (HS Code 2309) (tonnes)

Source	2009	2010	2011	2012
Cambodia	74	623	538	391
China	34,455	37,908	24,673	26,541
Vietnam	689	2,055	3,061	4,238

Source: Ministry of Commerce, Thailand

Thailand is a large exporter of animal feed and the share taken up by fellow GMS countries is increasing steadily every year. This has implications for livestock production in neighbouring countries, as well as a potential shift in the movements of livestock and their products.

Thai Exports of Livestock Products

Recently, the majority of animal parts, including guts, bladders, stomachs and other edible offal, are being exported to Lao PDR or Myanmar (Tables 12 and 13).

Table 12: Thai Exports of Edible Offal (HS Code 0206) (tonnes)

Destination	2009	2010	2011	2012
Lao PDR	0.09	215	464	1,285

Source: Ministry of Commerce, Thailand

Table 13: Thai Exports of Animal Guts, Bladders and Stomachs (HS Code 0504) (tonnes)

Destination	2009	2010	2011	2012
Lao PDR	0	0	122	50
Myanmar	0	0	0	421

Source: Ministry of Commerce, Thailand

Table 14 presents Thai export data on a variety of animal products. Several trends exist, but one of the most prominent is that Lao PDR is importing a significantly larger amount of bovine meat in recent years.

Table 14: Thai Exports of Various Animal Products for Human Consumption by HS Code and Country

Destination	2009	2010	2011	2012
0202 (KG) Meat of bovine animals, frozen				
Lao PDR	27,000	1,342,075	11,357,918	16,900,609
Myanmar	530,185	85,746	-	2,801,875
021020 (KG) Meat of bovine animals, salted, in brine, dried or smoked				
Lao PDR	-	373,810	1,351,149	4,407,598
0203 (KG) Meat of swine				
Lao PDR	349,500	916,500	2,323,509	1,752,323
Myanmar	1,596,595	192,458	-	190
021012 (KG) Bellies (streaky) & cuts thereof				
Cambodia	-	-	10	2,904
Lao PDR	5,162	27,044	22,825	16,537
0401 (KG) Milk and cream, not concentrated nor containing added sugar or other sweetening matter				
Cambodia	6,216,360	6,400,280	7,353,634	8,276,450
Lao PDR	502,504	949,902	1,019,581	434,328
Myanmar	484,893	93,247	27,539	62,784
Vietnam	329,339	708,618	905,683	1,348,062
0402 (KG) Milk and cream, concentrated or containing added sugar or other sweetening				
Cambodia	4,908,430	7,076,961	9,672,793	8,502,198
Lao PDR	2,105,702	3,120,452	3,575,822	3,788,308
Myanmar	1,971,101	3,578,570	6,017,798	2,534,951
Vietnam	890,446	672,218	672,493	943,459
040390 (KG) Buttermilk, curdled milk and cream, kephir and other fermented or acidified milk and cream (excluding yogurt)				
Cambodia	1,895,623	3,266,979	3,310,396	3,287,926
Lao PDR	1,557,443	1,152,494	1,877,001	2,035,552
Myanmar	935,745	888,983	1,553,982	2,382,197
Vietnam	186,519	348,133	353,851	197,028
040310 (KG) Yogurt				
Cambodia	1,272,707	1,477,292	1,174,039	724,885
Lao PDR	2,701,233	4,355,558	5,213,609	6,755,866
Myanmar	68,689	176,389	795,095	192,581
Vietnam	1,383,894	1,412,686	1,129,909	1,143,778

Destination	2009	2010	2011	2012
0407 (NO) Birds' eggs, in shell, fresh, preserved or cooked				
Cambodia	-	3,002	1,034,134	3,170,500
Lao PDR	13,260,300	440,230	78,710	270,300
Myanmar	4,173,160	4,509,846	4,328,260	2,425,905
0406 (KG) Cheese and curd				
Cambodia	18,941	32,694	103,202	63,068
Lao PDR	3,366	2,623	8,510	24,618
Myanmar	1,925	6,991	1,020	4,846
Vietnam	5,769	1,176	14,204	3,033
0405 (KG) Butter and other fats and oils derived from milk				
Cambodia	27,948	43,303	49,787	11,054
Lao PDR	126,160	132,736	170,350	219,334
Myanmar	17,615	31,938	397,038	171,614
Vietnam	58,760	-	-	-
0404 (KG) Whey; products consisting of natural milk constituents				
Cambodia	6,657,331	7,145,161	8,303,831	9,681,550
Lao PDR	2,701,384	2,772,460	2,781,282	3,115,555
Myanmar	2,742,051	3,755,332	5,207,541	62,896
Vietnam	363,350	820,800	296,500	320,400

Source: Ministry of Commerce, Thailand

Minimal reliable evidence was found on the trade of animals, parts or feed from Vietnamese, Cambodian or Laotian authorities. For an investigation of Vietnamese agricultural statistics, the Ministry of Agriculture and Rural Development, Vietnam Customs, the General Statistics Office and the Ministry of Industry and Trade were all examined, and found to be either out of date or containing no relevant information on agriculture. The same predicament occurred in Cambodia with the Ministry of Agriculture, Forestry and Fisheries, the National Institute of Statistics, the General Department of Customs and Excise and the Ministry of Commerce, as well as in Lao PDR with the National Agriculture and Forestry Research Institute, the Lao PDR Statistics Bureau, the Agricultural and Forestry Extension, the Customs Department, the Ministry of Agriculture and Forestry and the Lao PDR Trade Portal. Additional information from these countries would contribute to improved understanding and assessment of livestock trade and its inherent risks.

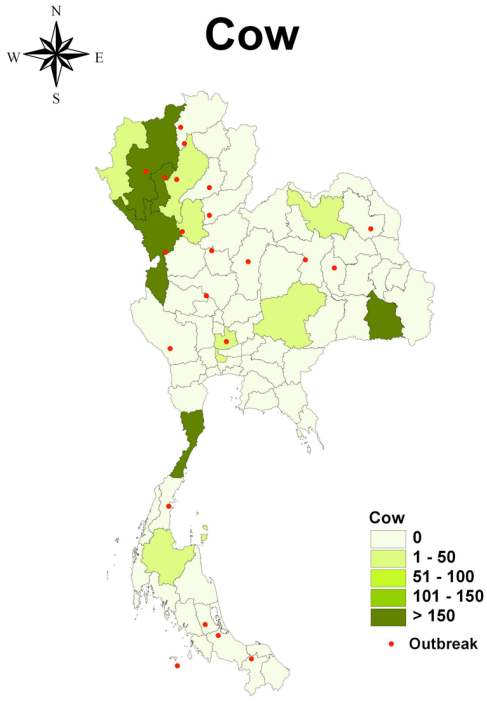
Data from FAOSTAT on food supply and the production of primary livestock goods within the GMS is provided in the Annex. However, FAO import and export statistics were not included due to issues of reliability. While several other sources were examined, a common issue in data collection from both governmental departments and secondary sources is that the information is either inconsistent or not available. While there is a considerable amount of research on land production and yield, population, dietary needs, and other such indicators, most data on food and livestock, if obtainable, is in terms of currency. As such, there is considerable room for improvement in the production of reliable and consistent information on domestic consumption, nutrition and trade of animals and their products.

Registered Livestock Movements in Thailand

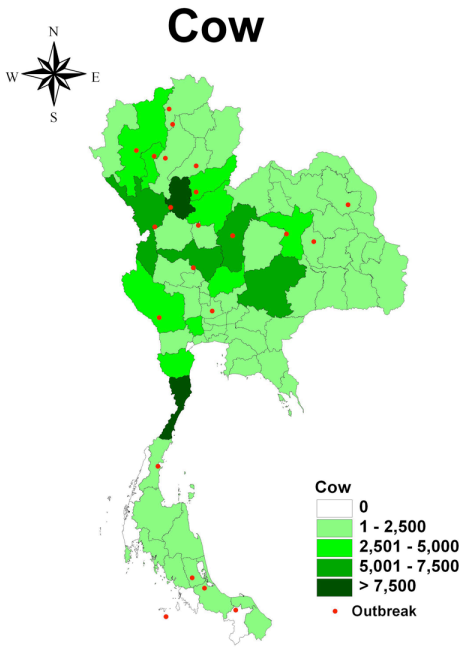
Figure 2 shows the movements of cattle, buffaloes, and pigs in Thailand from 2010 to 2012. For each of these animal species, GIS data is presented on the volume of registered animal movements within and between provinces. There are also indicators of where FMD outbreaks occurred (red dots). The movement of cattle is spread out across all provinces, while the volume of pigs and their movements are more concentrated in certain provinces. With added information, specific trade routes could be inferred.

Figure 2: Movements of Livestock within Thailand

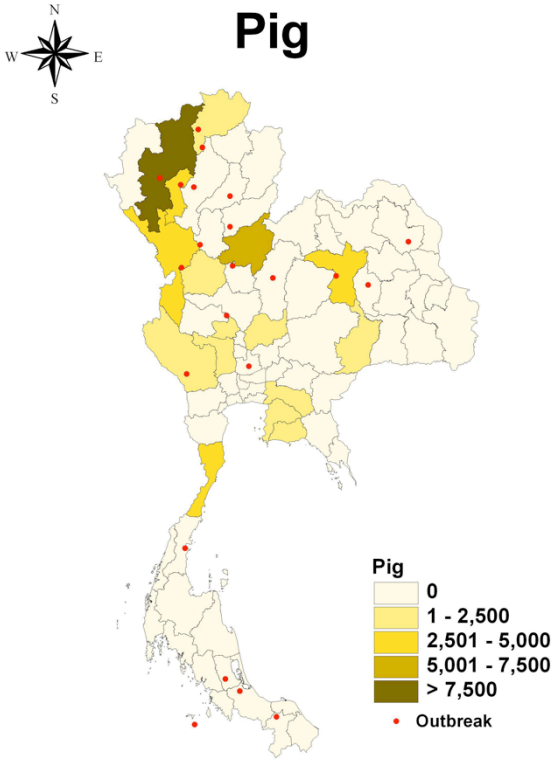
Movements within Province



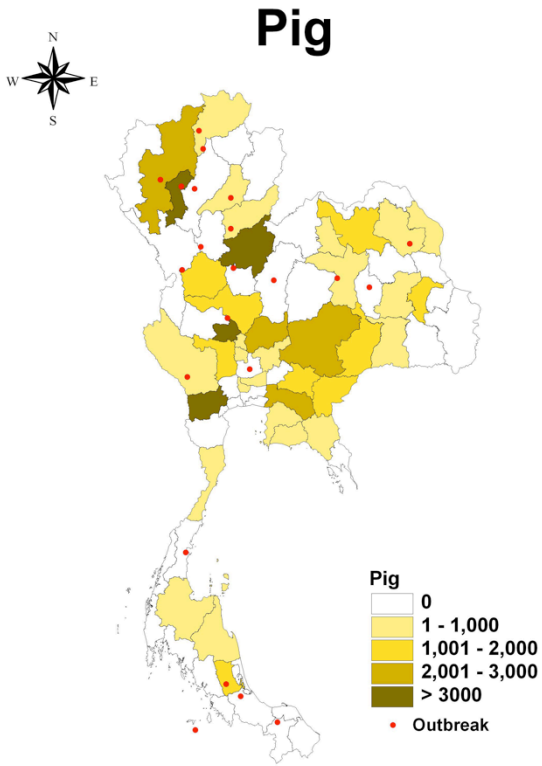
Movements across Province by Origin



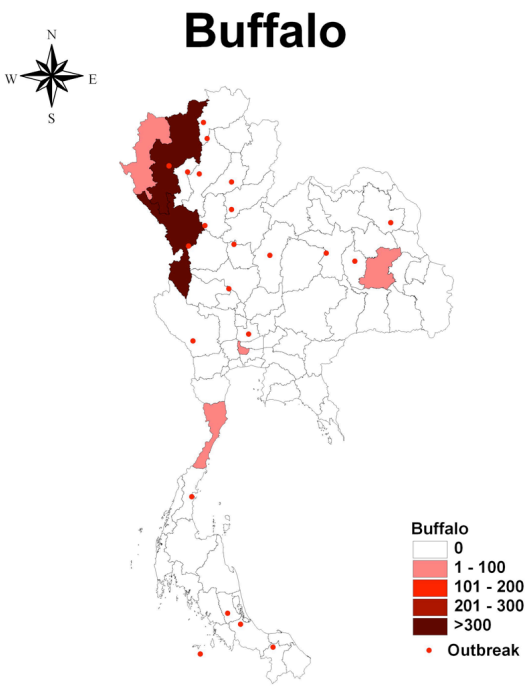
Movements within Province



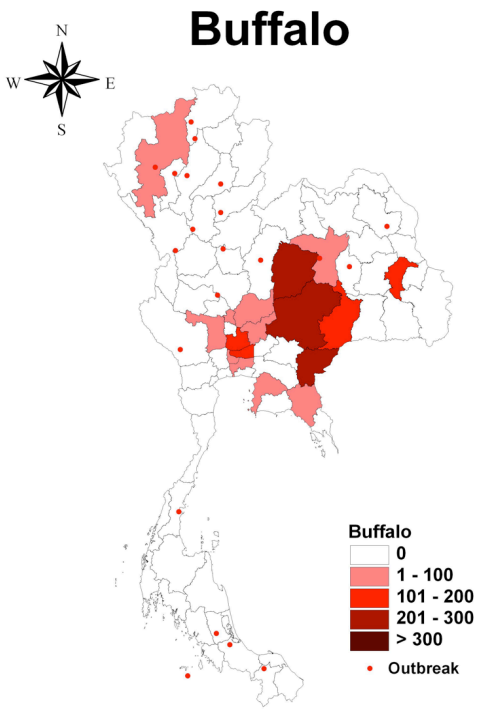
Movements across Province by Origin



Movements within Province



Movements across Province by Origin



Unofficial Data

Sample Data

The following section describes the data collected from informal conversations with trans-boundary actors in the animal trade. In addition, similar completed research of the region is discussed, as well as the potential for expanding the survey activities. It should be emphasized that the sampling was opportunistic and neither randomized nor independent.

Interviews with Small and Medium Producers in Northern Thailand

For this project, a research partnership with the Faculty of Economics at Chiang Mai University (CMU) was established for several reasons. Most importantly, Chiang Mai is the largest urban area in close proximity to four GMS member countries, and represents an ideal hub for studying regional trans-boundary trade. CMU also offers strong support for livestock research through their leading faculties in agriculture and agricultural economics. Lastly, its student body, which includes students from neighboring GMS countries, makes it an attractive recruitment pool for rural field research.

To better understand the fundamentals of non-industrial regional livestock production and its distribution mechanisms, direct observation and interviews of small to medium sized producers in Northern Thailand have been conducted. While the initial results are relatively anecdotal, they provide general insights into justifying, designing and undertaking more rigorous sampling schemes.

Most initial investigations have been combined with academic field trips, allowing students to conduct individual interviews. One such trip occurred in March 2013, when the weekly cattle market in the San Pa Tong district was visited. With the help of the local livestock department staff, the team was introduced to a trader who imports cattle from Myanmar. This trader stated that his annual import volume was approximately 3 000 head of cattle, paying a tax of 300 baht per head. He invited the team to his farm in Mae Sa Riang.

Bhumibol Dam and Catchment

The site above the Bhumibol dam in the Tak Province is known locally as a big area for raising cattle. Another assessment is being planned, but from an initial investigation, a trader in San Pa Tong suggested that generally more mature cattle, from four to five years of age, are imported from Myanmar. Even though the trader and the San Pa Tong livestock staff confirmed that there is a high demand for livestock, they added that this draws cattle into the market at a young age. Dean Lertrak at CMU suggests that it is dairy farmers who often dispose of surplus calves into the meat market, as the dairy market has not been as lucrative in recent years. Large beef importers in Chiang Mai are currently being identified and interviewed.

Three additional trips are planned, which include the border town of Mae Sot (between Thailand and Myanmar), the Tak Province of Thailand and the Greater Bangkok region. The intention is to interview livestock industry sources in order to supplement the previously collected data. Each trip will utilize students from the GMS who can maximize the use of local knowledge and language. This sampling information will be compared with the available official data on imports and exports.

Muslim Traders in Chiang Mai

Two former traders from the Muslim community in Chiang Mai were interviewed. One trader suggested that the livestock trade between China and Thailand had reversed in recent years, specifically in the Chiang Saen district. When this former trader was still active approximately ten years ago, China was selling cattle and the movement of animals was downstream along the Mekong River. The recent change in direction of animal trade flows is most likely due to China's emerging middle class and the growing importance of meat in their diet. The trader added that the strong Yuan and income increases, specifically in the Sipsongpanna population, are also major factors. On the eastern border, however, trade with Vietnam has been sporadic until recently. The customs officials and traders at Mukdaharn suspect macroeconomic factors have affected the trade, such as the credit crunch and a devalued Vietnamese Dong.

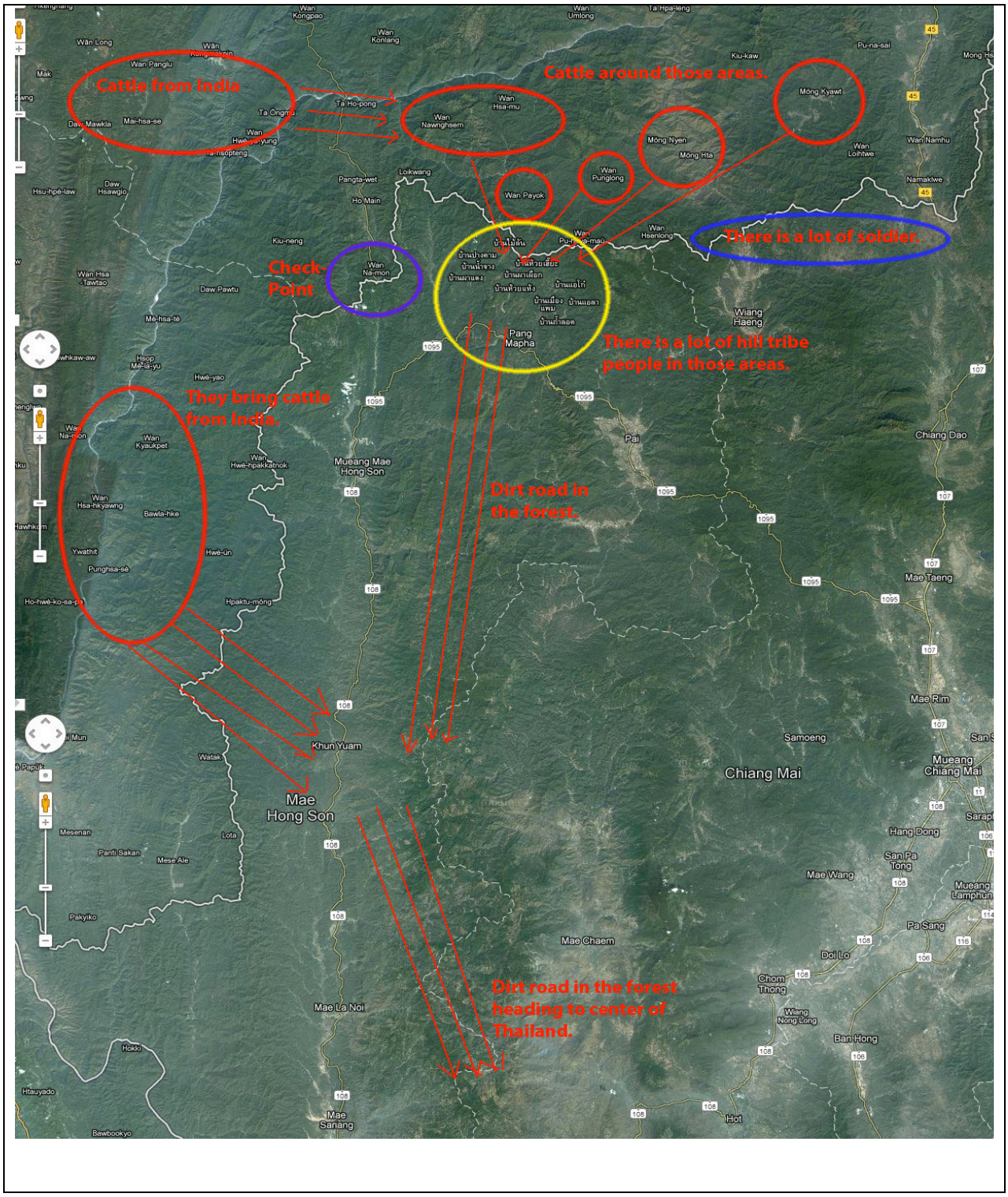
Network Based Sample Data

This survey consisted of interviewing active members in the informal trans-boundary animal trade and using their conversations to connect with other traders. This approach does not provide a representative sample, but it is nonetheless an effective way of collecting information from otherwise inaccessible sources.

The team met with traders from Chiang Mai, Lampang, and Mae Hong Son provinces, and gathered information about informal livestock movement across several borders, with a focus on Northern Thailand. A preliminary finding is that cows and pigs move regularly across the borders between Thailand and Myanmar. There are separate trading networks for formal and informal movements, and both types of trade are common. Cows imported from Myanmar generally arrive by truck on dirt roads or by foot through the forest. The traders who use dirt roads have a relay system in place to confirm that no soldiers are present while moving animals. It is easier to avoid detection when walking animals, but it is also quite slow. Typically, there are one to two hundred head of cattle per trip, and while the level of flow fluctuates with demand, this form of informal trade functions year round.

The largest informal flows in the north of Thailand exist around Mangmapha in Mae Hong Son province. This village has several couriers, is geographically high and contains a dense forest along the border between Thailand and Myanmar. Ampur Khunyuam, the second most popular border crossing, has a similar geography, which makes both villages ideal locations for informally moving animals across borders. A diagram of these trade routes is seen in Figure 3. It has also been suggested that approximately 80% of this type of informal trade is operated by ethnic minorities who have family members on both sides of the border.

Figure 3: Cattle Movement Across the Thai-Myanmar Border in Northern Thailand



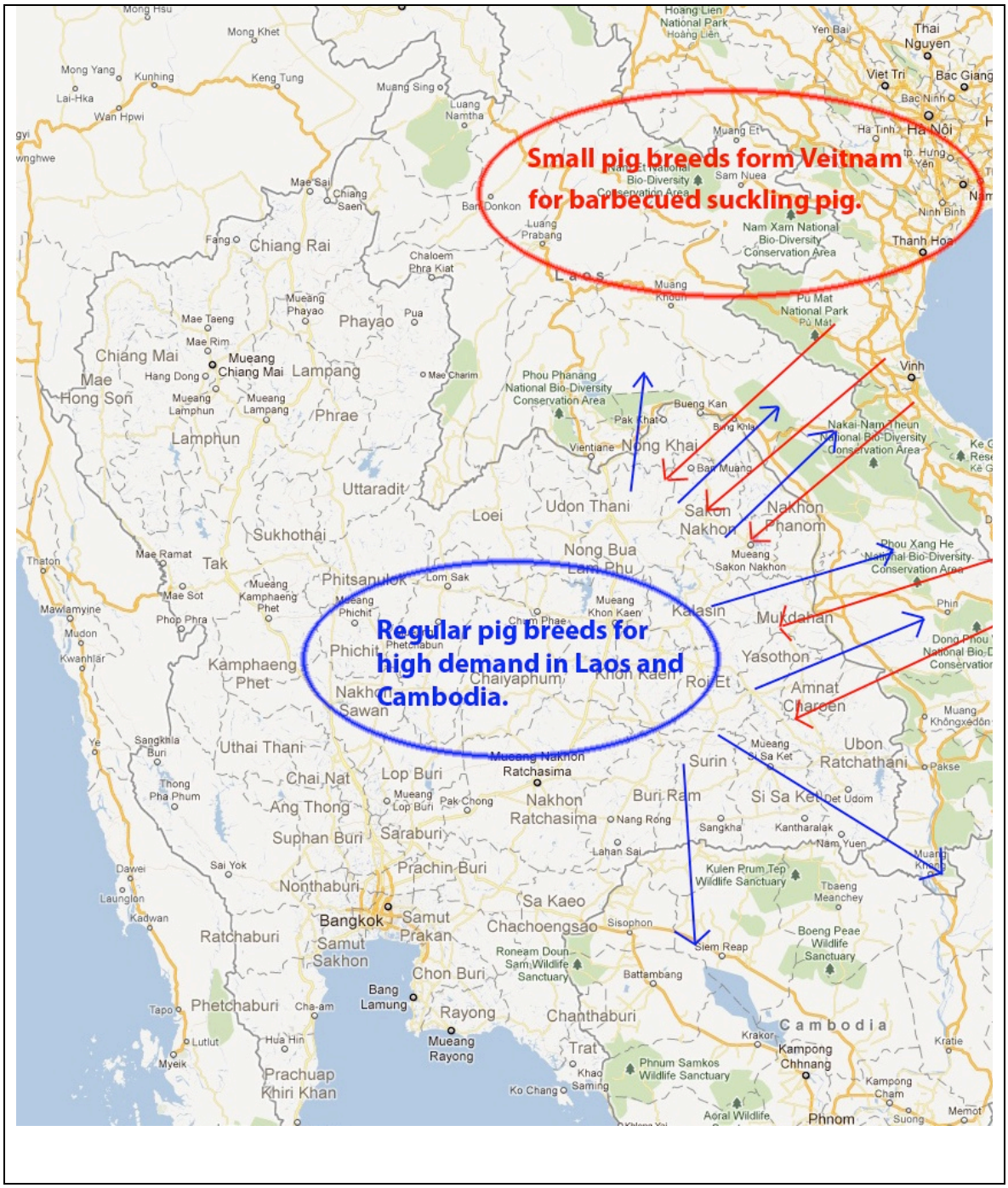
Source: Informal conversation with traders

The punishment for informally introducing livestock into Thailand is severe, and many traders employ ethnic minorities to move animals across the border because

of their willingness and connections. Traders who informally import livestock generally have arrangements to hand off the animals immediately after crossing the border. Buyers of these animals are typically illegal slaughterhouses or traders who come from Central Thailand. There is a higher demand for cattle in the central provinces, and the imported animals travel there for slaughter or for sale.

According to several traders who are involved in the cross-border trade between Thailand and Myanmar, the origin of most cattle is India, and to a lesser extent, Bangladesh.

Figure 4: Pig Movement in the Eastern GMS



Source: Informal conversation with traders

Discussion and Conclusions

Livestock Population Trends

In Lao PDR populations of cattle, pigs, buffaloes, goats and sheep have grown every year since 2009. With the exception of pig populations in Vietnam, the reverse trend is occurring in Cambodia and Vietnam for the same animal species.

Official / Registered Trade in Livestock and Livestock Products

Thailand is increasing its swine exports to Cambodia, showing that the movement of pigs is generally east towards Vietnam, with the potential for continuation onto China. Myanmar is also exporting more bovine animals to Thailand, where slaughterhouses are producing and moving meat to several countries, such as Lao PDR.

The official trade data also shows that the production and trade of animal feed from Thailand is rapidly growing. This alone has many implications on the production and demand for livestock within the GMS. Additional trends include Lao PDR importing more frozen bovine meat, live swine and bellies every year since 2009 from Thailand. Cambodia is also increasing imports of whey, milk and milk products, and in general, Thailand is increasing its exports of livestock products to all GMS countries in recent years.

Informal Trans-boundary Livestock Movements

The ACIAR spent several years collecting information on informal trans-boundary livestock movements in Cambodia (Figure 1; FAO, ADB, and OIE SEAFMD, 2009 and ACIAR, 2010). During the course of their project, snowball sampling and trader interviews were used to map the informal trade flows in Cambodia, Vietnam and Lao PDR. Their analysis extends to Thailand, and more information is currently being gathered on the trade between Myanmar, Thailand and Malaysia in order to connect these trade flows with what the ACIAR has mapped.

Snowball sampling should be utilized in other regions of the GMS as well. Several traders in Chiang Mai, Lampang, and Mae Hong Son provinces have already been

interviewed. Preliminary discussions with traders in the northeast have revealed several transit points for the informal trade of pigs (Figure 4). This analysis will be expanded into the eastern and southern regions of Thailand in the near future.

If these survey activities are to expand into other countries, however, a pilot approach should be first developed and focused on one GMS country. Thailand is the ideal candidate because of the established livestock research networks. In particular, the connections in the northeast can be utilized to rapidly organize and execute informal surveys at the main trading points. Surveys in the east and south would require new connections to be created.

Possible Livestock-Related Trade Developments

The GMS contains highly diverse geography, demography, and economic activity. As such, it is an attractive candidate for the study of trade-based economic development.

Myanmar is a country that is slowly opening up more to foreign trade and investment due to recent political changes. Myanmar has considerable amount of farming land and livestock, and is being used as a transit country for certain goods from India. However, although little evidence is available on current trade with Myanmar, there is considerable speculation about its future. A valid concern is that large investments may drive up the currency, affecting Myanmar's agri-food competitiveness. This influx of inbound capital could constrict the export sector, resulting in a total decline in cattle exports or the re-exporting of Bangladeshi cattle to Thailand. An alternative view is that the Chinese are buying considerably more cattle from Myanmar, thus diverting the flow of cattle from Thailand to China.

The growing middle class in China and higher relative prices in Vietnamese markets are two examples that are causing shifts in the direction of many traditional trade movements. Previous livestock patterns are also being amplified, such as significantly higher bovine exports from Myanmar. These prove that more research on this topic must be pursued in order to address or prevent any potential hazards.

Thailand's domestic cattle industry is debating their current trade strategy, with a potential focus of shifting upstream production towards Lao PDR. While debate is still ongoing, producers are approaching consensus on the value of traceability. There has been little success thus far with regards to traceability, but it is known to contribute to higher standards and productivity, technology growth, more coordination within the supply chain and the establishment of clusters. The local beef industry is preparing for regional trade liberalization, and these are important components of a competitive strategy.

Managing Livestock-Trade Related Disease Risks

Population density and the movement of livestock are primary drivers of infectious disease propagation. Unmonitored transport of animals from different regions contribute to the risk. However, the traders of livestock are responding to price differences in local and regional markets, and rarely consider the economic costs of this externality.

The animal health risk should be addressed through effective surveillance systems and movement control measures. Reliable evidence and risk models that contribute to more efficient targeting should also support disease risk management policies. Currently, the focus is on data that supports more advanced management of domestic and trans-boundary risk. For bovine animals and pigs, which are vulnerable to foot and mouth disease (FMD).

From this data, it is possible to begin creating probabilistic models of outbreak risk and severity, with forecasts of biological and economic damages. These risk-adjusted assessments would provide policy makers with a more accurate means to budget and target risk management interventions.

For example, the risk of disease spread continues to grow, not only due to an increasing population and its growing demand for livestock, but also by the interaction of nations that were unable to participate in same markets until recently. Agri-food trade also links the rural poor to opportunities in urban markets. The

benefit of this livestock trade for smallholder farmers increases with the size of the market and the value of their products. For this reason, trade and poverty reduction are intertwined in a favorable regulatory environment.

However, restrictive trade policies can negatively affect the health of those in the GMS. These types of policies strengthen the market for informal trade, which undermines standards and product quality, and elevates disease transmission risk. A more constructive approach would be to facilitate trade through incentive-based regulation. While multilateral cooperation and policy development may be difficult, the regulation of the GMS livestock trade provides a great and mutually beneficial opportunity for all countries involved.

References

Abila, RC and Foreman, S 2006, 'Control of Foot and Mouth Disease in South-East Asia', paper presented at the ISVI conference in 2006.

Ahuja, Vinod (2010). "Emerging production and market environment for livestock in the Mekong region: opportunities, challenges and the response," in Adams, L.B., G.D. Gray and G. Murray (eds.) (2010) Animal biosecurity in the Mekong: future directions for research and development. Proceedings of an international workshop held in Siem Reap, Cambodia, 10-13 August, Australia Centre for International Agricultural Research. [http://aciar.gov.au/files/node/14481/

Cheva-Isarakul, Boonserm (1995) The Flow of Cattle and Buffalo Towards Thailand. Department of Animal Science, Faculty of Agriculture, Chiang Mai University, Thailand.

Cleland, P.C., Baldock, F.C., Chamnanpood, P., Gleeson, L.J. 1996. Village level risk factors for FMD in Northern Thailand. Preventative Veterinary Medicine. Vol. 26 pp 253-261

Cocks, P., Abila, R., Black, P., Edwards, J., and Robertson, I. 2009. Livestock trade and marketing networks in Malaysia, Thailand and Myanmar. Report for AusAID-DAFF SPS Capacity Building Project.

FAO-ADB-OIE (2009) "Cross-Border movement and market chains of large ruminants and pigs in the Greater Mekong Sub-Region," by Cocks, Polly, Ronello Abila, Alexandre Bouchot, Carolyn Benigno, Subhash Morzaria, Pouth Inthavong, Nguyen Van Long, Nancy Bourgeois-Luthi, Axelle Scoizet and Socheat Sieng.FAO ADB and OIE SEAFMD, Bangkok.

Department of Livestock Development [DLD] (2009) Database of Livestock Statistics. http://www.dld.go.th/

Department of Livestock Development [DLD] (2010). Statistics of Animal Export (1998 – 2007). Bureau of Disease Control and Veterinary Service, Information and Statistics Group.

Department of Livestock Development 2008, 'Thailand Country Report', paper presented at the Lower Mekong Working Group Meeting, Pakse, Lao PDR, November 2008.

Di Nardo, A., N.J. Knowles & D.J. Paton (2011). "Combining livestock trade patterns with phylogenetics to help understand the spread of foot and mouth disease in sub-Saharan Africa, the Middle East and Southeast Asia," Rev. sci. tech. Off. int. Epiz., 2011, 30 (1), 63-85.

FAOSTAT (2012) Thailand Import of Livestock 1987 – 2009

Gibbens, J.C., Sharpe, C.E., Wilesmith, J.W., Mansley, L.M., Michalopoulou, E., Ryan, J.B.M, and Hudson, M. 2001. Descriptive epidemiology of 2001 Foot and Mouth Disease epidemic in Great Britain, the first five months. Veterinary Record. Vol 149. Pp 729-743.

Gleeson, LJ 2002, 'A review of the status of foot and mouth disease in South-East Asia and approaches to control and eradication', Rev Sci Tech, no.3, pp 465-75.

Heckathorn, D.D. (2002). "Respondent-Driven Sampling II: Deriving Valid Estimates from Chain-Referral Samples of Hidden Populations". Social Problems 49 (1): 11–34. doi:10.1525/sp.2002.49.1.11.

Kurant, M.; Markopoulou, A.; Thiran., P. (2011). "Towards Unbiased BFS Sampling". IEEE JSAC 29 (9): 1799-1809.

Kyaw Naing Oo, 2009, 'Epidemiology of FMD in Myanmar', PhD Thesis, Murdoch University, Western Australia

Ortiz-Palaez, A., Pfeiffer, D.U., Soares-Magalhaes, F.J., 2006. Use of Social Network Analysis to Characterize Patterns of animal movement in the initial phases of the 2001 Foot and Mouth Diseaser epidemic in the UK. Preventative Veterinary Medicine. Vol 76. Pp 40-55

Perry B.D., Gleeson L.J., Khounsey S., Bounma P. and Blacksell S.D. 2002. The dynamics and impacts of FMD in smallholder farming systems in South-East Asia: A case-study in Lao PDR. Rev Sci Tech Off Int Epiz. Vol 21, No. 3. Pp 663-673

Salganik, M.J. and D.D. Heckathorn (2004). "Sampling and Estimation in Hidden Populations Using Respondent-Driven Sampling". Sociological Methodology 34 (1): 193–239. doi:10.1111/j.0081-1750.2004.00152.x.

Thorpe, W., and Tesfaye Jemaneh (eds.) (2006). “Pig systems in Asia and the Pacific: how can research and development enhance benefits to the poor?” Proceedings of the regional workshop held 23–24 November 2006, Bangkok, Thailand, ILRI, Nairobi.