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SECTION 1

Executive Summary

Executive summary

Background

ACIAR commissioned the Centre for International Economics (CIE) in collaboration with AusVet Animal Health Services to undertake a review of animal vaccine supply and demand in Lao PDR. This review was undertaken in July 2006 as background to a proposed ACIAR project to improve the technical aspects of the production and distribution of vaccine produced at the Vaccine Production Centre (VPC) in Laos titled *Improved supply and quality of livestock vaccines in Laos (AH 2005/084)*. This document provides a combined summary of the CIE's and AusVet's final reports.

Current vaccine coverage is low

The VPC currently produces vaccines for 7 livestock diseases — hemorrhagic septicaemia (HS), classical swine fever (CSF), Newcastle disease, fowl cholera, infectious bronchitis, fowl pox and duck plague. In addition to locally produced vaccine, anecdotal evidence suggests that unofficial importation of vaccine is relatively common. Formal importation is permitted, but with a costly approval process and virtually unrestricted informal imports, no vaccine is imported formally.

Based on official vaccine production and distribution data, effective vaccination coverage rates are below 10 per cent for most diseases — and estimated at around 6 per cent for HS and 8 per cent for CSF. While these figures do not include imported vaccine, they do suggest that there is significant scope for increasing vaccination rates. Rates of vaccination in commercial and semi-commercial settings are relatively high, and commercial operators often source vaccine from neighbouring countries where most of their other inputs are also sourced.

Demand for vaccine at the smallholder level is currently relatively low for a complex set of reasons. Smallholders operate in a risky environment. They are often subsistence or quasi subsistence farmers who are managing a range of activities including subsistence food production and cash generating activities with limited labour. Livestock are one of the cash activities available to smallholders. But large ruminants in particular are primarily used as an asset — a way of storing cash that can easily be

liquidated when a cash need arises. As long as smallholders primarily use livestock as subsistence production and store of wealth, it is difficult to engage them in activities like vaccination because the risks of investing even small amounts of cash into livestock are significant. Moreover, investing in vaccination in isolation makes little sense if there are other factors that limit the ability of smallholders to realise returns on that investment such as poor nutrition and limited access to markets. Moving towards more intensive, specialised production of livestock where there is more turnover and livestock is used for income generation will ultimately drive increased demand for animal health services including vaccination.

Other factors limit livestock demand such as awareness and understanding of livestock disease and vaccination. The diagnostic network is limited, and as such the ability to effectively control outbreaks of infectious diseases is limited.

Distribution chain important

The quality of supply from the VPC has long been recognised as an issue for livestock vaccination in Laos. However, the facilities at the VPC are reasonable, with previous aid projects contributing significant funding in facilities and equipment. Supply quality issues at the VPC including storage problems, incorrect labelling and uneven production planning have been identified in the past and rectified where possible. While production quality problems at the VPC are obviously of concern, the major supply quality issues are related to distribution and cold chain management throughout the supply chain.

Transportation is a significant constraint — particularly to remote areas. Vaccine is transported to provinces using a combination of methods including bus, boat and plane. It can take up to 48 hours to transport vaccine from the government's Veterinary Supply Unit (VSU) to provincial offices. From there, it is generally stored and finally transported to district offices. Only around half of district offices have electricity, which makes refrigeration difficult. Some districts operate kerosene fridges, which have been supplied by past aid projects. Vaccine is transported mainly in foam ice boxes, and National Animal Health Centre (NAHC) staff estimates suggest that the temperature in boxes remains near zero degrees Celsius for only up to 10 hours. This leaves significant scope for the quality and efficacy of the vaccine to be compromised.

Transportation issues are difficult, as much of the necessary infrastructure to ensure an efficient distribution chain is relatively underdeveloped in Laos. In general, the road network is in poor condition, which increases

transport time. Other infrastructure such as reliable electricity supply and more effective cold chain storage methods are also problematic.

Funding of VPC a major issue

The major constraint facing the VPC in a technical sense is a funding shortage. This affects its ability to maintain and repair equipment used in the production of vaccine. This highlights a major sustainability problem facing the VPC. Current funding arrangements are not sufficient to cover the costs of operating the Centre. In the past, donor funding has assisted to 'fill the gap', but there are currently no donors funding the VPC. Some factors contributing to the funding problem at the VPC have been identified in this study, including:

- low factory price of vaccine — significantly below the cost of production;
- no system of pre-paying for vaccine;
- long payment delays common and non-payment also a problem;
- inability to enforce payment; and
- a reduction in the level of government funding, partially as a result of past donor projects and the expectation of ongoing funding by donors.

Current vaccine prices were set in 2000, and have not been adjusted since. As a result, prices don't cover the cost of production. This study estimated that based on reported distribution, the maximum income generated by vaccine sales at the VPC in 2005 is around US\$40 000. Other funding comes from the government (for full-time salaries and electricity expenses) and from a revolving fund left over from the last EU project. The inference from the current price levels is that they are designed to encourage vaccination by smallholders. However, in reality, the factory price of vaccine is a very small component of the final price paid by smallholders in most cases. Mark-ups and discretionary charges along the supply chain are overwhelmingly the major determinant of the final price at farm level.

Part of the problem with non-payment stems from the fact that a significant proportion of vaccine distributed from the VPC is done through government organised campaigns. Here, the primary objective is to distribute a targeted amount of vaccine, with little or no consideration given to the sustainability of payment recovery under this system. The VSU also indicated during consultations that it has attempted to enforce payment by withholding supplies until payments have been received for previously supplied vaccine, but that the government had effectively

overruled them and required that they continue supplying. Taking away this option means that incentives for payment throughout the supply chain are low. It encourages non-payment and rent seeking and ultimately reduces the sustainability of the VPC.

Future demand depends on development

Demand for vaccine in Laos in the future will largely be determined by the future size and structure of livestock industries. This in turn will be influenced not only by economic development within Laos, but also demand for livestock products in neighbouring countries. Livestock are widely traded, and while Laos is some way off developing a processing sector capable of exporting meat, demand from neighbouring countries is already driving significant change in livestock industries. The success of several recent projects, especially centred around increasing forage production for feeding cattle, has been influenced by strong demand in Thailand and in particular Vietnam and consequently high prices. But there are reasons to exercise caution about extrapolating from this current situation and concluding that cattle production in Laos has a long term future supplying these countries.

While meat consumption in these countries and China can be expected to grow along with incomes, evidence from other countries in the region suggests that this will favour pig and poultry meat rather than beef. Also, as the markets in these countries develop, imports of meat will tend to be favoured over live animal trade. The formal restrictions and market constraints on importing livestock and meat into countries such as Vietnam are likely to change with development and investment in transport and cold chain infrastructure to facilitate imports of meat from more efficient producers will become more viable. In addition to this, if neighbouring countries follow the lead of Malaysia and relax restrictions related to FMD, imports of beef from competitive suppliers such as Brazil and India will become a competitor to live cattle imports. The bottom line is that live trade into these markets will face increased competition over time, and any involvement in the development of the sector should take this into account.

Notionally, given the current low vaccine coverage rates, there is significant scope for increased demand. But as long as livestock is viewed primarily as a vehicle for saving or an asset and cash incomes remain extremely low, it is unlikely that demand for vaccine will increase significantly. Willingness to invest in animal health and other inputs depends largely on a degree of intensification. This does not necessarily mean significantly more animals for a smallholder, but does necessitate a move away from keeping animals

as an asset to keeping them as a more commercial turnover based activity. Intensifying production also promotes smallholder interest in and understanding of animal health — a lack of understanding is often cited as a reason why farmers don't vaccinate animals.

Even with strong demand and associated high prices, smallholders must take significant risks to intensify their production of livestock within the subsistence farming system they currently operate in. But as general economic development increases in Laos, the risks of intensifying and becoming more specialised in particular activities will decrease. This in turn will improve the benefit-cost ratio of intensifying and more smallholders will take this path. This development will be the biggest factor that will drive demand for not only livestock vaccine, but a range of other animal health and management inputs that are required in a more intensive system.

Recommendations

The terms of reference for this study also included a request for recommendations for improvements to the proposal for project AH 2005/084 where appropriate. These are outlined below.

Develop a new business plan for animal vaccine supply

One of the clear findings coming out of this study is that the domestic vaccine production system that currently operates is not sustainable. Vaccines produced at the VPC are sold for less than the cost of production and funding shortfalls are not met appropriately through other sources. Distribution through the VSU does not seem to offer assurances of financial viability or effective marketing. An option for ACIAR is to work with the Lao government to develop an alternative business model for producing and distributing livestock vaccine. This would involve three major steps:

- get an agreement from the appropriate level of government to develop a study to look at options for vaccine supply and distribution;
- implement and undertake the study, develop options and reach an agreement on the preferred option; and
- implement the agreed option.

Once the agreed option has been implemented, a clear assessment of the technical capacity at the VPC in the context of the new business plan could be used to inform practical and useful interventions on the technical side.

Other aspects such as the supply chain could also be looked at in the context of the new business plan.

The study would have to examine options for dealing with the VPC and VSU in the broader context of the government's approach to public expenditure and state enterprise reform. It has to be recognised that some of the problems facing these institutions are linked to where Laos currently is in its transition to a market economy in Laos, and progress made on the related problem of developing robust systems of public finance and clarifying the role of government in service delivery. The government is working with international financial institutions on these issues, and approaches to dealing with the problems affecting the VPC and VSU would have to take account of the broader strategies being developed in these areas.

Formal collaboration with other livestock projects

Unless the business operations of the VPC are placed on a sustainable basis, the returns to any investment in its technical capacity are likely to be limited. Given that working directly with the VPC is contingent on a commitment to restructure the business to make it more sustainable, the question is what opportunities are there elsewhere if agreement cannot be reached?

This study has identified significant constraints affecting the demand for vaccines, particularly the adoption of vaccination by smallholders. Many of these factors relate to the smallholder production system and the inherent disincentives to engage in more intensive livestock production that are present in the current production system. There are a number of other livestock projects currently underway in Laos that attempt to address many of the wider factors that affect smallholder approaches to animal health and vaccine demand. If ACIAR is to work on vaccine issues in Laos, it makes sense to collaborate with these larger projects, which also provide a network of relevant provincial and district level government staff as well as other collaborators. In addition to this, being largely extension based, these projects provide scope for ongoing implementation.

There is an opportunity for field based research that looks more closely at the factors affecting smallholders' management of animal health, including vaccine use. In addition to this, the handling of vaccine throughout the distribution chain has previously been identified as a major constraint to the delivery of effective vaccine at the farm level. The proposal for project AH 2005/084 identified some of these constraints. A potential project could attempt to address some of the supply chain issues in the context of factors

identified as limiting vaccine use at the smallholder level. This would have the added benefit of addressing problems in the supply chain that affect imported vaccine as well as vaccine produced domestically. Collaboration with other projects would mean that information coming out of those projects on constraints faced by smallholders could also be used to inform appropriate interventions in the supply chain.

There are already informal linkages, with many of the in-country experts on the current proposal also involved in the larger projects. Much of the effort would be in establishing formal linkages at the higher management levels within the respective donor agency, and in ensuring that the method of collaboration in the field is formally agreed.

SECTION 2

***Livestock vaccines in Lao:
an economic assessment***

Report by the Centre for International Economics (CIE)

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We would also like to thank David Kennedy from AusVet for his valuable contributions, insight and good company during the project.

Glossary

ADB	Asian Development Bank
ASEAN	Association of South East Asian Nations
CSF	Classical Swine Fever
DLF	Department of Livestock and Fisheries
EuropeAid	European Union Aid Cooperation Office
FAO	Food and Agriculture Organisation
FMD	Foot and mouth disease
GMS	Greater Mekong Subregion
HS	Haemorrhagic septicaemia
ILRI	International Livestock Research Institute
NAHC	National Animal Health Council
ND	Newcastle's Disease
NGO	Non-government organisation
SEAFMD	South East Asian FMD campaign
VPC	Vaccine Production Centre
VSU	Veterinary Supply Unit
VVW	Village Veterinary Worker

1

Background

Agricultural growth is widely recognised as a major contributor to reducing poverty in developing countries. It is not surprising then that large amount of aid funding is devoted to improving the productivity of agriculture in developing countries. Agriculture is a major component of Laos' economy — accounting for over 50 per cent of the gross domestic product (GDP). Within this, livestock is estimated to contribute around 10 per cent to GDP. However, this figure masks major regional differences. In many upland areas, livestock accounts for over half of all cash income.

Livestock production in Laos is limited by high mortality and morbidity rates. Both endemic and sporadically occurring diseases impact on production, with the most important diseases being classical swine fever in pigs, Newcastle's disease in poultry and haemorrhagic septicaemia (HS) in cattle and buffalo. In addition to this, there is also a range of parasitic diseases that affect livestock, such as toxocariasis in cattle and buffalo that affect production. Poor nutrition also presents a significant constraint. The production and delivery of vaccines in Laos is an important factor that is likely to affect the development of livestock industries in the future.

Vaccine penetration, while difficult to pin down accurately, is widely considered to be low. A study estimated that vaccination coverage was around 30 per cent for large animals, 20 per cent for poultry and 10 per cent for pigs (Singkham 1998). However, these estimates are based on the number of vaccines distributed. The likely actual number of effectively vaccinated animals is likely to be lower due to problems with the distribution and efficacy of vaccines.

ACIAR is currently evaluating a proposal to look at improving the supply and quality of livestock vaccines in Laos. This is following previous projects, including:

- AS1/1994/038: *Improved diagnostic and control methodologies for livestock diseases in Lao PDR and Yunnan Province, PRC;*
- AS1/2003/001: *Control of trans-boundary diseases in Laos; and*

- *AS1/2003/001: Management of CSF and FMD at the village level in Laos PDR.*

Other donor agencies, particularly the European Union (EU) and the Asian Development Bank (ADB), have also been active in this area. There is concern in ACIAR that previous projects looking at vaccine supply and delivery mechanisms have not delivered sustained improvements in livestock health. As such, they have commissioned the CIE to undertake an economic assessment of the current and future demand for vaccines in the livestock industry in Laos. This study was undertaken in collaboration AusVet Animal Health Services.

2

Demand for vaccines in Laos

Demand for livestock vaccine is shaped by many factors. These include the prevalence of disease and the probability of contracting it, the impact of vaccination on this probability, and how producers see the risk of disease relative to other things that influence the returns from reducing this risk. In practice, there are many factors that shape a farmer's incentives and willingness to vaccinate. This is particularly true for smallholders, who manage complex, multi-product enterprises and must manage a range of risks — of which livestock disease is only one. In this section, we look at the factors that shape the current and future demand for livestock vaccine in Laos. These include the relative size of livestock industries, the structure of production, the role of livestock in the smallholder system, the role of commercial operators and the future prospects for livestock industries in Laos.

Livestock industries in Laos

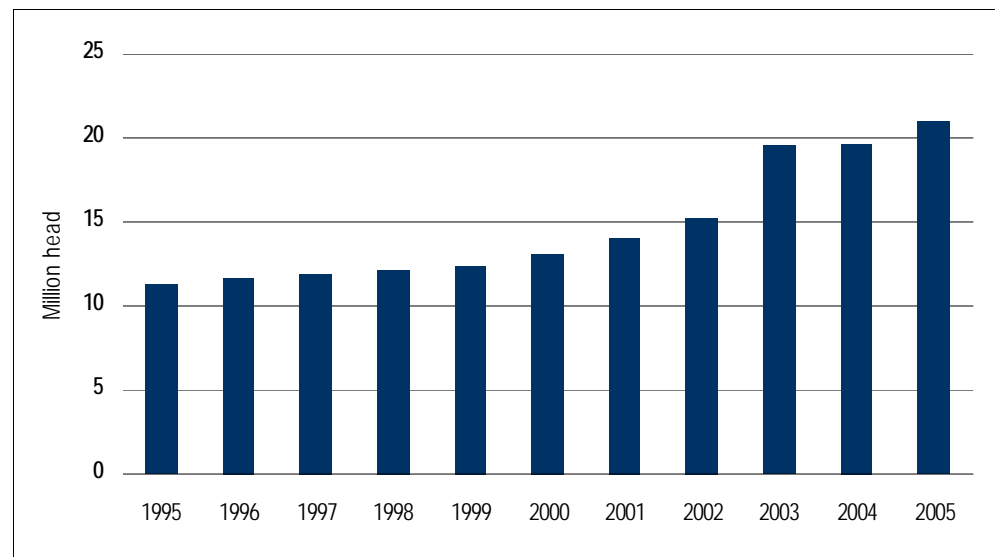
Livestock industries form an important part of the Laos economy. They account for around 10 per cent of GDP and is an extremely important component of cash income for smallholders — particularly in upland areas. In terms of animal numbers, the major livestock industries are poultry, pigs, buffalo and cattle. In general, smallholders dominate livestock production, with small numbers of commercial operators around major population centres. Data on livestock in Laos is extremely sparse. There was an agricultural census undertaken in Laos in 1998-99, however the only complete time series data source is the Food and Agriculture Organisation (FAO). Data from the FAO should be interpreted with caution, as information sources can often be outdated in developing countries such as Laos and numbers are often estimated. However, in the absence of a better source, FAO data is used in the following section.

Poultry industry

In terms of animal numbers, poultry production is the most important livestock activity in Laos, with almost 75 per cent of households raising chickens. According to the FAO there are around 20 million head of

chicken in Laos. The agricultural census in 1999 estimated chicken numbers at 11.2 million, while the FAO had numbers at around 12.4 million in 1999. This implies that chicken numbers have increased by around 70 per cent since 1995. Chart 2.1 shows how the chicken population has grown since 1995. According to the FAO, the number of chickens in Laos grew by an average annual rate of around 7 per cent.

2.1 Chicken numbers in Laos



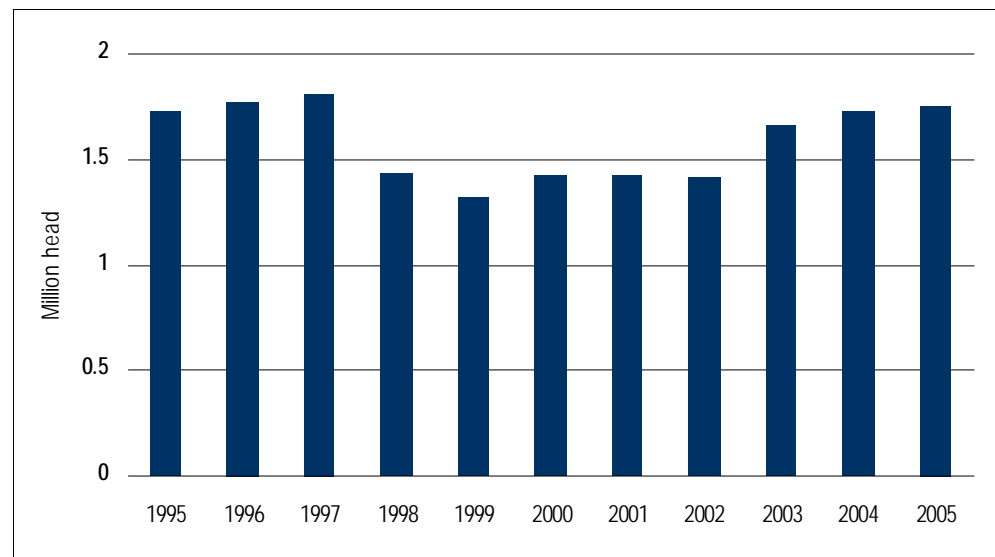
Data source: FAO 2006.

Smallholders dominate chicken production, with the average smallholder raising around 20 chickens. There is some commercial activity around major population centres, however the commercial sector is limited by high feed and other input costs. Concentrated feed is in short supply in Laos, and hence commercial producers generally rely on imported feed from Thailand, mixed with available domestic feed. In the smallholder system, raising poultry is generally the responsibility of women in the household. Chickens largely scavenge food from around the house and village with supplementary feed consisting — largely rice — fed twice a day. Chickens generally roam the village and are only penned at night (ILRI 2002).

Pigs

Pig production is an important activity in Laos — particularly in upland areas. Around 50 per cent of households raise pigs, and they provide cash income and a subsistence protein source. Smallholders dominate production, with commercial producers located near major centres as with poultry. In the smallholder system, pig raising is almost exclusively the responsibility of women. FAO estimates the current pig population in Laos at 1.8 million. Chart 2.2 illustrates how pig numbers are thought to have moved since 1995.

2.2 Pig numbers in Laos



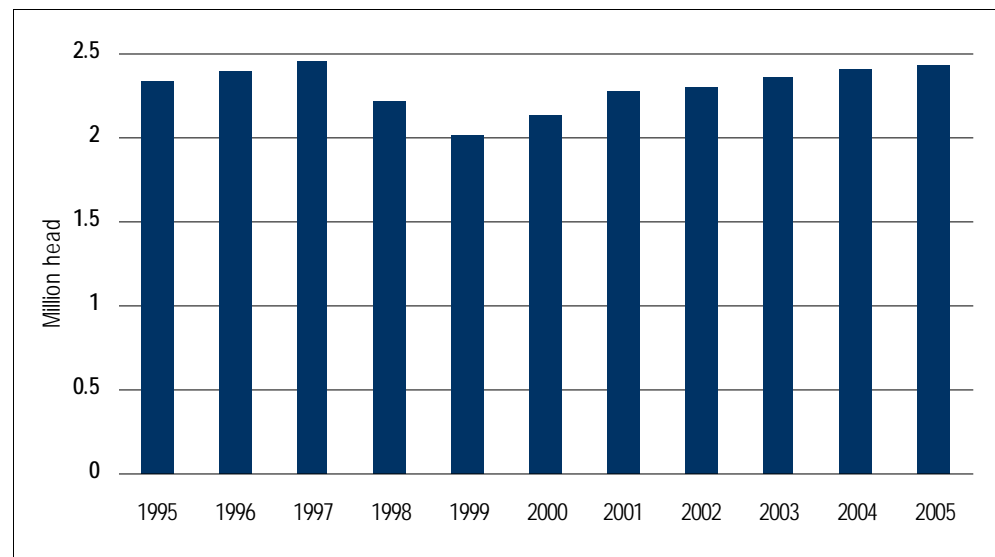
Data source: FAO 2006.

The data suggest that there has a trend decline in pig numbers (at a rate of -0.2 per cent annually), with a small dip between 1998 and 2002. Smallholders account for around 95 per cent of pig raising establishments. In most smallholder systems, pigs roam freely around houses and villages scavenging for part of their food requirements. Supplementary cooked feed is also provided, and the feed gathering process is labour intensive. Supplementary feed can include rice bran, broken rice, banana stem, yams, maize and other vegetation (ILRI 2002). Pig production is especially popular in Northern Laos for cultural reasons. The average number of pigs per household in Northern Laos is estimated at around 4, while for Central Laos, the average is around 1.5 and in Southern Laos this number is around 2.

Cattle and buffalo

Cattle and buffalo are a major source of cash income for smallholders in Laos, particularly in upland areas. Buffalo are closely tied to draught power and land cultivation, while cattle and buffalo also have the added benefit of being able to utilise common property land for grazing. FAO estimates that there are around 2.4 million cattle and buffalo in Laos. Chart 2.3 illustrates cattle numbers in Laos since 1995. According to the FAO, cattle and buffalo numbers have remained relatively steady, and within this, buffalo numbers have fallen slightly and cattle numbers have increased.

2.3 Cattle and buffalo numbers in Laos



Data source: FAO 2006.

The major difference between cattle and buffalo and other livestock industries in Laos is that there is significant trade in live animals to neighbouring countries. Much of this trade is informal and hence not captured in published statistics. FAO statistics put live exports of cattle and buffalo at around 30 000 head; however this figure fluctuates wildly. Official import statistics from Thailand tend to match the FAO data, and Thailand is the major destination for cattle exports from Laos. However, more realistic estimates of cattle and buffalo exports to Thailand are around 100 000 per annum. In addition to this, there is an emerging export trade with China and Vietnam as transport linkages improve. However little is known about the numbers involved in this trade (ADB 2005a).

As with other livestock activities in Laos, smallholders dominate production of cattle and buffalo. Growth rates are low, with animals taking 4-6 years to reach mature weights. Average live weights are up to 350kg for male cattle and 450kg for male buffalo. Calving rates are relatively low, with females producing their first calf at an age of 3 years, and an average annual calving rate of around 70 per cent. Calving rates for buffalo are considerably lower, estimated at around 50 per cent (ILRI 2002). This performance reflects not only disease prevalence, but also parasite control and poor nutrition.

Cattle and buffalo are often viewed as a form of savings or wealth accumulation in Laos. Cattle and buffalo are high in weight, and hence benefit from having a high value per unit relative to other income sources. In areas where road access is limited, they also have the advantage of being able to be walked to markets.

Livestock and smallholders

Livestock are an important source of cash income for smallholders in Laos. They are also an important source of protein as a subsistence food and a source of draught power for farmers engaging in crop production. Additionally, livestock — particularly large animals — are often seen as a source of wealth or capital accumulation.

In remote areas that are not easily accessible, there often is no organised marketing of livestock. In these instances, livestock are an ‘asset’ used to store cash for liquidation when a particular expenditure is needed. Large animals are often preferred in these areas, as they have a high unit value and are relatively easy to transport where road access is poor. This has a major impact on a smallholder’s decision on whether to vaccinate. If the suspected benefits of vaccination are relatively distant and uncertain to smallholders, they are less likely to vaccinate. Indeed, there are often few formal markets of any kind in remote areas, and the demand for cash is consequently low. Transport and communication infrastructure is the key element in developing markets in rural areas — these factors are closely linked to economic development.

Live trade is also important for smallholders, particularly those adjacent to neighbouring countries. In the past, informal trade from Thailand into Laos was a major source of animal movements. In recent years, this has shifted, with strong prices encouraging live exports from Laos to Thailand and Vietnam. Informal trade is large relative to total trade, with official trade only comprising an estimated 10 per cent of total exports to Thailand. There are several reasons for this informal trade including a range of regulations and taxes on animal movement that add costs to exporting cattle officially. More of these regulations are discussed in the next section. Trade to Vietnam is also increasing, with demand strong to the point where prices of up to US\$800 per head reported for cattle moving from Laos. All trade to Vietnam is unofficial, with Vietnam not officially recognising the importation of cattle.

Cattle and particularly buffalo are still an important source of draught power in Laos. They are primarily used in northern areas in rice production. As Laos continues to develop, the demand for draught power from livestock will decrease as more advanced equipment is adopted. This will most likely result in a realignment of cattle and buffalo numbers in favour of cattle.

Gender also plays an important part in livestock production for the smallholder. In general, raising pigs and poultry is exclusively the role of

women in the smallholder system, while raising cattle and buffalo is the responsibility of men. This invariably means that the demand for female labour is a constraint within the smallholder system, as raising pigs and poultry is far more labour intensive than raising cattle and buffalo. Even in a basic system, some supplementary feed is provided for pigs and poultry, and this feed must be gathered and prepared for the animals. In addition to looking after pigs and poultry, women are also often responsible for much of the other subsistence production in the smallholder system. Demand for labour and limited supply is undoubtedly one of the major constraints smallholders face in intensifying production and improving productivity. The report prepared for the ADB's proposed Participatory Livestock Development Project said, for example, that with respect to pig rearing (ADB 2005d):

Labor resources are clearly inadequate in many rural households of the Northern Region. Shortages are often seasonal but when they occur, priority activities may interfere with the effective management of housing pigs. Pigs that are usually housed may be released to scavenge during periods when cropping operations are particularly intensive as labor needed for feeding is fully utilized in trans-planting rice.

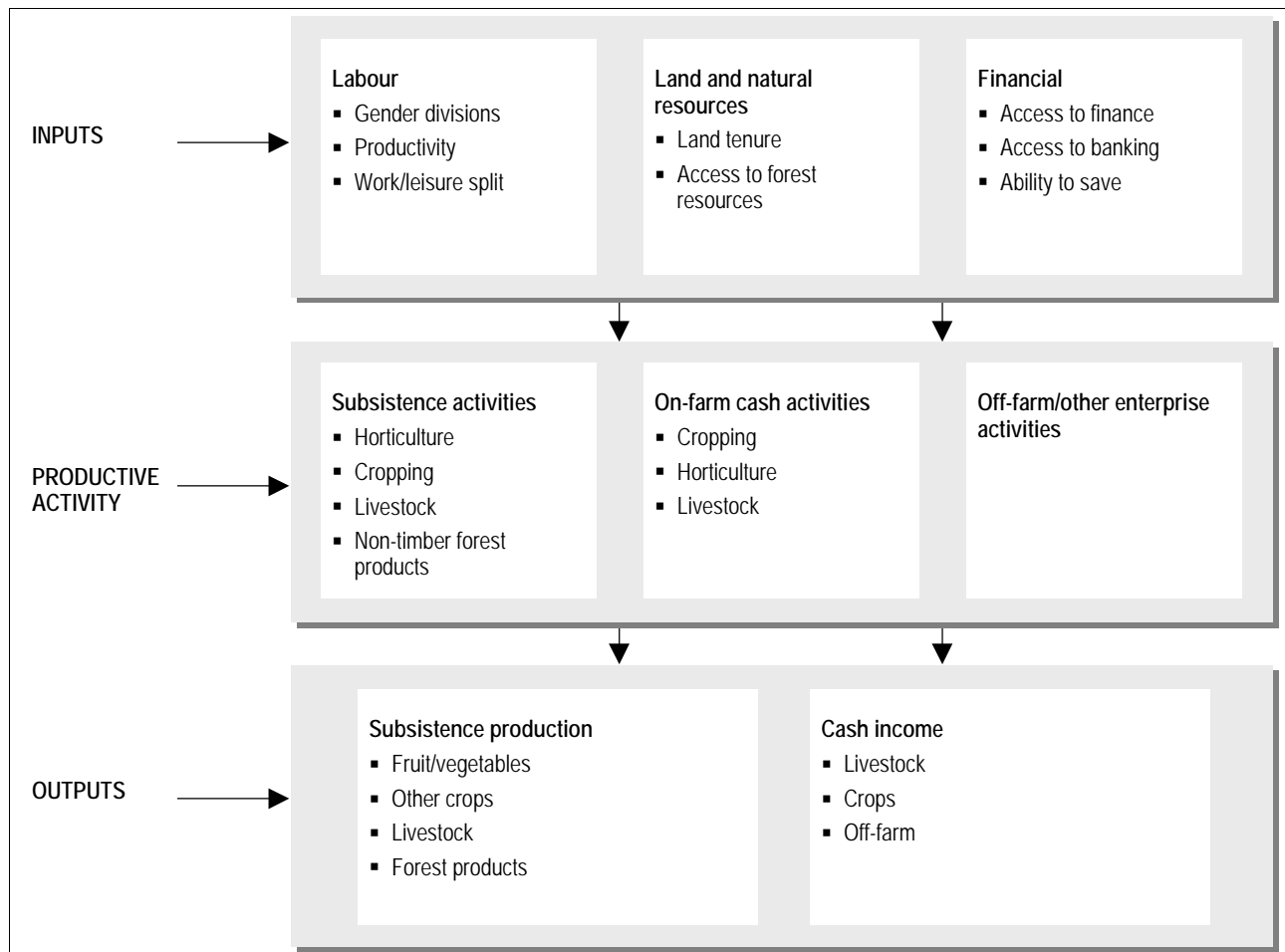
Smallholder enterprise structure

One of the difficulties that arises when attempting to characterise the role of livestock production in the smallholder system is that it does not make sense to look at livestock as an enterprise on its own. While there are smallholders who engage in livestock production in an enterprise sense, for a majority of smallholders, livestock is only one of a range of activities. The reason for this is that Lao smallholders face a range of constraints and incentives that lead sensibly to a system of risk management and diversification. Chart 2.4 attempts to capture some of these factors.

Smallholders face decisions about what to produce given limited resources. As noted earlier, labour is a significant constraint and within this, gender divisions are important. Given that labour is close to fully employed — changing the mix of activities in favour of a particular activity means that labour must be diverted from another activity. More effective vaccination would result in a reduction in mortality and morbidity rates. This, other things being equal, would mean more animals that require forage and other inputs that currently depend significantly on labour. The additional forage requirements would come not only from more animals, but in more healthy animals with higher feed requirements. In addition to this, livestock vaccination is a relatively labour intensive activity, particularly in the free ranging livestock systems that operate in Laos. Livestock must be

gathered for vaccination, which can be exceedingly difficult for chickens, and is problematical for large animals, which are often spread over a large distance. The question is which activities this additional labour would be drawn from in the current system.

2.4 Smallholder production systems



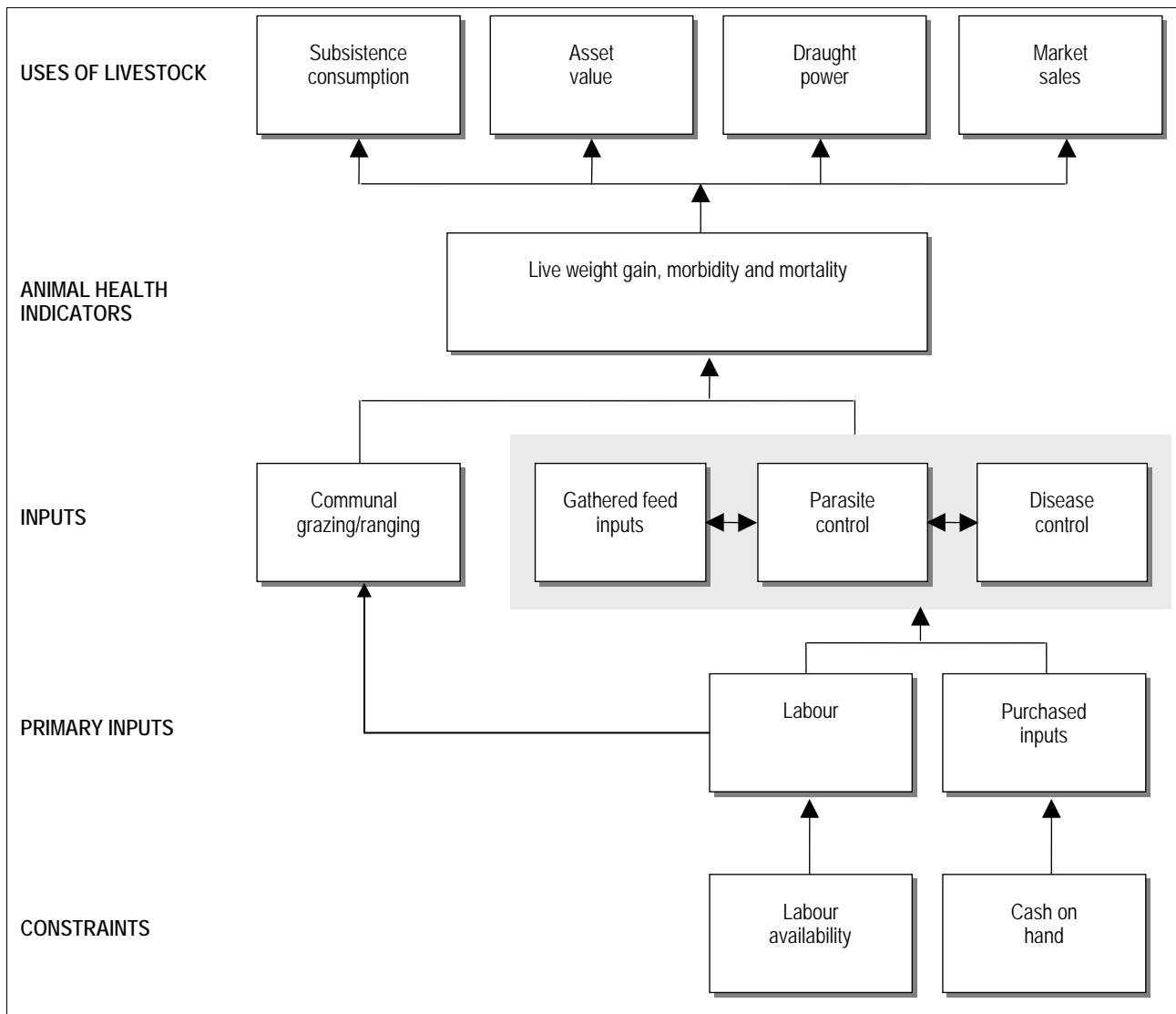
Source: CIE.

In the current system of subsistence farming combined with limited cash generating activities (especially in rural areas), there is limited capacity to divert labour towards animal management and vaccination. Incentives in this system are naturally skewed towards ensuring basic food needs are met in the first instance, with other cash generating activities largely a secondary priority. In other words, the risk adjusted returns of additional investment in livestock production are not sufficient in the current system.

While chart 2.4 attempts to characterise the overall smallholder production system, it is also a useful exercise to expand the livestock component, in particular focusing on the role of animal health. Chart 2.5 attempts to

illustrate the uses of livestock and the role of animal health and the inputs that smallholders have at their disposal.

2.5 Smallholder livestock production systems



Source: CIE.

The process of specialisation will lead to a shift in emphasis from an enterprise system focused on subsistence needs to a more intensive system oriented to a specific cash market. When this occurs, demand for vaccination along with other inputs into animal health should increase.

Disease prevalence and current vaccine demand

There is a range of diseases that affect livestock in Laos. Vaccines are currently produced for seven different diseases. While all these diseases are important, the major livestock diseases in Laos are:

- Classical Swine Fever
- Haemorrhagic Septicaemia
- Newcastle's Disease
- Foot and Mouth Disease.

A major issue that is confronted when trying to examine the demand for vaccine in Laos is the lack of prevalence data. In the absence of other complicating factors, a farmer would decide whether or not to vaccinate his livestock for a particular disease based on assessments of a combination of:

- the actual or perceived risk of catching the disease;
- the effects of the disease on livestock;
- the cost of the vaccination relative to the value of the livestock (including the labour costs involved in the process); and
- the effect of the vaccine on the risk of catching the disease.

The risk of catching a contagious disease is closely linked to the prevalence of the disease, while for non-contagious diseases, the prevalence gives a good indication of the risk and susceptibility of the livestock population. The method of transmission is also an important factor. There is only a notional idea of the prevalence of major livestock diseases in Laos.

In a livestock industry structure like Australia's for example, the above factors would be the main determinants of vaccine demand. In reality, the factors driving vaccine demand in Laos are likely to be quite different. Part of the problem in determining the prevalence of major diseases is that smallholders have limited capacity to effectively identify when an animal is carrying a disease, and even if they do, they may not have sufficient incentives to report the incidence of disease.

In many cases the basic concept of disease — cause and effect, treatment and prevention — are not understood. In many parts of the country, both smallholders and district level extension officials have limited understanding of the basic principles of infectious diseases (ADB 2005c). In this type of environment, vaccines have a limited market. Demonstration is one of the most powerful tools for encouraging vaccination, but its effectiveness is limited in Laos for a number of reasons. Misdiagnosis is a

common problem and often results in ineffective vaccination against a different disease to the one that is present.

Other animal health issues add another layer of complexity to this situation. Parasitic diseases such as toxocariasis are major problems, especially in the large animal sector and cause a significant number of deaths in cattle. General poor health and nutrition are also likely to contribute to mortality amongst livestock, and separating these effects from the diseases that can be vaccinated against is not an easy task. Mistrust of the government in many areas is also a deeply rooted factor, and with a significant proportion of vaccination taking place as a part of government driven campaigns, this contributes to an environment of scepticism and doubt surrounding vaccination.

Current vaccine production and distribution

One way of looking at the current demand for vaccines in Laos is to examine the effective coverage rates of vaccines produced at the VPC.

The VPC collects data on production and distribution of vaccine. The distribution figures give an estimate of the coverage for different diseases when applied to the livestock population. However, an allowance for wastage should be made, as evidence was found during consultations that up to 30 per cent of vaccine doses distributed were not administered (Mr Poun, personal communication, 27 July 2006). There are several possible factors behind this. The small scale of many farmers means that in practice a bottle of vaccine containing as many as 20 doses could be opened to vaccinate only a few animals. In some cases, more than one farmer could have livestock vaccinated by one bottle, but once opened, vaccine needs to be used within 2 hours. In many cases, the excess vaccine is thrown out. There was little evidence found of smallholders cooperating in gathering livestock together for vaccination. There is also a possibility that the Village Veterinary Workers (VWV) who administer the vaccine may open a new bottle rather than use an already opened bottle for a new farmer in order to charge full price to each farmer. Table 2.6 shows the production and distribution of vaccine from the VPC for 2005.

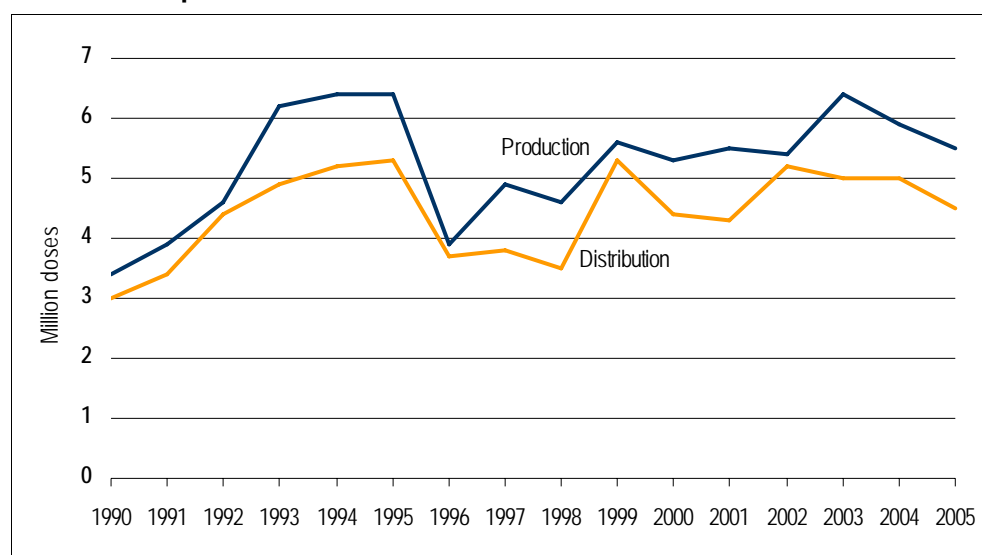
These figures assume a distribution rate of 82 per cent — this figure was provided by the VPC for the distribution rate for all vaccine. Chart 2.7 illustrates the production and distribution of all vaccines produced at the VPC since 1990.

2.6 Vaccine production and distribution from VPC in 2005

Vaccine type	Doses produced	Doses distributed
	No.	No.
Haemorrhagic Septicaemia	500 695	410 570
Fowl cholera	793 100	650 342
Newcastle F strain	1 293 900	1 060 998
Newcastle M strain	1 513 800	1 241 316
Newcastle I2 strain	79 800	65 436
Infectious bronchitis	344 800	282 736
Fowl pox	306 300	251 166
Duck plague	201 700	165 394
Classical swine fever	216 670	177 669

Source: VPC 2005.

2.7 Vaccine production and distribution: 1990-2005



Data source: VPC 2005.

Over this period, total vaccine production has increased by an average of 2.1 per cent annually, while distribution has increased by 1.7 per cent. This indicates that the proportion of vaccine not being distributed has increased slightly over the period. Overall, the average distribution rate between 1990 and 2005 has been 85 per cent and it has ranged from a low of 76 per cent to a high of 96 per cent. The distribution shown in the chart above does not account for wastage, which is estimated to be at least 30 per cent. Table 2.8 presents estimated vaccine coverage for major diseases at different levels of wastage based on FAO animal numbers.

These coverage rates are the 'best case' scenario for effective vaccination rates, as they assume that all vaccine delivered provides effective protection against disease.

2.8 Estimated vaccine coverage in 2005

<i>Disease</i>	<i>20% wastage</i>	<i>25% wastage</i>	<i>30% wastage</i>	<i>40% wastage</i>
	% of total animals			
Haemorrhagic Septicaemia	6.8	6.3	5.9	5.1
Fowl cholera	1.2	1.2	1.1	0.9
Newcastle's Disease	10.0	9.4	8.7	7.5
Classical swine fever	8.1	7.6	7.1	6.1

Source: VPC 2005 and CIE calculations.

Imports are not included in these figures, as there is no reliable estimate of imported vaccine quantities. The Veterinary Supply Unit (VSU) itself imports vaccines, but this is done informally: that is the standard approval processes are not followed (Dr Signa Kittiphone, VSU, personal communication, 25 July 2006). There is anecdotal evidence that traders are using imported vaccines from Thailand before transporting animals across the border, and some commercial operations around Vientiane are importing all their vaccine needs. (For example, consultations with a large commercial piggery based in Vientiane indicated that they vaccinated all animals for CSF, FMD, Aujeszky's Disease and Porcine Parvovirus with vaccine imported from Thailand.) Further, some donor and NGO projects distribute imported vaccines (Mr Warren Hoye, personal communication, 26 July 2006).

One of the major issues for ACIAR is how factors that are restricting demand for vaccines in Laos interact with and affect the outcomes of their technical research. During consultations for this report, the following were identified as factors that are limiting vaccine coverage and demand:

- farmers not understanding the purpose of vaccination;
- farmers confusing vaccination with treatment;
- poor farmers with a lack of access to markets often have no means or incentive to pay for vaccination; and
- quality issues leading to poor performance of vaccine and subsequent loss of confidence in vaccination.

Future prospects for livestock in Laos

The future demand for vaccines in Laos is not only a function of the coverage rate of the current livestock population but also depends on the prospects for growth of the livestock industries themselves. There are several drivers that will affect the prospects for livestock industries in Laos. Broadly speaking these are:

- population growth;
- income growth;
- productivity growth in segments of the livestock industries;
- prospects for trade with adjacent countries; and
- the institutional environment.

The growth in the livestock industries therefore requires some careful scenario building about developments with Laos and in surrounding countries.

Regional demands

One driver of demand for the livestock industries of Laos will be demand for meat from neighbouring countries. The key drivers of the total demand for meat are population and income growth. In addition to this, changes in the composition of total meat consumption is driven by the relative prices — most often a function of relative rate of productivity.

Population growth

In terms of population, while China, Thailand and Vietnam all have had annual average annual population growth of around 2 per cent over the past 20 years, forecast growth for the next 10 years are now between 0.5 and 1 per cent per year. While this is a function of government policy in China, it is also a hallmark of economies with strong income growth.

Income changes will shape trade

Average annual income growth for these countries in the next 5 years is forecast to be robust: between 5 per cent for Thailand, 7 per cent for Vietnam and 7.5 per cent annual growth for China. A key factor to consider is the substantial divergence in income prospects between rural and urban areas. This divergence has been driven by rapid industrialisation and the employment it generates. Therefore, growth tends to occur around urban areas and in the case of China - the coastal and southern regions. This is also the case for Vietnam where it has been estimated that one million people migrate to the major urban areas every year to take-up employment in industries located in the export processing zones. This leaves those remaining in rural areas to commence the transition from subsistence to more specialisation. Given these trends, Laos appears centrally located to a region with potentially strong demands for meat.

2.9 Per person meat consumption by country

<i>Meat consumption by country</i>	1980	1990	2000
	Kg/per capita/per year	Kg/per capita/per year	Kg/per capita/per year
<i>Beef</i>			
Thailand	5.9	5.7	3.5
China	na	1.0	4.2
Vietnam	1.5	1.4	1.5
<i>Pig meat</i>			
Thailand	4.9	6.0	7.5
China	na	19.6	31.7
Vietnam	5.0	11.0	17.5
<i>Poultry meat</i>			
Thailand	4.0	9.4	14.0
China	na	2.8	10.1
Vietnam	2.0	2.5	4.0

na Not available

Source: GMI database and FAO.

One way to assess the potential demand for meat from these countries is to look at historical trends. Table 2.9 summarises readily available data of trends in per person meat consumption for the past 20 years for China, Thailand and Vietnam.

At the relatively low levels of meat consumption for the region, compared to those observed in western countries, per person meat consumption is highly correlated with income. Per person meat consumption has increased at an average annual rate of 2.6 per cent in Thailand, 7 per cent in China and 5 per cent in Vietnam. While these growth rates are off a low base, it would not be difficult to extrapolate these trends into strong demands for meat over the next ten years. This growth is especially driven from the urban areas of eastern and southern China and Ho Chi Minh City in Vietnam.

Another feature of this table is how the composition of meat demand in these countries has changed in favour of pig and poultry meats. While there may be small cultural elements to this trend, relative productivity of each meat is also a key driver. Pigs and poultry production are more amenable to intensification through the use of feed inputs – which in turn depends on access to energy-dense feeds such as grains and oilseeds. The result of this intensification is stronger production growth in pig and poultry meats and lower relative prices than for beef and buffalo.

While incomes in these countries have been growing, meats consumption is still dependant on sale through wet markets and home-consumption. This is largely because the necessary infrastructure for a cold-chain is still being

developed. This fact has some important implications for how trade will satisfy future demands.

Infrastructure also changes the nature of trade

Currently a significant amount of inter-regional trade (both formal and informal) is restricted to live animals due to poor transport infrastructure plus a lack of processing facilities and cold chain. The majority of the live trade is in cattle because walking the cattle out to a road is a viable option.

But over time, as incomes and road and other market infrastructure develops, these countries should follow trends in other parts of the world. These trends would comprise two developments:

- improved road access will allow more inputs to be imported, particularly feed; and
- better roads and development of a cold chain will facilitate opening-up to fresh and frozen meat imported from suppliers, most likely from outside of the region.

The bottom line is that the live trade, especially in cattle, while being a feature of the region at the moment, will probably diminish in significance over time as it is replaced by trade in feed (grains and proteins) and boxed meat products. There is a concern that the recent success in some initiatives in Laos has been assisted by favourable market conditions, which have largely been driven by demand for live cattle in neighbouring countries. More needs to be known about the livestock market in the region and how these market conditions are likely to change and how this could affect livestock producers in Laos.

Lao demand for meat

Table 2.10 outlines estimated per person meat consumption in Laos. As mentioned earlier, the only real data source is the FAO, which is unreliable at best, so these figures can only be viewed as indicative.

2.10 Historical per person meat consumption

	1990	1995	2000	2005
	Kg per person			
Beef and buffalo	3.8	6.1	6.3	6.9
Chicken	1.5	1.9	1.8	2.7
Pigmeat	5.0	6.1	5.2	4.7

Source: FAO 2006.

This data suggests that per person consumption of meat in Laos is low by broad regional standards but is probably equivalent to that observed in areas of neighbouring countries with similar income levels and household structures. That said, there is also a significant potential to increase meat consumption in Laos and 'catch-up' to that consumption observed in adjacent countries.

How prospects for income growth in Laos will translate into increased meat consumption in the medium to long term involves some speculation. While official estimates of GDP growth at around 6 per cent for Laos compare favourably to its neighbours, composition of that growth may not translate into proportionately higher demand for meat in the medium term. This is because:

- hydro-electricity and the Sepon gold and copper mine are responsible for a large proportion of this growth – neither of which is intensive in local employment;
- a large proportion of the population is likely to remain in quasi-subsistence; and
- there is far less scope for rural-urban migration to work in manufacturing industries or processing zones, as compared to China and Vietnam.

While significant road infrastructure is on the cards for Lao, this will not address the low-income regions of the south and north. Therefore, it would be expected that the livestock industry will not be fully opened to external markets in the medium term.

Implications for Lao production

We have already identified that the current structure of Lao production is based around smallholders with a few small commercial operators around the capital. Live exports of cattle and buffalo, of animals at low weights, are occurring formally and informally from Laos. These animals are then being fattened with better quality feeds and then sold-on for slaughtered in urban areas. This is a familiar model of cow-calf producers selling to (essentially) lot feeding.

Trade has the potential to drive significant increases in vaccine demand. If Laos is to become competitive in regional markets for meat and livestock, there will be increased requirements placed on animal health and quality assurance generally. How much of this potential is realised will depend on how the adjacent markets move away from the importation of live animals.

In a regional context, production would inevitably become more intensive with these operations sited adjacent to urban areas based on purchase feeds. This will focus on pig and poultry production, where conversion of feed is higher than cattle. Relative prices will put pressure on demands for cattle and buffalo meat. This should limit demand for live animals.

Intensive livestock production of pigs and poultry is already emerging in Laos — but it is limited due to the lack of feed. This feed will have to be imported — which depends on road access and both formal and informal barriers. Better access would also promote imported meat. Laos's membership of ASEAN and the ASEAN Free Trade Area (AFTA) also provides impetus to general economic and trade development. Within the region, factors such as Vietnam's accession to the WTO and Laos's own negotiations to join the WTO will also encourage more openness to trade.

The bottom line is that while there is continued prospect for greater integration of the Lao livestock industry with the surrounding region, these prospects are limited. The most significant opportunity should be the transition of the Lao economy itself that drives meat demand and permits more specialisation in the livestock industries.

3

The institutional environment

The institutional environment is a major factor that not only directly affects the supply of effective livestock vaccine, but can also affect the demand for vaccine directly through price controls and indirectly by distorting producer incentives to vaccinate livestock. It is important to understand the institutional and regulatory environment governing vaccine supply and distribution both in theory and in practice. Implementation of central government policy is often quite weak: there is often a long delay in issuance of key implementing regulations for new legislation (CIE 2003a). Given Lao's emergence from central planning, critical legislative and judicial support for business transactions is often only just developing. The administrative system is quite decentralised, and provincial authorities exercised a high degree of autonomy: often over policy as well as how it is implemented (CIE op cit). This means that there is often considerable geographic variation in the effective policy environment for agriculture and livestock development.

Current regulatory picture in Laos

Laos is a transition economy, and reliance on market centred instruments to achieve policy objectives is still at an early stage. Limited infrastructure and the legacy of early periods where provincial self-sufficiency was a key goal mean that domestic markets are fragmented and underdeveloped.

Current government policy in the agricultural sector is largely based on strategic vision document that was released in 1998. This outlines approaches needed to achieve the overall goal of reducing poverty. The document confirms the Government's commitment to pursue a more market-oriented economy. More specific to livestock development, the 'Vision for Livestock Development in Lao PDR to the year 2020' was prepared by DLF in 1998. This document sets out government priorities and mechanisms for livestock development, including a focus on developing large animal trade to take advantage of regional demand. It also specifies a target for protein consumption of 50-70kg per person by 2020 (ADB 2005). While priorities and targets contained in these documents are largely indicative — they have an effect on policy and regulation that in turn affect the ability of ACIAR projects to deliver outcomes.

Regulation and livestock marketing in Laos

Regulation in the livestock sector in Laos reflects the status of the transition from centralised planning. Official and unofficial regulation affects almost every level of economic activity. In many situations, the objectives of regulation are not very clear — often reflecting a view that the state should regulate economic activity. Frequently, the effect of regulation is constrained by the absence of appropriate instruments and capacity for effective enforcement. While regulation in the livestock sector is often inconsistently applied, it impacts significantly on the incentives facing industry participants to engage in intensive production and hence the demand for a range of inputs, including vaccines. An example of regulation at the national level is regulation No.0036/DLF was issued in 2000 and included the following regulations (ILRI 2002):

- onerous regulations surrounding the importation of livestock, feed and veterinary supplies, including application to import 15 days before scheduled importation, different application forms for different products, certification from exporting country and samples in the case of veterinary drugs;
- in addition to general certification for exports in line with import requirements, additional certification and associated paperwork is required for movement of animals within Laos;
- compulsory vaccination of cattle, pigs and poultry against major diseases; and
- comprehensive regulations surrounding the reporting of disease epidemics including provisions restricting the movement of livestock, the destruction of affected animals and vaccination of surrounding areas.

Regulation 0036/DLF is not regularly enforced, and regulations surrounding importing and exporting are regularly circumvented by importing and exporting informally (ILRI op cit). In addition to this, there are special directives imposed on livestock industries at the provincial level. During the development of the new ADB project, a detailed review of livestock marketing was undertaken (ADB 2005b). The study focused on the Northern provinces of Luang Prabang and Xieng Khouang and found a range of fees and charges are levied on livestock movement. In addition to this, it found that ‘most of these payments are aimed at generating revenue at the local level, with little practical relevance to animal health and controlling the spread of livestock diseases’ (ADB 2005b). A summary of some of these fees and charges is shown in table 3.1.

3 THE INSTITUTIONAL ENVIRONMENT

3.1 Summary of fees and charges on livestock in Northern Laos

Type of charge/fee/tax ⁷	Collection office	Luang Prabang Province		Xieng Khouang Province	
		Phou Khoune	Nam Bak	Nonghet	Pek
Annual livestock tax	Village headman	N/A	N/A	N/A	KN1000 per year
Certificate of sale/purchase	Village headman	KN10 000-15 000 per head	KN10 000 per head	KN5 000 per head	KN2000-50000 per head
Transit fees to collection centre	Check points	KN200 000	None	N/A	N/A
Letter of approval for internal movement of animal	District agriculture and forestry office	KN10 000 per head	KN5 000 per head	KN10 000 per head	KN10 000 per head
Veterinary certificate and registration card	District agriculture and forestry office	KN12 000 per head	KN5 000 per head	KN10 000 per head	KN13 000 per head
Letter of approval for internal movement of a commodity	District commerce office	KN10 000 per head	Included in trade license	KN3 000 per head	KN10 000 per head
Property tax	District commerce office	KN60 000 per shipment	Included in trade license	KN3 000 per head	KN10 000 per head
Tax payment for moving animal including form	District finance office	2 per cent of value of animal	KN3 000 per head	KN47 000 per head	KN3 000 per head and KN3 000 form
Revenue taxes	District finance office	KN20 000 per head	Included in trade license	▪ 5 per cent	▪ 5 per cent
▪ Business revenue				▪ 35 per cent	▪ 35 per cent
▪ Profit revenue				▪ KN5 000 per sheet	▪ KN5 000 per sheet
▪ Form					
Trade licence	District finance office	N/A	KN5 000 per year for export, KN0.8 million for internal	N/A	N/A
Export charge	Provincial finance office	N/A	KN10 000-15 000 (unofficial)	N/A	N/A
Veterinary export certificate	Provincial agriculture and forestry office	N/A	N/A	N/A	N/A
Transit fees to market	Provincial agriculture and forestry office	KN200 000	KN40 000	N/A	N/A

Source: ADB 2005b, p4.

It is important to note that it is not possible within the scope of this study to detail all the taxes, fees and other impositions on livestock industries. Indeed, taxes and charges on livestock are often levied inconsistently and informally, which makes it difficult to characterise and quantify them comprehensively. However, as table 3.1 illustrates, regulation is a pervasive force on livestock marketing in Laos. These regulations have evolved largely around the revenue collection system in Laos and the lack of an effective, systematic tax system. Public service wages are low and as a result, public officials rely on local, regional and provincial revenue generated from areas such as the livestock sector.

The main effect of regulation on livestock marketing is to reduce incentives for producers to participate in the market. This has significant implications for livestock vaccines, as the demand for vaccines is closely related to the degree of intensity of production and marketing in the industry. In addition to regulation that directly affects livestock industries and

incentives to engage in intensive production, there is also a range of regulations and legal requirements that restrict private enterprise in Laos (ILRI 2002). These regulations increase the cost of operating commercial livestock enterprises and discourage the private investment that is necessary to establish commercial operations. Long delays in registration and licensing for private enterprises are common and approval processes for business registration are not transparent and are often at the discretion of individual officials. As a result rent seeking throughout the approval process is commonplace. Taxes are also inconsistently applied and often negotiated individually. Taxes are frequently collected in advance in response to a particular financial constraint facing a province.

In recent years it appears that some regulations have been removed. The Lao-EU project identified problems with veterinary regulation, specifically:

- an absence of a basic legal framework;
- an inability to provide sufficient detail to cover all areas addressed in the legislation;
- confusing provisions; and
- an absence of empowerment and enforcement of existing regulations.

The Lao-EU project was involved in drafting a revised veterinary law covering a range of factors including animal disease prevention and control, animal movement, trade, and feed production and management. The draft law is currently under consideration by the Council of Ministers.

Vaccine production through the VPC is under the broad authority of the Department of Livestock and Fisheries within the Ministry of Agriculture and Forestry. The VPC is the only body licensed to produce livestock vaccines in Laos. Official imports of livestock vaccine must have a permit issued by the DLF. In reality, there are no official imports — informally imported vaccine is relatively freely available and the government does not appear to make any serious attempts to limit informal vaccine importation. The approval process for importing vaccine is most likely too onerous — particularly in comparison to freely importing unofficially.

Various amendments have been made to the regulations surrounding livestock exports to encourage an increase in 'formal' trade. Currently, only a small proportion of livestock exports pass through formal channels (ILRI 2002). This presents a significant transboundary disease problem, especially given Laos central location in the South East Asian region. The amendments have focused on reducing administrative procedures that add costs to exporting livestock. These include formal costs, but also rent-seeking activities including 'fees' for animal movements between villages,

districts and provinces. There has been an attempt to establish a 'one stop shop' style service to facilitate the administration of livestock exports. In reality, these regulations are not enforced and there remain significant incentives for informal trade.

The interaction of these regulations and impediments are complex, and all contribute to creating the environment that livestock producers operate in. They affect incentives to vaccinate livestock at the smallholder level, and they play a role in limiting the development of a commercial livestock sector and the associated implications for demand for vaccine.

Linkages between central and provincial government

There is a high degree of provincial autonomy in the Lao system of government, reflecting the legacy of the pre-reform system and a more recent focus on decentralisation of government operations. The result of this is that there is the potential for wide differences in how regulations are legislated and enforced between provinces, and this has consequences for livestock management and vaccine delivery. This fact was emphasised during consultations, with DLF personnel acknowledging that there were wide differences in the application of regulation in different provinces.

The use of vaccination campaigns accounts for a significant proportion of vaccine produced by the VPC. The conduct of these campaigns is highly dependent on provincial and district government staff. The vaccination campaign process broadly involves an announcement from the central authorities that a campaign will take place. It then relies on provincial staff to determine the demand within their province by collecting information from district staff. The district staff relies largely on the VVW network for information on demand within their local areas.

Regional institutions

There are a number of regional institutions that contribute to the environment that livestock industries and vaccination operate in, including:

- South East Asian FMD campaign (SEAFMD)
- Association of South East Asian Nations (ASEAN)
- Greater Mekong Subregion (GMS).

The SEAFMD campaign involves the coordinated control of FMD by eight countries in the ASEAN region including Laos. The campaign is

coordinated by the World Organisation for Animal Health (OIE) Regional Coordination Unit in Bangkok. Funding for the SEAFMD campaign comes largely from AusAID. FMD poses a serious threat to livestock trade from South East Asia. Uncontrolled movement of cattle in the region is common, with the major movements being from Laos into Thailand and Vietnam, Thailand into Malaysia and Cambodia into Vietnam. Strong demand for cattle in Malaysia and Vietnam has resulted in high prices, which has increased the incentive for informal, uncontrolled animal movement. The SEAFMD's primary role is to promote cooperation between countries and a regional approach to FMD control. Within the context of Lao policy, the SEAFMD campaign provides important support — as the capacity to deal with livestock diseases is lower in Laos than in surrounding countries.

ASEAN is an important regional organisation both in terms of its influence on trade policy that affects livestock directly and also how it affects the broader policy and institutional environment. ASEAN publishes a range of standards and protocols related to livestock vaccination. These include:

- Manual of Standards for Animal Vaccines;
- Manual of Rules and Procedures for the Registration of Animal Vaccines;
- Manual of Standards for Good Manufacturing Practices (GMP) for Animal Vaccines;
- Manual of Accreditation Criteria for Animal Vaccine Testing Laboratories;
- Manual of Code of Practice for the Commercial Storage, Transportation and Handling of Animal Vaccines; and
- Protocol for Accreditation of Animal Vaccine Testing laboratories in Member Countries.

In theory, these standards provide a comprehensive framework for vaccine production, storage, handling and transportation. In practice, the application of these standards in Laos is somewhat limited by technical capacity and infrastructure within the country.

Of particular importance in relation to ASEAN, the ASEAN Free Trade Area (AFTA) has been a contributor to the development of a more market-oriented economy in Laos. There is still significant progress to be made on this front but as the AFTA and other factors contribute to economic development in Laos, increasing numbers of farmers will become involved in more market-oriented livestock production. This in turn will contribute to greater demand for vaccine. WTO accession discussions also began in Laos in 2004. While WTO membership is most likely some distance away,

negotiations will have an impact on the development of legal structures and frameworks in Laos that are important factors underpinning the development of industries such as livestock.

The Greater Mekong Subregion (GMS) is a program of subregional economic cooperation established in 1992 with the assistance of the ADB. It consists of Cambodia, Laos, Myanmar, Thailand, Vietnam and China. Since its inception, the major focus of the GMS has been on the provision of infrastructure. Within this, highest priority was accorded to the development of the subregional road corridors (ADB 2006). The major thrust of the GMS transport infrastructure development program is building three 'economic corridors'. These are the North-South, East-West and Southern corridors. The first two of these pass through Laos — the North-South corridor links two northern Lao provinces with Yunnan province in China and Chang Rai in Thailand. The East-West corridor, when complete will link Mawlamyine on the Andaman Sea in Myanmar with Da Nang in Vietnam. In total, the East-West corridor will be 1 500km in length and pass through Myanmar, Thailand, Laos and Vietnam.

Transport infrastructure is a crucial element in the economic development process. It facilitates trade and investment and reduces the cost of transport. The GMS economic corridor projects provide important linkages that have the potential to greatly facilitate trade in Laos' livestock industries. However, the quality of feeder roads is also critical, as they provide access to major roads for smallholders and give them access to markets, domestic as well as export, that they wouldn't otherwise be able to reach. In addition to this, feeder roads provide avenues for other goods to reach remote areas, which assists in establishing markets for a range of goods and services.

Donor bodies

Donor funding plays an important role both in vaccine production and also livestock extension programs in Laos. In the past, the VPC has had significant donor input. The original construction of the VPC premises was funded by the FAO, while much of the equipment that is currently in use at the Centre was funded under the Lao-EU Livestock project. Presently, there are no donor projects directly involved with the VPC, however there are two large projects within the livestock sector — one funded by the EU and one by the ADB.

The ADB has recently completed a design for a major Participatory Livestock Project in Laos. The project is aimed at reducing poverty through smallholder livestock development in the northern region of Laos. The project area comprises 18 districts in five northern provinces (Bokeo,

Houphanh, Luang Namtha, Luang Prabang and Xieng Khouang). It will target animal nutrition, animal health and fertility and animal management practices. Its budget is US\$18.4 million, comprising of a loan of US\$9.4 million and a US\$9 million grant. This project will initially focus on feed supply, HS vaccination, and de-worming including toxocara and then move on to animal management and husbandry.

The ADB project is scheduled to begin early next year. There is also another ADB capacity building project currently underway that attempts to build on previous forage project work undertaken by CIAT and NAFRI (in particular the Forage and Livestock Systems Project (FLSP)¹) and provide a link into the new ADB project. It is focused on training extension workers.

The EU has begun to implement a follow up to the Lao-EU Livestock project, called the 'Livestock Farmer Support Project' which will operate in 6 northern provinces (Luang Prabang, Oudomxai, Xieng Khouang, Luang Namtha, Bokeo, Xayabouri) and 33 districts. Its total budget is 5.3 million Euros. The overall objective of the project is to 'improve rural livelihoods of poor households by increasing the value of their assets and their agricultural output' (EU 2006). To achieve this, the project will focus on improvements in four areas:

- livestock marketing system
- animal health services support
- animal nutrition
- animal husbandry.

There is significant overlap between the EU and ADB project, both in terms of content and geographical areas. Therefore it makes sense to have a high degree of collaboration and cooperation between the two projects. Significant collaboration and cooperation between donor agencies is not common, and hence there is often significant duplication and wasted effort — not just in Laos but in all countries that receive donor funding. Attempts have been made in the design of the EU and ADB projects to encourage cooperation. Firstly, the two projects share the same steering committee, which comprises national and provincial level stakeholders. Secondly, due to the overlap in district focus of the two projects, there is also district staff common to both projects. These moves are encouraging, but don't guarantee cooperation

In addition to these projects, general development projects usually have a livestock component. The livestock component of these projects is usually

¹ See <http://www.ciat.cgiar.org/asia/forages.htm#flsp> for more information.

extension focused. Table 3.2 gives some examples of development and extension projects that include livestock components.

From ACIAR's point of view, these projects provide an opportunity for leverage to assist in ensuring that the proceeds of their research have a long-term, sustainable impact. ACIAR is primarily a research organisation, and in the context of the environment they operate in, a relatively small player. With a majority of development projects focusing on extension, it makes sense for ACIAR to link any research they undertake closely with an appropriate existing project.

3.2 Selected development projects in Laos

<i>Project</i>	<i>Funding organisation</i>	<i>Budget</i>	<i>Major objectives</i>
Agriculture Development Project	World Bank	US\$12.21 million	<ul style="list-style-type: none"> ▪ Improving rural infrastructure ▪ Improving environmental management ▪ Improving agricultural services.
Poverty Alleviation in Remote Upland Areas	Swiss Agency for Development Cooperation (SDC)	US\$1 million approx	<ul style="list-style-type: none"> ▪ Improve the performance of agricultural livelihood systems ▪ Improve the ability of households to take advantage of market opportunities ▪ Improve access to water.
Small-Scale Agroenterprise Development in the Uplands	SDC	US\$3.3 million approx	<ul style="list-style-type: none"> ▪ Identifying and evaluating market opportunities for agroenterprise development ▪ Establishing a strategy and local capacity for promoting agroenterprises
Laos Extension for Agriculture Project	SDC	US\$5.8 million approx	<ul style="list-style-type: none"> ▪ Support the development sustainable agricultural extension system
Smallholder Development Project	ADB	US\$15.2 million approx	<ul style="list-style-type: none"> ▪ Promote small scale agriculture production to increase farming income and alleviate poverty
Special Program for Food Security and South-South Cooperation	Japanese Government	US\$3.6 million	<ul style="list-style-type: none"> ▪ Increase food production through diversification of production. ▪ Expand and develop livestock raising system. ▪ Improve agricultural product management. ▪ Build capacity for extension.
Forest Management and Community Support Project	Japan International Cooperation Agency (JICA)	N/A	<ul style="list-style-type: none"> ▪ Improve forest management, production and income generation activities, which contribute toward stabilization of shifting cultivation and poverty reduction
Xieng Khouang Agricultural Development Project Phase II	IFAD	US\$9.6 million	<ul style="list-style-type: none"> ▪ Reduce poverty, increase household food and income security and improve nutrition for the poor.

Source: <http://www.laoex.org/index.htm> accessed 16 October 2006.

4

Supply chain for vaccines in Laos

In this section, we outline our understanding of the supply chain for vaccines in Laos and how incentives at each point in the chain shape the supply and delivery of vaccine to farmers. Understanding the supply chain for vaccines is crucial not only in understanding where in the chain there are problems that are affecting the delivery of effective vaccines to producers, but also in understanding how information flows back along the chain regarding diagnosis and reporting of disease. Chart 4.1 illustrates our current understanding of the supply chain for vaccines in Laos. Each component of the chain is discussed further below.

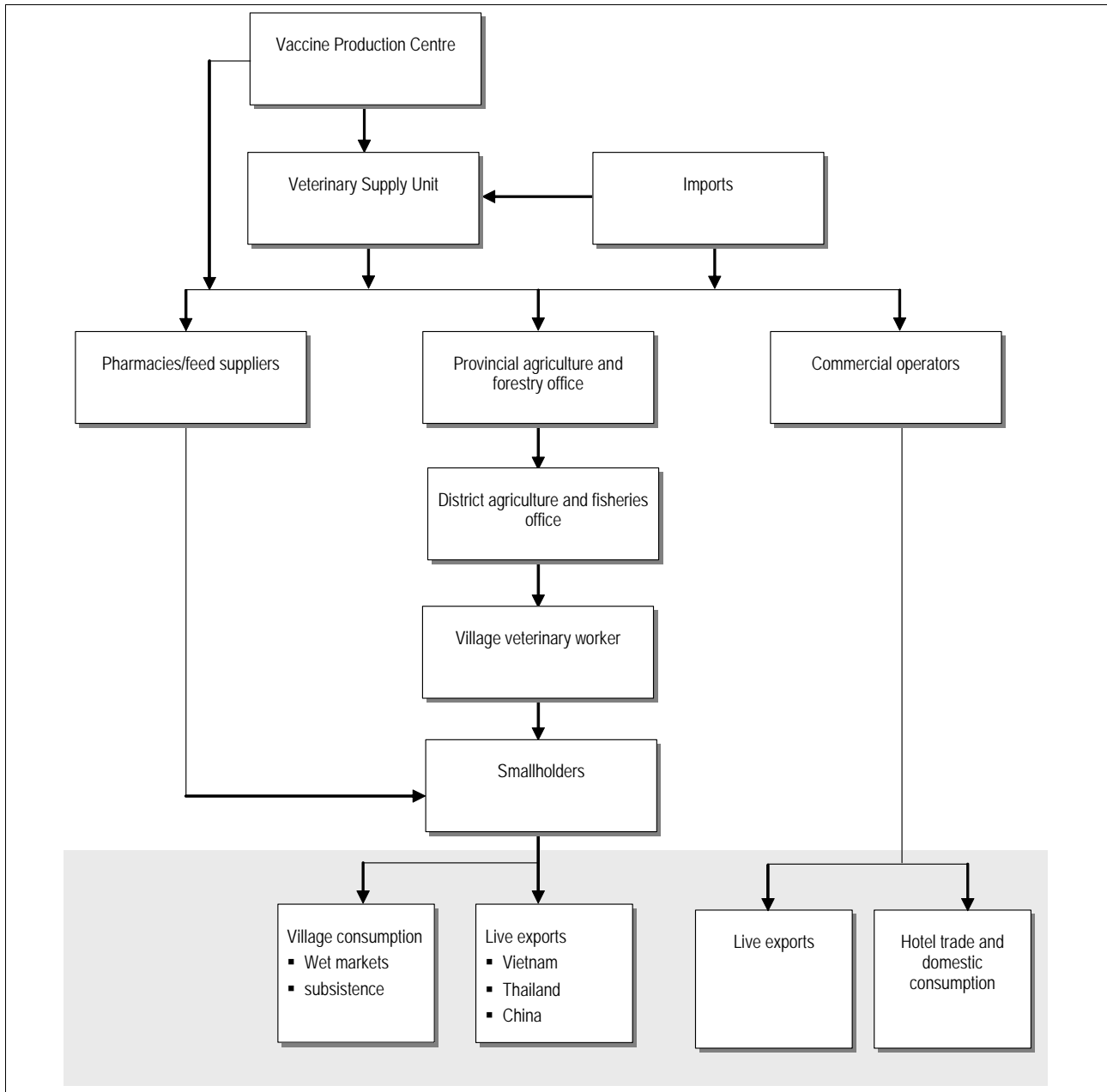
Vaccine Production Centre

The Vaccine Production Centre (VPC) was established in 1979 under the Department of Livestock and Fisheries. The initial cost of establishing the centre was around US\$2 million and was funded by the FAO. The VPC was born out of a policy of guaranteeing supply of vaccine against major livestock diseases. The Centre was privatised in 1988, but financial problems saw the government again take ownership in 1992.

The VPC remains the sole body licensed to produce livestock vaccine in Laos and it is generally regarded as a national asset. However, the government privatised the Centre in 1998, only to take it over again when it proved financially unviable. Commercial viability remains a major problem for the VPC. Prices for vaccine supplied by the VPC are relatively low — it appears that the government has pursued a policy of effectively suppressing vaccine prices to encourage more widespread use. Table 4.2 outlines the latest prices obtained from the VPC.

Using these prices along with the quantities distributed by the VPC in 2005, it is possible to estimate the gross income from vaccine sales at the VPC. Assuming all payments are received from the distributing agencies, the revenue generated from sales amounts to around US\$40 000. It is likely that payment delays and non-payments would reduce this figure to some degree.

4.1 Supply chain for livestock vaccines in Laos



Source: The CIE.

4.2 Factory price of vaccine distributed by the VPC, 2005

	<i>Price per vial</i>	<i>Distilled water price</i>	<i>Total price per vial</i>	<i>Doses per vial</i>	<i>Price per dose</i>	<i>\$US price per dose^a</i>
	Kip/vial	Kip	Kip/vial	No.	Kip/dose	\$US/dose
Haemorrhagic Septicaemia	7 000	0	7 000	30	233	0.02
Fowl cholera	4 000	0	4 000	50	80	0.01
Newcastle F strain	3 000	1 000	4 000	100	40	0.00
Newcastle M strain	3 000	2 000	5 000	100	50	0.01
Newcastle I2 strain	2 000	1 000	3 000	50	60	0.01
Infectious bronchitis	4 000	1 000	5 000	100	50	0.01
Fowl pox	3 000	1 000	4 000	100	40	0.00
Duck plague	3 000	2 000	5 000	50	100	0.01
Classical swine fever	5 000	1 000	6 000	10	600	0.06

^a Assumes an exchange rate of 10 000 kip per \$US.

Source: VPC, personal communication.

Prices have not increased since 2000 — when an adjustment was made for the depreciation of the Kip against the US dollar following the Asian financial crisis. At the time, prices were calculated using production costs, however these costs no longer reflect the real cost of inputs to produce vaccine. The VPC relies significantly on imported materials, and the cost of these would have increased significantly since 2000, and the exchange rate has further depreciated since then.

Vaccine prices do not include provisions for depreciation of equipment — it is not clear how depreciation expenses are met. DLF pays for full-time salaries at the VPC and some electricity and maintenance expenses. Vaccine sales and donor projects are the other two funding sources. A report commissioned by the Lao-EU project (EU 2002) indicated that costs were not being met by sales for most vaccine. It estimated that the shortfall was around US\$800 without depreciation expenses, and US\$12 000 with depreciation expenses. Given that these figures relate to 2002, it is likely that the shortfall has increased over the past four years. In addition to this, these estimates assume that all the costs of vaccine distributed are recovered and as such are likely to represent the best case scenario.

While the Lao-EU Livestock Project provided significant assistance to the VPC in terms of funding equipment, there are no current donor projects directly involved with the VPC. Several problems with equipment were identified during consultations, including a problem with one of the two fermentors. There have also been ongoing problems with the air filters, which has resulted in several batches of vaccine being contaminated with bacteria and fungus growth. The funding shortage is so acute that the VPC is not able to fund the US\$1000 cost to replace the fermentor or the US\$200 cost for a replacement air filter. During consultations, VPC staff indicated that they were anticipating that the proposed ACIAR project would assist in funding repairs to equipment. Clearly, it is not ACIAR's role to provide

funding for maintenance and repair, but expectations such as this give some indication of maintenance issues that constrain the capacity of the VPC. Consultations with NAHC staff highlighted some instances where problems at the VPC had affected the supply of vaccine, including:

- Uneven production, partially a result of equipment problems, but also of poor production planning. Significant periods can go by without any production, and then a large amount is produced in one month to the point where there isn't enough demand and vaccine is thrown out after expiry.
- Quality problems associated with storage at the VPC. In one instance, a storage freezer was periodically defrosting and exposing vaccine to high temperatures. In other cases, a lack of a buffer zone has exposed vaccine to high temperatures when the freezer door is opened. In another instance, vaccine bottles were allowed to heat up to room temperature to assist with labelling.
- Incorrect labelling of vaccine produced at the VPC is a problem, with labelling of CSF vaccine a particular problem — according to NAHC staff, the VPC labels CSF vaccine as safe for use on pigs over 3 months of age, when it can safely be used after 1 week. It also does not recommend the vaccine for pregnant sows, while the NAHC contends that it should be safe to use in the first month of pregnancy — these labelling issues were cited by commercial pig producers during consultations as a major reason why imported vaccine was preferred to VPC vaccine.

While these anecdotes on the production side are concerning, problems with the distribution are widely thought to contribute more to quality problems than the actual production process. Some of these issues are discussed below.

Distribution mechanisms

While quality assurance at the VPC is undoubtedly important, the distribution of vaccine once it leaves the VPC is the other crucial element to the supply chain. Most vaccines produced at the VPC are heat sensitive, so how they are handled along the supply chain can determine whether or not they are effective at the farm level. There are several paths that vaccine can travel along the supply chain from the VPC, and unofficial imports are fairly widespread.

Veterinary supply unit

The Veterinary Supply Unit (VSU) was established in 2002 as a distribution centre for vaccines produced at the VPC. It is a branch of the NAHC under the DLF. The VPC sells some vaccine directly to farmers (mostly commercial) and traders, but around 80 per cent of vaccines produced at the VPC are supplied through the VSU. In addition to this, the VSU also imports vaccine from Thailand where necessary. These imports could be viewed as 'informal', since the VSU does not seek an official permit to import vaccine. Imports are used to supplement supply from the VPC, and are generally imported from retail outlets in Thailand because quantities are insufficient to import from vaccine production companies.

The VSU is not involved in marketing vaccine; it acts purely as a distribution point and relies on demand from the provincial level. The VSU does not charge a specific margin for distributing vaccine to cover its costs. Transportation costs are added to the price paid by the provincial offices. Payment to the VSU from provinces is often slow. Information gathered during consultations suggested that there were delays of up to 12 months between supplying vaccine and payment for some provinces. It is likely that in some instances payments aren't received at all. The VSU pays the VPC after it receives payment, so delays can cause significant cash flow problems at the VPC. At the present time, shortfalls resulting from delayed or non-payment are funded through an 80 000 Euro revolving fund set up by the EU in 2001.

It is difficult to get a complete picture of the pricing and incentive structure throughout the supply chain for vaccine. It is likely that there are many opportunities for discretionary charges and rent seeking. The VSU is unable to effectively compel provinces to pay in a timely manner. It has attempted to restrict supply of vaccine to provinces with outstanding debts, but it appears that exhortation, particularly from higher levels of government under the guise of vaccination campaigns, has restricted the effectiveness of this. As such, there are inherent incentives for rent seeking throughout the chain as money flows back to the VSU and ultimately the VPC.

As an example, discussions with a VVW in the Sikkothabong district of Vientiane during consultations suggested that CSF vaccine was administered to the farmer at a price of 30 000 kip (US\$3) per vial (Mr Poun, Sikkothabong district VVW, personal communication, 27 July 2006). The cost per farmer ultimately depends on how many animals are vaccinated before the vaccine is unusable. If the full 10 doses are used, this indicates an average price of US\$0.30 per dose, compared with the VPC

price of US\$0.06 per dose or a mark up of 500 per cent. As noted earlier, any wastage would increase the cost per dose. Other anecdotal evidence suggests that pricing structures vary significantly in different areas. In Thaphabat district in Southern Laos for example, farmers are charged 3000 kip (US\$0.30) per dose for HS vaccine along with a 500 kip VVW charge for administering the vaccine (Thaphabat Agriculture and Forestry Extension Office, personal communication, 28 September 2006). Other discussions with provincial and district staff in Xieng Khouang province suggest that farmers are charged up to 15 000 kip (US\$1.50) for a VVW to administer a HS vaccination (Nong Haet District Agriculture and Fisheries Office, personal communication, 26 September 2006). This compares to an average factory price per dose of US\$0.02 at the VPC. While these are only anecdotal examples and it is beyond the scope of this report to provide a comprehensive overview of vaccine pricing, it does illustrate the difficulty of characterising the vaccination environment as a whole.

Provincial and district level distribution

Once vaccine leaves the VSU, it is generally sold to either private operators (usually located around Vientiane) or to provincial livestock and forestry offices. Distribution and maintaining the quality of vaccines becomes more problematical the further the distribution point is from Vientiane. The main method of transportation is bus, and transport can take as long as 2 days and 1 night to reach the provincial offices. This poses significant challenges for maintaining an effective cold chain for vaccines that ensures the efficacy of the vaccine for end users. Vaccine is packaged in foam iceboxes, which are estimated to maintain a temperature below zero for around 10 hours. Samples taken by NAHC staff have shown that for transportation to distant provinces, temperatures inside the storage boxes reach well above zero (AusVet Animal Health Services 2006). Adding to the storage problems, only around half of the provincial and district offices has electricity. Prices paid by provincial offices are the same as VPC prices with a mark-up for transportation costs from the VSU. There appears to be a fairly uniform application of this pricing structure, with most of the discretionary price variation occurring further on in the supply chain. However, there is no officially collected information on prices paid by provinces for vaccine.

Provinces are responsible for collecting information on vaccine demand from the districts. In particular, for government announced campaigns, provinces are largely responsible for communicating with the districts and actively promoting the campaign. At other times, the provinces generally rely on requests for vaccine from the district level.

From the provincial offices, vaccine is distributed to district agriculture and fisheries offices in much the same way as they are distributed from the VSU. This poses more problems, not only with maintaining the cold chain, but also with accessibility to transport in remote areas. Relatively short trips can take a significant amount of time due to poor quality roads. This increases the scope for mishandling and ultimately a poorly performing vaccine at the farm level.

The district offices' main responsibility in promoting the use of vaccine is largely through vaccination campaigns. In this respect, their main contact is the VVW. Pricing structures at the district level are uncertain and unlikely to be the same across different districts and provinces. Provinces receive vaccine at a notional price consisting of the VSU price, plus transport costs. Consultations with a province in the Vientiane level indicated that there was a further margin applied for transportation from the provincial to district level. It is probable that there are further margins applied to cover costs and other expenses at the provincial level, however these are not likely to be consistent.

The Village Veterinary Worker

The VVW plays a crucial role in the vaccination supply chain as the agent who has contact with smallholders and in many cases administers the vaccine. The VVW is officially an unpaid position, reporting to the District Agriculture and Fisheries Office. However, in reality, the VVW recoups costs and earns money from vaccinating animals by charging a mark-up on vaccination, charging to administer the vaccine or some combination of these two.

Training of VVW's does not appear to be undertaken with any real organisation, with the exception being the Lao-EU livestock project, which funded the training of around 5000 VVW's. However, very few of these are still working effectively in their role as a VVW. Gleeson (ADB 2005c) commented:

The Lao-EU SLSEAP has spent a considerable level of resource to build up the training program for the VVW, but one reviewer suggests that the individuals acting as trainers and trainers of trainers were not well qualified and experienced and there did not seem to be any skills test applied to 'graduates'.

'There seems to be an unrealistic expectation that with a minimal amount of training to a relatively uneducated person, they will develop and maintain a whole level of competency with a minimum of on-going supervision and support. Many of the trained persons drop by the wayside and don't maintain the role but undoubtedly there are some who are competent to carry out

simple procedures. Past performance of the VVW system has also been adversely affected because the “wrong people were selected”.’

One of the major problems with the approach taken in the past to training is that it was not market driven. VVW’s were trained, but with insufficient demand for their services, they did not last long in the role. However, there is some anecdotal evidence that this is slowly changing, and some people are paying up to US\$25 for training, which is being driven by demand for their services.

The VVW faces unique challenges, as it is a position that relies on trust and cooperation with the farmers, which can pose difficulties, particularly in relation to government lead vaccination campaigns. Mistrust of the government is fairly widespread, particularly in northern regions. Vaccination campaigns are discussed further below.

Vaccination campaigns

One of the main methods for distributing vaccine in Laos is through government driven vaccination campaigns. These campaigns reflect a ‘tops down’ approach to vaccination that is fairly typical of the centrally planned system. Annual vaccination campaigns are generally undertaken for classical swine fever and haemorrhagic septicaemia, and these probably account for a significant proportion of the VPC’s annual distribution of vaccine for these diseases.

The incentives surrounding vaccination campaigns are somewhat unclear. Despite the campaigns being government driven, farmers are still expected to pay for vaccine. It would seem that the campaign process recognises the public good aspect of vaccination for communicable diseases, but relies on private payment. Funding issues are fairly acute at the VPC, and it is likely that without vaccine campaigns, distribution of vaccine would be significantly lower than it presently is. Districts and provinces rely largely on the VVW network to determine demand during campaigns — and it is possible that there are targets set for distribution. Gleeson (ADB 2005c) notes that:

There is anecdotal information of instances where the DAFEO and the VVW pressure farmers to vaccinate as there are vested interests to do so, both to meet targets and raise revenue. However there is no accountability for the quality or efficacy of the vaccine or the service provided.

5

Evaluating the benefits of improvements in vaccination

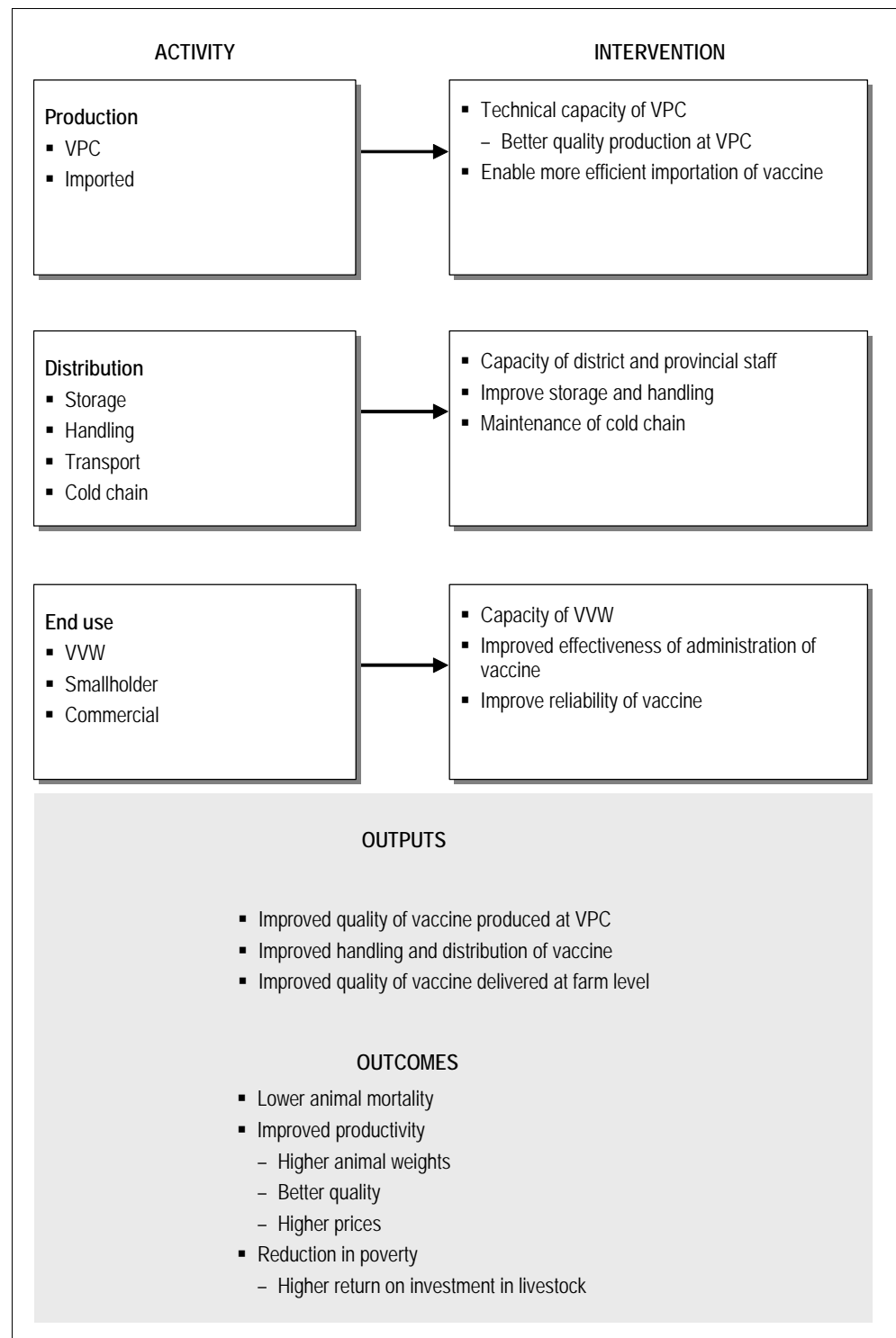
A lack of data makes it difficult to do any significant quantitative analysis on the potential benefits of improving the supply, quality and delivery of vaccines in Laos at this time. However, it is useful to think about how to set up a framework to undertake such an analysis, and the information and judgments that would be needed to carry it out. This could help with making clear what would need to happen for the proposed project to generate acceptable benefits, or to inform analysis that should be undertaken in parallel with the project.

A framework for evaluation

The objective of vaccination is to prevent mortality and morbidity of livestock as a result of disease infection. The outcome of this is that more of the potential value of the animal can be realised. Whether the disease results in reduced productivity or death, the effect is to reduce the value of the animal to the farmer. Effective vaccination may be able to contain this reduction in value, and generate direct benefits to the producer. Under some circumstances, vaccination may provide benefits to a wider group than just the producers carrying out the vaccination: there may be externalities, for example, if vaccination safeguards access to external markets, or reduces the chance of other producers being affected by an outbreak of disease.

Chart 5.1 presents a way of thinking about the potential benefits to producers from effective vaccination, and how different interventions in the production and distribution chain could generate outputs that lead to such benefits.

5.1 Potential benefits of improving vaccine supply



Source: CIE.

The expected benefits shown in the bottom part of the chart will only accrue if the vaccines work and are seen to work. Improving the quality of vaccines produced at VPC may help to ensure that this occurs. But it is not the only thing that is required: what is equally if not more important is cold

chain and handling control in the distribution chain. It may also require improved capacity to identify disease and to diagnose the correct intervention when outbreaks occur. (Importantly, it is conceivable that all of these gains could be achieved without any production at all at VPC, since all of the vaccines used in Laos can be imported.) In addition, producers and government officials providing livestock extension and management services will need better understanding of the basic principles of infectious diseases — and the benefits of long term preventive strategies. Lack of understanding of these issues is seen as a major constraint to improved animal health in Laos (ADB 2005c), and will impact on demand for vaccination.

Evaluating improvements in domestic vaccine production

A key decision to be made in the context of the proposed ACIAR project is the value of direct interventions in domestic vaccine production through the VPC.

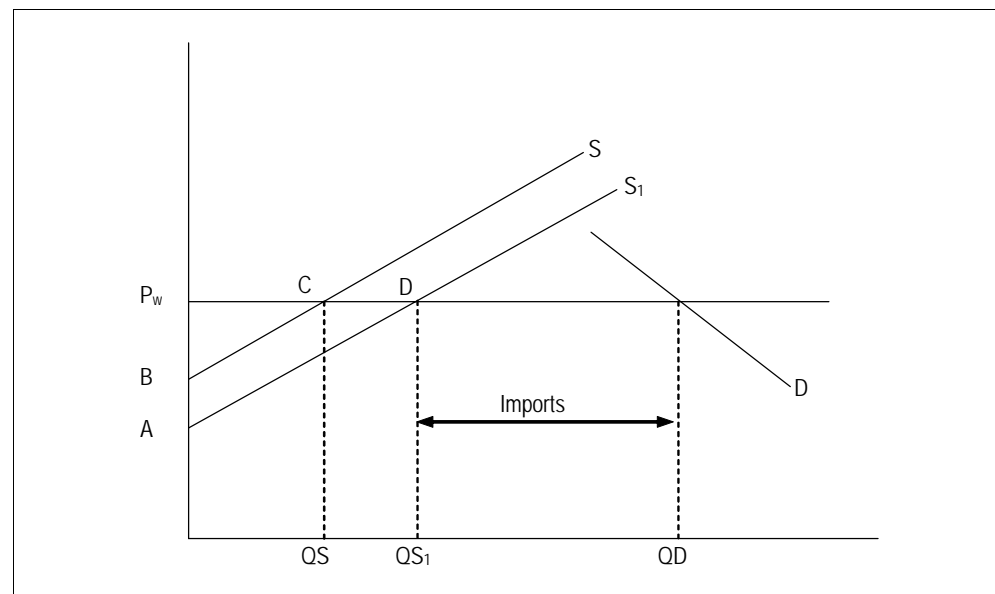
Much of the logic of providing support to VPC, as distinct from the total supply chain for livestock vaccination services, is predicated on an assumption that the Government of Laos will continue local production of vaccines as a matter of policy. As discussed in this report, actual government policy towards importation of the vaccines produced at VPC is ambiguous, since informal imports appear to be widespread. It is possible that there are sound reasons for continuing to maintain local production of vaccines: perhaps the capacity to produce vaccines to deal with localised strains of disease is important, or perhaps the government is concerned about the security of supply from surrounding countries, if intergovernmental relations were to become strained.

In principal it should be possible to evaluate an intervention targeted at VPC's production processes within this framework. If these considerations are not paramount, then the benefits of improving production processes at VPC can be assessed purely by reference to the value of imports (in world prices) that would be displaced by the improvement in VPC's production. This ignores issues in the supply chain, but if the intervention is at the production level, then the comparison is simply with imported vaccine at the point of production.

Given that VPC's products are sold at prices that are below the economic costs of production, and imports are subject to an unpredictably enforced licensing system, it could well be that an intervention to improve quality of production generates no economic benefits to Lao PDR: in other words it might make more economic sense to import all vaccines rather than to

undertake the project. Only if the VPC could produce vaccines of comparable quality to imports and at full economic costs at or below the price of imports would there be a benefit from expanding production. This effect is illustrated in chart 5.2. (It is important to note that this example is purely conceptual — the magnitude of the changes and relative quantities are not indicative of the actual environment.)

5.2 The effect of a stand alone improvement in VPC's production



Source: CIE.

In this example, an intervention in domestic production shifts the supply curve from S to S_1 . The world price is fixed at P_w — that is, changes local supply does not affect the world price. Before the intervention, domestic supply is Q_S , and demand is Q_D . The difference between Q_D and Q_S is satisfied by imports. After the intervention, the domestic supply increases to Q_{S_1} , and the quantity imported decreases. From the consumer's perspective, the price hasn't fallen, and the only gain is an increase in producer surplus equivalent to the area $ABCD$. There is no increase in consumer welfare.

Evaluating an increase in 'effective' vaccination

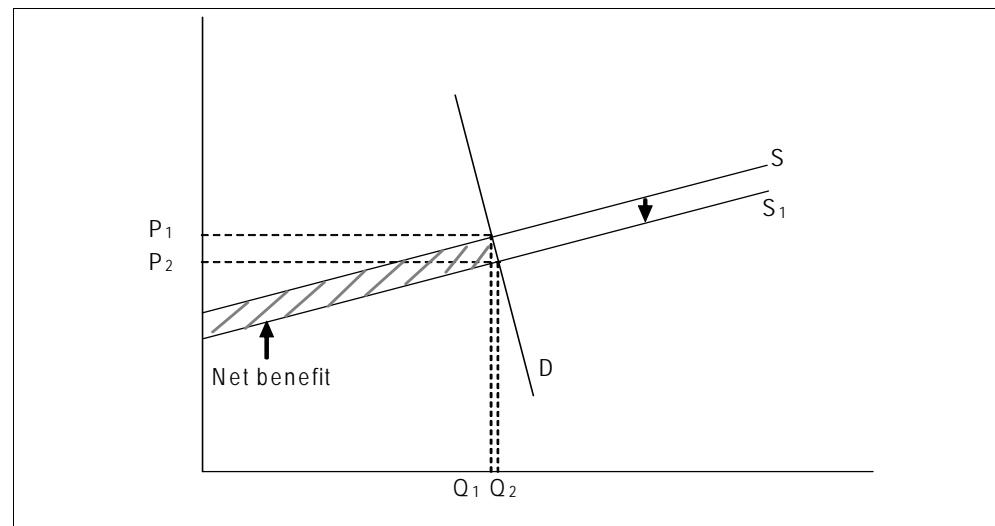
Rather than concentrating on improving production techniques at the VPC, interventions in vaccine supply should aim to improve the supply of vaccine that works at the farm level. In this sense, the supply that is of interest is not necessarily production of vaccine at the factory door — rather it is 'effective' vaccine at the farm level. The largest gains from improving effective vaccine supply are likely to come from improvements along the supply chain, rather than interventions at the production level.

Interestingly, while the EU has been a major contributor of funds to the VPC in the past, current activities in their livestock program do not involve the VPC.

Also, as discussed earlier in the report, an intervention in vaccine supply and quality alone is not likely to have significant impacts without other developments in the livestock sector and the wider environment.

A measurable impact of improvements in the quality of vaccines on producer's wellbeing could be illustrated as a shift in the supply curve. This is illustrated in chart 5.3. (The vertical axis represents the price or cost to a producer of delivery of a unit of 'effective' vaccination services, and the horizontal axis represents the number of effective doses delivered.)

5.3 Evaluating the benefits of improving quality of vaccine supply



Source: CIE.

The downward shift in the supply curve from S to S₁ occurs as the supply of effective vaccination at the farm level increases. Note that the price of effective vaccine decreases, but this does not necessarily mean that the actual average price of vaccine will decrease. It could be that the price could increase as quality improves, but the real cost to farmers of securing reliable vaccine that works has decreased. Also note that an increase in the supply of effective vaccine could be achieved both by improving the quality of domestically produced vaccine and improving the delivery — as noted earlier, the evaluation of interventions targeted at local production hinges quite critically on assumptions to be made about future government policy on importing vaccines.

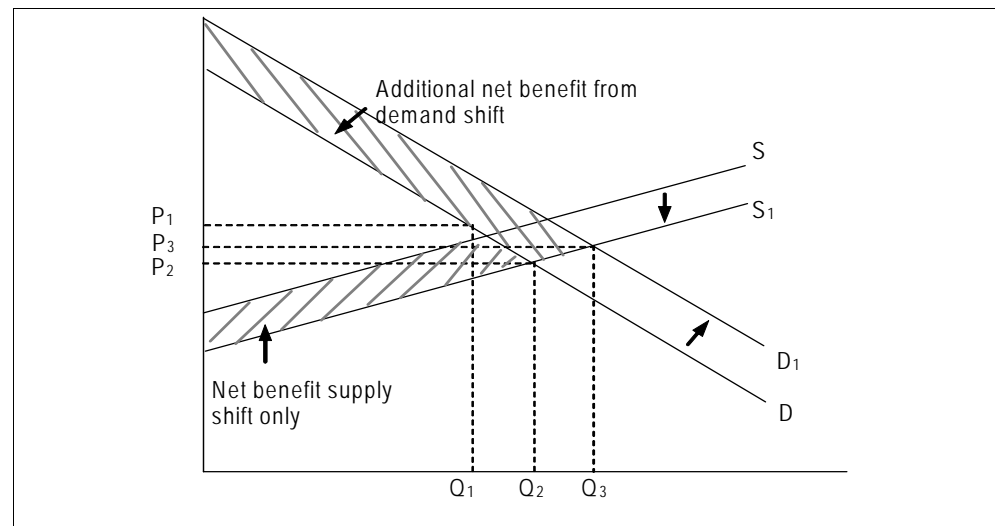
Chart 5.3 assumes demand is highly inelastic, as represented by the steep slope of the demand curve. Given this, the increase in the quantity of vaccine services utilised is relatively small. This reflects that in the system

smallholders currently operate in, their responsiveness to changes in the price of vaccine alone is fairly small. In this case, the net benefits of an improvement in quality is represented by the shaded area — the sum of the change in consumer and producer surplus.

In the example illustrated above, it is conceivable that if efforts were concentrated on an improvement in the quality of vaccine at the factory door, the effective supply at the farm level may not improve. That is, the supply curve in the above diagram would not shift. This highlights the importance of improving the distribution and delivery of vaccine, ensuring that any intervention on the production side is sustainable.

As the livestock industries develop and become more intensive, the responsiveness of demand to improvements in quality will increase. In addition to this, if the broader economic environment for producing livestock were improved by an integrated development project, demand for effective vaccination would also increase independent of any changes in supply. That is, demand for vaccine services would increase at all prices. This effect is illustrated in chart 5.4.

5.4 The benefits of improving quality of vaccine supply within a more intensive livestock system



Source: CIE.

The higher responsiveness to increases in quality is represented by a flatter demand curve. As in the previous example, the supply curve shifts from S to S_1 . The higher demand responsiveness is reflected in greater increase in the quantity of effective vaccination doses (from Q_1 to Q_2). Introducing an increase in demand (represented as a shift in the demand curve from D to D_1), increases the total quantity of effective vaccine to Q_3 . The total net benefits in this example are equivalent to the shaded area under the

demand and supply curve. This case presents an illustrative example of evaluating an improvement in vaccine quality within an integrated framework, similar to the approach taken by the broader livestock development and extension projects currently underway in Laos. The effect of improving the quality of supply is magnified by complementary developments in the livestock production system. This is discussed further in the next section.

The role of complementary inputs

The difficulty with trying to evaluate the improvement in vaccine supply with this approach is not only the lack of data, but also determining what other factors would need to change in order to facilitate changes in vaccination coverage and efficacy. These complementary inputs could be quite important — for example, forage supply has been identified as a crucial factor impeding improvements in livestock productivity. Gathering forage places significant demands on labour at the smallholder level, and it would be reasonable to assume that if vaccination delivered an improvement in survival rates, these demands would increase. If available, more effective foraging methods will be adopted, but only as the environment for more intensive production improves. (This would indicate the necessity of integrating any vaccine-oriented initiatives into activities that operate across a larger spectrum of animal health and productivity interventions, such as the proposed ADB and EU projects.)

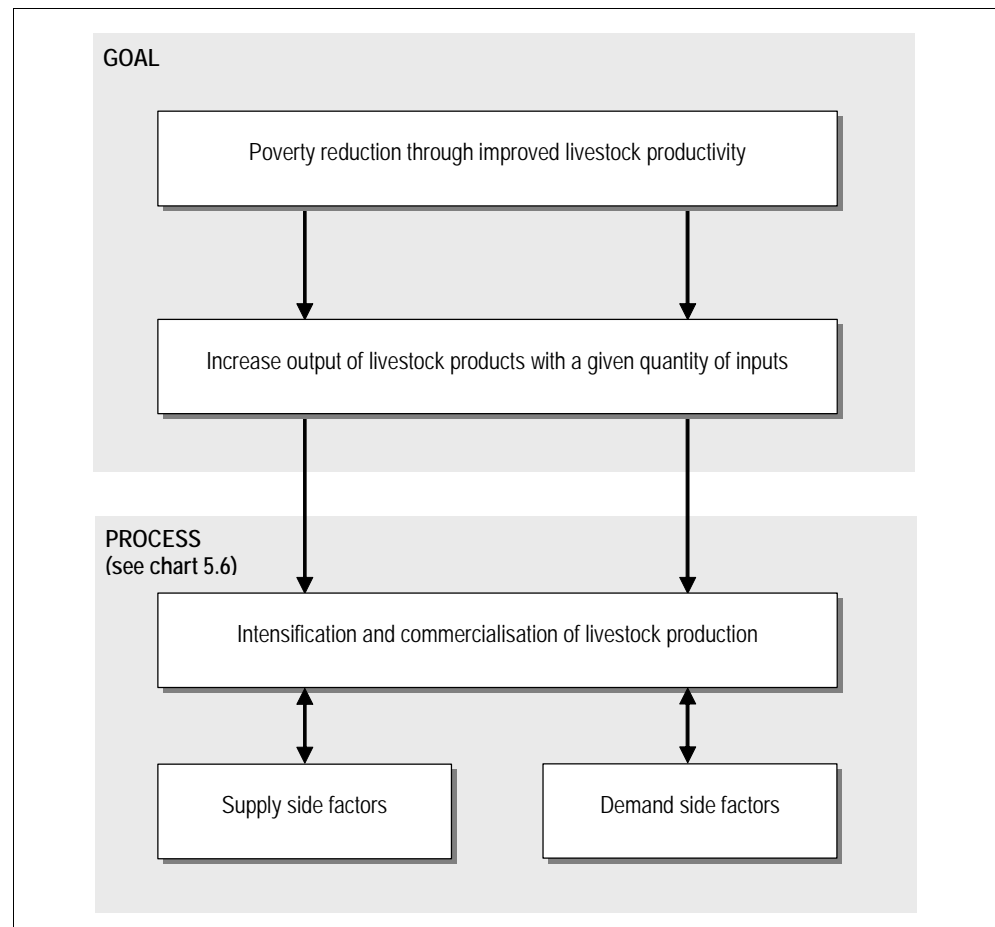
The perceived effectiveness of the vaccines is not the only factor that impacts on uptake. What is also important is the value that producers place on the reduction in the risk or presence of disease, which is a function of the value of additional output from their livestock activities. This value is in turn closely linked to the complementary inputs to livestock intensification that lead to a production system that enables producers' to realise a higher return on their livestock.

Producers also take account of all of the costs of vaccination. The cash costs, though perhaps small in relation to the value of a large animal, may be large relative to cash incomes, and as discussed earlier in the report, the scope to expand cash incomes may be limited. Further, the cash costs may be small relative to the other costs involved, such as the labour involved in rounding up and managing animals. As the ADB Livestock Disease Management Report (ADB 2005c) pointed out, realising the full benefits of vaccination may also require addressing the effect of poor nutrition and hygiene on the susceptibility of livestock to infectious and parasitic diseases: there may not be much to gain from vaccinating against one

disease if animal productivity is undermined by other causes. (By the same token, producers may be unwilling to invest in improved nutrition and husbandry, and improved breeding programs if the risk of death is high.)

Assuming that the overall goal is to reduce poverty through increasing livestock productivity, the broad process is illustrated in chart 5.5.

5.5 Livestock and poverty reduction

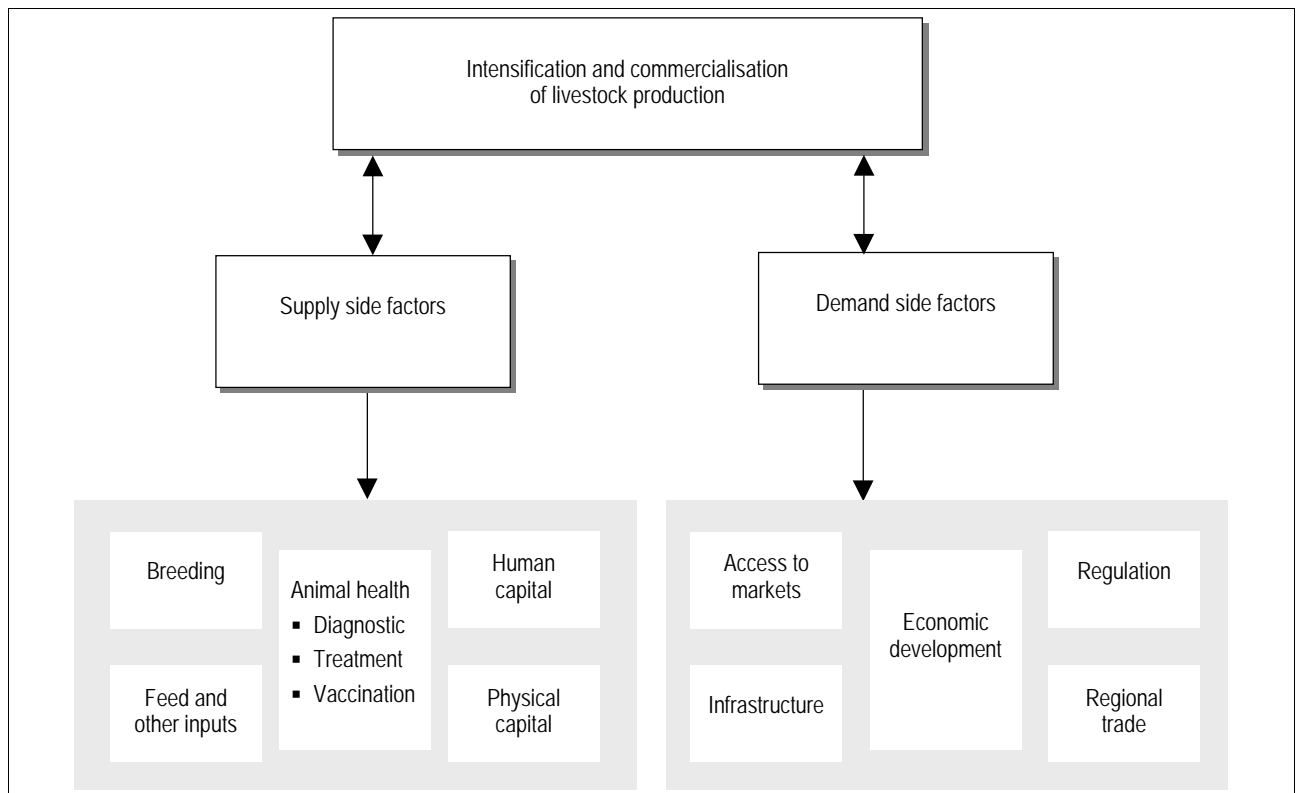


Source: CIE.

The intensification and commercialisation process is the main mechanism that will drive improvements in productivity in the livestock sector. There are a range of complementary factors that contribute to this process, including animal health and vaccination. These factors can broadly be described as supply side and demand side, which are expanded further in chart 5.6.

The interaction of these factors is complex — there are factors that require a degree of intensification to happen on a large scale. Vaccination is one of these. On the other hand, demand for better animal health goes hand in hand with more intense production and an enterprise based system.

5.6 The intensification and commercialisation process



Source: CIE.

Demand factors, particularly general economic development, regulation and infrastructure are major facilitators for the intensification process. In this sense, they feed more into the process, rather than being consequences of it. The key point is that vaccination is just one of a range of factors that contributes to the ultimate goal of improving productivity and reducing poverty.

Overlaying all these factors in relation to animal disease control, improved supply and delivery of vaccination is not likely, on its own, be enough to lead to more effective disease control. A parallel program of movement control and local as well as national level quarantining may be required to deliver these benefits.

What information is needed for an evaluation

Although it is not possible to do a quantitative evaluation of the potential benefits of the proposed project on vaccine supply at this time, it is worth thinking about what information is needed to perform such an evaluation. This is useful not only to inform information gathering during the project (if it goes ahead), but it also promotes a consideration in the planning phase as to what the objectives of the project are, and what are

realistic and achievable targets. With this in mind, some of the parameters that would need to be considered include:

- current prevalence rates by disease;
- current effects — mortality and morbidity — on livestock in aggregate;
- potential changes to these effects from effective vaccination for each disease;
 - including realistic estimates of total uptake of vaccination and associated time paths for this adoption;
 - reduced mortality as a result of disease;
 - reduced morbidity — more productive animals;
 - lower prevalence rates;
- complementary actions, such as movement control, needed to secure the gains in animal health; and
- complementary inputs to livestock development and how these impact on the uptake of vaccine;
 - this could involve looking at a model of livestock development that included changing input structure, with vaccination being one of these changes.

Another point to note — to properly undertake a broad quantitative evaluation of the benefits of improving vaccine quality, the benefits of improved supply would need to be estimated for all vaccines. The time path for adoption of vaccine would need to be considered and the overall net benefits calculated, taking into account the cost of improving quality — both project costs and implementation costs.

6

Findings

This study was undertaken in collaboration with AusVet — an Australian veterinary consultancy firm. The findings presented in this chapter represent this collaboration, and draw on some conclusions from AusVet’s report (AusVet 2006).

The main findings to come out of this study are as follows:

- Current demand for livestock vaccine in Laos is limited by a variety of factors both on the supply and demand side.
- The major supply issues confronting domestic supply is the quality of production at the VPC, but more importantly the distribution and cold chain management throughout the supply chain.
- Production problems at the VPC are sporadic — production planning appears to be a constraint in some instances, but the main constraint facing the VPC is financial. Vaccine prices are currently suppressed, and don’t cover the cost of production. Financial arrangements are complicated, but it is clear that under the current structure, the VPC is not financially viable in the long term.
- Previously, the VPC has been supported considerably by donor funding. While there are still residual funds in the form of a revolving fund, these are being run down to meet shortfalls. There are presently no donors actively funding the VPC.
- Significant quantities of imported vaccine are already supplied, particularly to commercial producers, but also in some instances to provincial and district government offices. It was not possible to estimate the quantity currently supplied in this study.
- On the demand side, uptake of vaccination is limited by a range of institutional and market factors that ultimately reduce the potential returns from vaccinating livestock and hence the incentives for producers to vaccinate.
- One of the major factors to consider on the demand side is the current structure of production amongst smallholders. It is clear that subsistence farming is still the dominant system — livestock production is one of a range of activities that the smallholder engages

in. Within the current production systems, there is limited willingness to devote more resources to intensifying livestock production, which in turn limits the widespread adoption of vaccination at the smallholder level.

- The future prospects for vaccine demand are uncertain. Given the current low coverage rates, in theory there is significant potential. However, that major factor influencing this demand is the strength of the intensification and commercialisation process. This is in turn influenced by a range of supply factors such as forage availability, land constraints, feed and other inputs and human capital. In addition, it is also linked to demand side factors including general economic development, infrastructure development, regional trade and regulation.

Suggestions for proposal

The objective of the proposed CSIRO/NAHC project is to improve control of livestock diseases by improving the quality and assurance of quality of vaccines in Laos PDR. While it identifies a number of constraints that affect the uptake of disease, the focus is largely on the technical side. A major issue that is not addressed is the long-term sustainability of the VPC. It is clear that under present funding arrangements and business operations, the VPC is not sustainable.

Develop a new business plan for animal vaccine supply

One of the clear findings coming out of this study is that the domestic vaccine production system that currently operates is not sustainable. Vaccines produced at the VPC are sold for less than the cost of production and funding shortfalls are not met appropriately through other sources. Distribution through the VSU does not seem to offer assurances of financial viability or effective marketing. An option for ACIAR is to work with the Lao government to develop an alternative business model for producing and distributing livestock vaccine. This would involve three major steps:

- get an agreement from the appropriate level of government to develop a study to look at options for vaccine supply and distribution;
- implement and undertake the study, develop options and reach an agreement on the preferred option; and
- implement the agreed option.

Once the agreed option has been implemented, a clear assessment of the technical capacity at the VPC in the context of the new business plan could

be used to inform practical and useful interventions on the technical side. Other aspects such as the supply chain could also be looked at in the context of the new business plan.

The study would have to examine options for dealing with the VPC and VSU in the broader context of the government's approach to public expenditure and state enterprise reform. It has to be recognised that some of the problems facing these institutions are linked to where Laos currently is in its transition to a market economy in Laos, and progress made on the related problem of developing robust systems of public finance and clarifying the role of government in service delivery. The government is working with international financial institutions on these issues, and approaches to dealing with the problems affecting the VPC and VSU would have to take account of the broader strategies being developed in these areas.

Formal collaboration with other livestock projects

Unless the business operations of the VPC are placed on a sustainable basis, the returns to any investment in its technical capacity are likely to be limited. Given that working directly with the VPC is contingent on a commitment to restructure the business to make it more sustainable, the question is what opportunities are there elsewhere if agreement cannot be reached?

This study has identified significant constraints affecting the demand for vaccines, particularly the adoption of vaccination by smallholders. Many of these factors relate to the smallholder production system and the inherent disincentives to engage in more intensive livestock production that are present in the current production system. There are a number of other livestock projects currently underway in Laos that attempt to address many of the wider factors that affect smallholder approaches to animal health and vaccine demand. If ACIAR is to work on vaccine issues in Laos, it makes sense to collaborate with these larger projects, which also provide a network of relevant provincial and district level government staff as well as other collaborators. In addition to this, being largely extension based, these projects provide scope for ongoing implementation.

There is an opportunity for field based research that looks more closely at the factors affecting smallholders' management of animal health, including vaccine use. In addition to this, the handling of vaccine throughout the distribution chain has previously been identified as a major constraint to the delivery of effective vaccine at the farm level. The proposal for project AH 2005/084 identified some of these constraints. A potential project could

attempt to address some of the supply chain issues in the context of factors identified as limiting vaccine use at the smallholder level. This would have the added benefit of addressing problems in the supply chain that affect imported vaccine as well as vaccine produced domestically. Collaboration with other projects would mean that information coming out of those projects on constraints faced by smallholders could also be used to inform appropriate interventions in the supply chain.

There are already informal linkages, with many of the in-country experts on the current proposal also involved in the larger projects. Much of the effort would be in establishing formal linkages at the higher management levels within the respective donor agency, and in ensuring that the method of collaboration in the field is formally agreed.

Appendix A

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(Continued on next page)

APPENDIX A

Lao PDR continued

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(Continued on next page)

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SECTION 3

*Assessment of current and
potential animal vaccine
use in Lao PDR*

Report by AusVet Animal Health Services Pty Ltd

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ABBREVIATIONS and ACRONYMS

ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
AFTA	ASEAN Free Trade Area
ASEAN	Association of South East Asian Countries
CIAT	International Centre for Tropical Agriculture
CLMV	Cambodia, Laos, Myanmar and Vietnam
CSF	Classical swine fever
DEA	District Extension Assistants
DLF	Department of Livestock and Fisheries (Lao PDR)
DP	Duck Plague
ET	Enterotoxaemia
EU	European Union
FAO	Food and Agriculture Organisation (of the United Nations)
FMD	Foot and mouth disease
FC	Fowl cholera
FP	Fowl pox
GMS	Greater Mekong Subregion
HPAI	Highly pathogenic avian influenza
HS	Haemorrhagic septicaemia
IB	Infectious bronchitis
JICA	Japanese International Cooperation Agency
LAAHR	Laos-Australia Animal Health Research (Project)
NAHC	National Animal Health Centre (of DLF)
ND	Newcastle disease
OIE	World Organisation for Animal Health
SEAFMD	South East Asia Foot and Mouth Disease (Control Program)
TAD	Transboundary animal disease
VPC	Vaccine Production Centre (of DLF)
VSU	Veterinary Supply Unit (of DLF)
VVW	Village Veterinary Worker

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I would like to acknowledge the contribution of the people listed in Appendix 2 with whom I consulted for this report. In particular, I would like to thank very much Dr Phouth Inthavong and his colleagues at the National Animal Health Centre in Vientiane who organised and hosted the visits to meet with people in and around Vientiane. Our visit coincided with a particularly busy time for the Department of Livestock and Fisheries as the staff were engaged in surveillance and disease control following a recent outbreak of Highly Pathogenic Avian Influenza (HPAI) and as the ACIAR Board also met in Vientiane that week.

I would also like to thank Messrs Bob Warner and Matthew Harding from the CIE for their kind assistance good company during the study.

EXECUTIVE SUMMARY

This review of animal vaccine supply and demand in the Lao PDR was undertaken in late July 2006 as background to a proposed ACIAR project to improve the technical aspects of the production and distribution of the products of the Lao Government's Vaccine Production Centre (VPC) near Vientiane, *Improved supply and quality of livestock vaccines in Laos* (AH 2005/084).

The VPC produces two bacterial vaccines, against fowl cholera and against haemorrhagic septicaemia (HS) in cattle and buffalo, and 7 viral vaccines against classical swine fever in pigs and against Newcastle disease, infectious bronchitis, fowl pox and duck plague in poultry. No animal vaccines are imported to Lao PDR along the official pathways but some commercial livestock producers, retailers and provinces do "informally" import an unquantified amount of animal vaccines. These "informal" imports from wholesalers and distributors in neighbouring countries are conducted with the government's approval and the VSU itself imports small amounts of vaccine, for instance, against foot and mouth disease and rabies.

Livestock production is being encouraged by the Lao government, especially more commercially oriented production of cattle, buffalo and pigs by smallholders. In 2000, the VPC set a total production target of approximately 21 million doses of vaccine per annum. In the past five years, annual production has averaged about 5-6 million doses although the VPC's capacity may be closer to 10 million doses. Vaccines are produced in response to the demand that comes largely from smallholders via government field staff and provincial offices. In recent years about 85% of the vaccine produced has been distributed, mostly via the government's Veterinary Supply Unit (VSU) in Vientiane. A small amount of vaccine is also sold to private resellers or "feed shops" in and around Vientiane.

The effective vaccination coverage of Lao smallholder livestock is low despite the government's policy of selling VPC vaccines at low prices to promote uptake. For instance, HS vaccine costs about 2 US cents per dose, CSF 6 cents and the poultry vaccines less 1 cent per dose. Returns on vaccine sales to the VPC were only about USD 40,000 in 2005. This is insufficient to cover the costs of materials (most of which are imported) and other variable costs of production. The institution has relied on donor support for equipment and maintenance on top of the government's contribution for permanent staff, electricity and major maintenance costs. Donor funds from a previous project are being used to cover annual deficits. Despite this, equipment failures are common and these affect production and quality.

The demand for animal vaccines in Laos comes from smallholders, commercial livestock producers and from official disease control for transboundary animal diseases (TADs) under national and regional programs. Smallholder demand for

vaccine is probably driven mainly by their ability to realise a cash return on their investments of time and labour in their livestock. Demand is also affected by their levels of understanding of infectious disease, the role of vaccines and their access to both information and product. Commercial producers use VPC vaccine but can access high quality imported vaccines at competitive prices and will probably continue to be able to import these “informally”. Greater confidence in the quality and effectiveness of VPC vaccines should also improve demand. Effective vaccines against HS and CSF may be used for government programs under the umbrella of regional TAD control in the Greater Mekong Region but FMD vaccine required would be imported.

This review has concluded that:

1. The demand for vaccines by commercial livestock producers will increase steadily as the number and size of such enterprises increases.
2. Commercial producers can access vaccines from a number of sources and do not need to rely on the VPC. They will use vaccines that are of high quality, conveniently sourced, promptly supplied and appropriately priced for their production systems.
3. International distributors are already supplying an unknown quantity of vaccine in relatively small consignments and appear interested in supplying a larger market as it develops over the next 10 years.
4. Current imports have tacit government support at the national level and some provincial governments may be actively importing vaccine.
5. When they become active, regional TAD programs will increase demand for specific vaccines, of which CSF and HS vaccines are manufactured in Lao PDR.
6. Smallholders can buy animal vaccines or have their animals vaccinated on a fee for service basis through village veterinary workers who are supplied through the government vaccine distribution network.
7. Smallholders’ access to vaccines and good animal health advice in remote areas is poor at this stage but should improve with rural development.
8. The current demand for vaccine from VPC by smallholders and the vaccination coverage of their livestock by VPC vaccines is low compared to the potential use.
9. Smallholders’ vaccine use will probably increase slowly, driven by their ability to supply cash markets and their awareness and understanding of

infectious animal diseases and the role of vaccination in protecting their investment in their livestock and the income from them.

10. Interested smallholders' awareness and understanding would be increased by more active and educated advisers.
11. Quality control in manufacturing at VPC and in distribution by VSU is compromised by inadequate government funding and poor cost recovery through underpriced sales and variable compliance with ASEAN standards of production.
12. There is significant potential to improve the quality and effectiveness of VPC vaccines through better quality control in production and distribution as proposed by the CSIRO/NAHC proposal to ACIAR.
13. The government policy of maintaining artificially low vaccine prices to encourage smallholder vaccination is not increasing demand and should be reviewed.
14. There are no major donors committed to funding the operations of the VPC/VSU in future.
15. A new business model for the VPC and VSU is needed to ensure financial and operational sustainability.

It is recommended that the current research proposal to ACIAR be improved by including an initial "go/no go" milestone of developing a **new business plan** with the Government of the Lao PDR for animal vaccine supply and distribution. Before the technical aspects of the proposed AH 2005/084 project proceeds this plan should be used to review the Lao government's commitment to local manufacturing of major animal vaccines at the VPC under the new business plan or an alternative sustainable model.

In addition to this project centred on the VPC, it is recommended that a **complementary field based project** investigates more closely the factors affecting smallholders' management of animal health, including vaccine use.

Introduction

CSIRO Livestock Industries' Australian Animal Health Laboratory and the Lao National Animal Health Centre (NAHC) have proposed a project to ACIAR titled, *Improved supply and quality of livestock vaccines in Laos* (AH 2005/084). Before proceeding past Phase 1, ACIAR requested an assessment of current and potential use of animal vaccines in the Lao PDR to provide a background to the project. David Kennedy of AusVet undertook the technical assessment according to the following terms of reference, in collaboration with Bob Warner and Matthew Harding from the Centre for International Economics (CIE), in July 2006.

Terms of Reference

1. Identify current animal vaccines produced at the National Vaccine Production Centre (VPC), the numbers of doses produced, how they are distributed, who pays, who are the end beneficiaries and who actually administers the vaccine. Document current and planned donor activity at VPC.
2. Document the cost of the vaccines to the producer, determine the flow of revenue and who benefits from that revenue.
3. Define what institutional or policy factors appear to be present that may limit or facilitate vaccine uptake.
4. More broadly to provide a view on the demand pull for vaccines from the various livestock sectors. This should provide an analysis of the value of vaccines to livestock owners. Is this value reflected in current sales and what is the potential for larger number of owners to use vaccines?
5. Determine if vaccines are imported and, if so, where from and at what price (relative to local vaccines).
6. Consider implications of a viable vaccine facility for current and planned regional transboundary disease control initiatives by OIE, ASEAN, etc.
7. Recommend improvements to the proposal for project AH 2005/84 where appropriate.

Approach

ACIAR requested AusVet to conduct a short consultancy comprising the following agreed activities:

1. Review confidential ACIAR project proposal from CSIRO on *Improved supply and quality of livestock vaccines in Laos* (AH 2005/084) and relevant papers on vaccine use in Lao PDR.
2. Plan and undertake in-country consultations with CIE staff and Lao PDR contacts for week beginning 24 July 2006.
3. In Vientiane, review vaccine production and distribution records and consult with
 - Senior staff of the Ministry of Agriculture and Forestry, Department of Livestock and Fisheries.
 - Director and Deputy Director of National Animal Health Centre (NAHC, Drs Bouloun Douangnggeun and Syseng Khounsy)
 - Director of VPC (Dr Sithong)
 - Livestock Production/Nutrition Expert CIAT (Dr. Werner Stur)
 - Importers and distributors of animal vaccines (incl. contacts from Stephen Page)
4. Undertake field trips to consult with users of vaccines including
 - district veterinary assistants, village veterinary workers and smallholders,
 - commercial cattle, poultry and pig producers.
5. Consult with coordinators of regional transboundary disease programs, in Bangkok if possible (Dr Ronello Abila Regional Coordinator, South East Asia FMD Campaign and Dr Carolyn Benigno Animal Health Officer FAO Regional Office)
6. Submit draft report to ACIAR by 7th August and final report by the 21st August.

CIE and AusVet undertook the visit to Vientiane and Bangkok together during the week, 24 to 29 July 2006, and met with the people listed in Appendix 2. The team completed most of the agreed activities and met with additional people who had an interest in animal production and health in Laos.

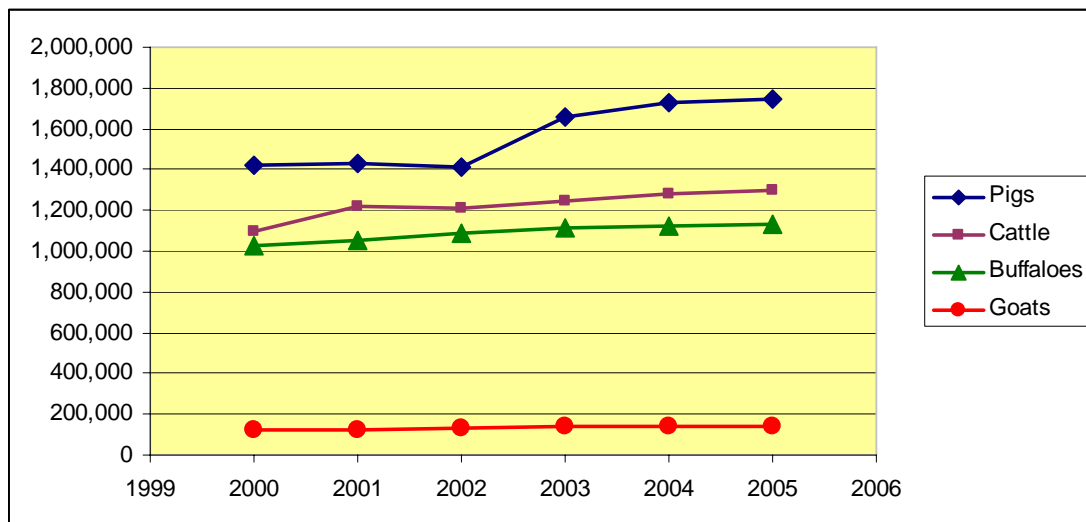
This report mainly covers (but is not limited to) the technical aspects of the review. CIE is submitting a separate complementary report that will focus more on the institutional and socioeconomic aspects of the review.

Animal Industries

Eighty percent of the estimated 5.6 million people in the Lao PDR are rural dwellers (UN 2005). The country is divided into three regions and 16 provinces which comprise the capital city, a special zone and 142 districts. In 2003, just under half the value of GDP was earned by agriculture which employed about 80% of the workforce (AusVet and ARECS, 2006).

The animal industries in Laos comprise mainly grazing cattle, buffalo and goats and pigs and chicken production. Intensification is slowly occurring in the developing commercial pig and poultry industries, using hybrid breed stock and local and imported feeds. Lao PDR conducted its first (and latest) agricultural census in 1998-99. There were estimated to be just under a million each of cattle and buffalo and just over a million pigs. The number of goats was estimated to be 94,000 and chickens 9.7 million and ducks 1.4 million. In 2005, FAO estimated the populations of chickens to have increased from 13 to 21 million and of ducks from 1.7 to 3.2 million from 2000 to 2005. Figure 1 presents the estimates for the larger livestock species populations over the same period. These are approximations only, probably based on extrapolations from the 1998-99 census and/or district estimates.

Figure 1. Estimated livestock populations, 1999-2005 (FAO Stat, courtesy Dr Colling)



The Lao government's five year plan is encouraging the large ruminant industries, associated improvements in feeding and management and increased marketing to Thailand and Vietnam. Improved forages in northern Laos have been developed by the International Centre for Tropical Agriculture's (CIAT) Forage and Livestock System Project (FLSP) that is now being extended by a new Asian Development Bank

(ADB) livestock project from 2006. Experienced CIAT staff members consider that smallholder goat production will also expand in a more commercial environment.

Animal health management and services

The government animal health service is managed by the Department of Livestock and Fisheries (DLF) within the Ministry of Agriculture and Forestry. This is supplemented by a small corps of private veterinary practitioners, some of whom service larger commercial pig and poultry farms. It is estimated that there are about 70 veterinary graduates in Laos, of whom approximately 45 are actively working in animal health. In the past Laos had significant support from the Soviet Union in training veterinarians but the country is now facing a scarcity of veterinarians. Only two new graduates have entered the animal health system in the past decade and none are currently in training. Animal health staff are largely local agriculture graduates who have studied animal production and health. The decline in the numbers of veterinary staff has been reported by others and is being partly addressed by the new EU project which includes training for up to two candidates at a veterinary school in the region.

Animal disease control is managed from the National Animal Health Centre (NAHC) in Vientiane through provincial livestock officers and district extension assistants, who specialise in one or more areas of livestock production (eg large livestock, poultry and aquaculture) depending on the local demand. The district staff work in the field but also coordinate some of the work of Village Veterinary Workers (VW).

The DLF and donor projects have trained “thousands” of VW to service village livestock production over the past decade but it is believed that most of these are no longer active for a variety of reasons, including lack of income generating work. For instance, even in the 60 villages of the Sikottabong District in and around Vientiane, there are still only 28 active VWs of the 40 trained. This is a relatively high retention rate that is largely attributed to better VW income resulting from higher education standards and understanding of animal health awareness and access to markets for smallholders around Vientiane. In the first nine months of the 2006 financial year, the VW we visited in this area had vaccinated 80% of the cattle and 70% of the buffalo for HS. However, only 10% of the less lucrative pigs and chickens had been vaccinated.

The VWs undertake simple tasks including treatment and vaccination for which they charge a fee. These fees are not regulated but some provinces reportedly set a maximum fee as a guideline. In Vientiane Capital region the maximum fee for vaccinating cattle or buffalo for HS is Kip 5,000 or approx USD 0.50. They also sell vaccines and medicines with a markup. Smallholders can also access vaccines and other animal health supplies through local retailers known as “feed shops”.

Commercial producers would have greater capacity to also use veterinarians and other private advisers to buy medicines and vaccines.

Vaccine Supply

Based on past history, it is felt that the most important infectious diseases of livestock in Lao PDR that are amenable to control by vaccination are those outlined in Table 1. However surveillance has been limited and the reported occurrence of diseases will be a significant underestimate of the true occurrence. Some projects have focused on CSF and FMD and more recently active surveillance for HPAI has been undertaken but the true occurrence and distribution and impact of most of these infections across Laos is not known.

Table 1. Major infectious diseases of livestock in Lao PDR.

Species	Diseases
Cattle	Haemorrhagic septicaemia (HS), Foot and mouth disease (FMD), Blackleg
Buffalo	HS
Pigs	Classical swine fever (CSF), FMD
Goats	FMD, Enterotoxaemia (ET)
Sheep	FMD, ET
Chickens	Highly Pathogenic Avian Influenza (HPAI), Newcastle Disease (ND), Fowl Cholera (FC), Fowl Pox,
Ducks	Duck Plague (DP), FC

Rabies is also a significant animal and human health issue against which some dog vaccination is undertaken (7,000 doses imported in 2005, Table 3).

To help manage its important infectious diseases by vaccination at relatively low cost to smallholders, the Lao government, like most governments in the region, operates a national vaccine production facility. The Lao Vaccine Production Centre (VPC) is considered a national security asset, to free Laos of reliance on international sources. The government however has recently considered privatising the VPC or operating it as joint venture but has had no expressions of interest.

Opportunities for sourcing vaccine from other suppliers outside Laos is increasing slowly as more farmers become engaged in the commercial production and marketing of animals and animal products within the country and with neighbouring countries. Although import regulations exist, no vaccine is currently imported through the official trade channels. However, the government is relaxed about “informal” imports of small quantities of vaccine and both the governments

Veterinary Supply Unit (VSU), provinces and private operators import vaccines from wholesalers and retailers in neighbouring countries as needed or as is convenient. The types and amounts of imported vaccines are unknown at this time.

The Lao Veterinary Vaccine Production Centre (VPC)

The Lao Ministry of Agriculture and Forestry, Department of Livestock and Fisheries (DLF) has been operating the VPC, located 15 km north of Vientiane, for 27 years. It is a service institution that has produced about 5-6 million doses of vaccine per annum in recent years, although VPC managers expect that its current annual production capacity is about 10 million doses.

The VPC bases its level of production largely on the orders received from the government's provincial offices. This in turn is based on orders or estimated demand from district offices and VVWs. Vaccine is supplied to these and other private customers through the VSU at a set price, approved annually by the government. As a service institution, the VPC does not aim to make a profit. Most of the capital equipment and variable inputs for production are imported and therefore some of the VPC's major costs are subject to currency fluctuations and price changes. However, prices have not been increasing to cover costs and the institution has insufficient funds to maintain its business.

The FAO and UNDP supported the VPC financially and technically until 1995 and from 1998 to 2004, the EU's *Strengthening of livestock services and extension activities project*, ALA/96/19, was a major supporter. This EU project also included activities in relation to the use of vaccine in the field. Recently the *Japan-Thailand Technical Cooperation on Animal Disease Control in Thailand and Neighbouring Countries* has supported equipment and training for producing oil adjuvant vaccines;

Currently there is no specific donor support for the VPC which is funded by,

- Government – for 15 permanent staff salaries, electricity and major maintenance, and
- Returns on vaccine sales – for materials, casual staff (currently 6) and operations.

The facilities and operations at the VPC include animal houses for producing rabbits and eggs that are used in viral vaccine production and other houses for other animals that are used in quality control testing. Management advised that vaccine is manufactured in compliance with the ASEAN standards (See references) but that significant problems occur from time to time. Some serious problems that have been identified by NAHC staff (and have been resolved) in recent years have included twice daily thawing of freezers and staff removing vials from freezers to allow them to warm up so that labels could be applied. On the day of our visit, several staff in street clothes were applying rubber plugs to filled vials with bare hands, although it

was explained that they thoroughly wash and disinfect their hands before this work commences.

The FAO *Vaccine Use and Production Project* funded equipment and cold storage at the VPC and at district offices across the Lao PDR in 1990-95 and the EU project funded a significant refurbishment of the laboratory buildings and equipment a few years ago. At present however, the main fermentor for bacterial vaccines has been out of use for over a month because of a technical malfunction and because its air filters are apparently not working effectively. Government funding of the VPC allows for depreciation of equipment at a set rate but does not allow for maintenance. VPC management expressed the hope that a new donor would assist with maintaining equipment.

The total annual production of vaccines at the VPC since 1990 is presented in Figure 2, together with the number of doses distributed to wholesalers and users. The highest annual production was reached in 1993-95. At that time, Laos exported vaccine to Cambodia, which has subsequently established its own production capacity. Total vaccine production fell to 4 million doses in 1996 and increased slowly to another peak of approximately 6.5 million doses in 2003 following the substantial input from the EU Livestock Project. However this extra production in 2003 was not distributed to users and production was cut back in 2004 and 2005.

The VPC currently produces three wet bacterial vaccines (two for HS and one for FC) and freeze dried viral vaccines for CSF and for infections of poultry. Recently two new vaccines have been manufactured at the VPC; small quantities of thermotolerant I-2 for ND since 2003 and an oil adjuvanted HS vaccine for longer immunity in 2006. The VPC ceased production of anthrax, blackleg and rabies vaccines in 1999 after a review of the limited markets, production costs and alternative suppliers.

The production of individual vaccines from 2000-2005 is shown in Table 2. Poultry vaccines accounted for 4.5 million of the 5.25 million doses produced in 2005. Production figures for each vaccine varied over the period without any particular trends being evident, except for CSF vaccine. CSF vaccine production increased from 66,000 to 217,000 doses. It had been thought that this was probably associated with the increased interest and use resulting from the *Lao-Australia Animal Health Research Project* (LAAHR) that strongly promoted improved pig production and CSF control in 24 villages in two provinces (Bolikhamxay and Xieng Khouang). However, this effect may have not been as significant as it seemed as these two provinces took only about 10% of the CSF vaccine distributed in 2005 (Table 4).

The prices for vaccines have been held at the same level since 2000 when Dr Sithong calculated the true production costs and there was an adjustment for the exchange rate of the Lao Kip against the US dollar (see Table 7). The current costs of production were not available to this study but there continues to be a heavy reliance on imported materials.

Figure 2. Total numbers of doses (in millions) produced and distributed by VPC 1990-2005 (Dr Sithong, July 2006)

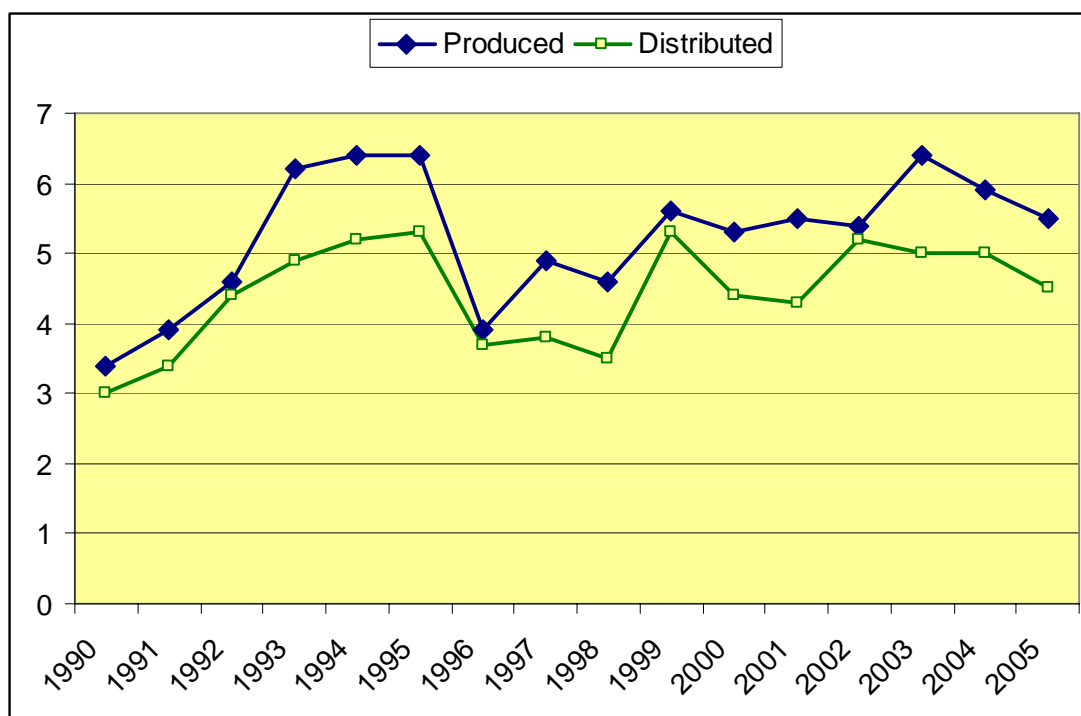


Table 2. Production of individual vaccines VPC, 2000-2005 (source: VPC 2006, courtesy of Dr Colling)

Vaccine	2000	2001	2002	2003	2004	2005
Haemorrhagic Septicaemia	457,290	483,180	504,390	503,820	499,875	500,695
Classical swine fever	65,640	62,230	115,870	115,480	166,120	216,670
Fowl cholera	837,900	994,700	980,800	1,000,100	821,100	793,100
Newcastle F strain	1,759,200	1,699,200	1,515,500	1,984,100	1,205,600	1,293,900
Newcastle M strain	1,666,000	1,645,600	1,739,300	2,023,400	1,159,400	1,513,800
Newcastle I2 strain	0	0	0	125,000	95,000	79,800
Infectious bronchitis	230,450	420,900	236,700	201,500	328,600	344,800
Duck plague	261,650	179,700	180,150	202,200	140,650	201,700
Fowl pox	0	0	180,150	232,800	131,000	306,300
Total	5,278,130	5,485,510	5,452,860	6,388,400	4,547,345	5,250,765

Imported Vaccine

The Lao PDR became a member of ASEAN in 1997 and has committed to fully implement the ASEAN Free Trade Area (AFTA) in 2008. The backbone of AFTA is tariff reduction through the mechanism of the common effective preferential tariff (CEPT). Under CEPT, tariffs on goods traded by Lao within the ASEAN region will be reduced to 0-5 per cent by the year 2008. In 2002, vaccines imported to Lao already attracted only a 5% duty (http://www.aseansec.org/economic/afta/2002_cept_package/LaoPDR2002.zip).

According to the United Nations (2005), the Lao regulations for imports require that,

Any individual or firm seeking to import goods is required to make a six month or one-year plan for each commodity, which is to be submitted to the Trade Section of the province, the Vientiane municipality, or the special region for acknowledgement and then to the Trade Section of the control unit in order to obtain the import approval.

As part of the import license application process, importers should submit a list of goods for import. The list may consist of one or many goods according to their capacity. Once approved, the list of goods is part of the import license. The import operation should then be conducted in accordance with the list of goods as specified on the import license, as well as the terms of the sell-buy contract.

Imports of goods controlled by the Government are subject to an import permit delivered by the Ministry of Commerce/provincial offices or related line Ministries. (Animal medicines require a permit from the Department of Livestock and Fisheries, Ministry of Agriculture and Forestry).

Such conditions and especially the time taken to obtain approvals were mentioned as disincentives to compliance with import regulations. Our consultations in Laos and by email or phone contact with potential suppliers in Thailand (Betagro) and Vietnam (Navetco and Biopharmachemie) indicate that there are currently no imports of animal vaccine to Lao PDR that conform to these formal requirements. This appears to have been the case for some time and appears unlikely to change in the current environment. According to the Director of the VSU, Navetco is apparently interested in exporting clostridial vaccines to Laos but in large consignments that greatly exceed the Lao demand at this stage. The government however allows so-called, “informal” imports of relatively small quantities from retailers and wholesalers by the VSU (Table 3) and by private users, such as large commercial pig and poultry farms. The extent of private trade is unclear. This review only consulted people in an around Vientiane, but some of

these said that, in border areas away from Vientiane, vaccines are also commonly imported by some provinces and by small retailers or “feed shops”.

An example of an “informal” importer is a large commercial piggery near Vientiane that uses only vaccines imported from a major Thai manufacturer and distributor of animal products (Betagro). The farm currently uses vaccines for CSF and Aujeszky’s disease that are manufactured by CEVA in Hungary, a porcine parvovirus vaccine manufactured by Intervet in the Netherlands and FMD vaccine from Pakchong in Thailand. According to this producer, the Thai distributor delivers the vaccines to the farm and the landed cost of the Hungarian CSF vaccine is approximately USD 0.10 compared the price of Lao vaccine of approximately USD 0.06 at the VSU.

Distribution

The vaccine distribution pathways identified during this study are illustrated in Figure 3 with the shaded area highlighting likely areas where surplus animal products are consumed.

The DLF has recently established a branch of the NAHC, called the Veterinary Supply Unit (VSU), to distribute animal vaccines and medications in Laos. Currently about 80% of the vaccine produced by the VPC is sent to the VSU with the balance still sold directly to veterinarians, VVWs, commercial producers and “feed shops” in and around Vientiane. Most of the VSU’s distribution is to the provinces (Table 4 and Figure 4) but it also supplies private users and retailers

The handling and storage of VPC vaccine has been a source of serious concern recently as has been outlined by the CSIRO/NAHC proposal to ACIAR. Personnel at the NAHC investigated the cold chain in response to complaints about vaccinated pigs dying of CSF and finding that vaccinated pigs had no detectable immunity. They found that some of the freezers at VOC did not operate correctly with one in particular defrosting regularly, during which time its internal temperature rose well above freezing. These problems have been addressed at VPC and the cold storage at VSU is also appropriate. More problematic is the integrity of the cold chain in transit to the provinces.

At the VPC, vaccine is packed in light foam boxes with ice and then transported by bus to the VSU. There the ice boxes are unpacked and the vaccine put in cold or frozen storage before repacking in similar boxes for transport by overnight bus, boat and/or plane to the field. We were advised by NAHC staff that temperatures would probably be only maintained near zero degrees Celsius for a maximum of 10 hours under these conditions. Only about a half of the country’s district offices are thought to have electricity, although many may still have kerosene refrigerators supplied several years ago by an FAO project. Customers closer to Vientiane who buy direct from the VPC or VSU can probably better manage the cold chain in transit.

Table 4. Distribution of doses of VPC vaccine from the Veterinary Supply Unit to Provinces in 2005 (Source: VSU, Aug 2006).

	HS	FC	NDF	NDM	ND I2	IB	FP	DP	CSF
Produced	500,695	793,100	1,293,900	1,513,800	79,800	344,800	306,300	201,700	216,670
Distributed									
Vientiane Capital	35,970	68,600	133,800	142,300	12,900	63,150	57,250	43,100	45,840
Vientiane province	32,370	57,400	108,700	124,500	2,750	32,950	42,100	32,900	16,560
Phongsaly	25,395	22,500	38,700	45,000	-	-	-	-	4,530
Oudomxay	23,520	27,700	42,500	56,900	-	-	-	9,250	5,630
Bokeo	22,950	38,400	64,800	68,600	-	-	-	4,250	6,920
Luangnamtha	21,345	56,250	73,000	112,500	-	12,750	2,900	17,100	14,360
Luangprabang	38,250	50,800	79,800	76,200	-	24,100	-	12,700	11,250
Houaphanh	24,480	28,150	46,300	58,400	-	-	-	-	5,660
Xayaboury	25,335	32,500	52,000	66,500	-	6,250	-	-	7,400
Xiengkhouang	26,745	36,750	62,100	72,300	-	-	-	-	9,810
Bolikhamxay	32,585	49,900	79,000	96,500	-	17,900	-	21,900	12,450
Khammouane	32,175	49,100	85,200	103,200	-	19,100	12,000	10,700	15,490
Saravan	29,355	43,700	73,800	85,600	-	11,750	-	6,900	11,800
Savannakhet	42,510	63,400	89,400	117,000	-	21,250	16,250	22,550	16,530
Champasack	31,950	59,250	82,800	87,200	-	26,200	12,400	14,350	15,400
Xekong	17,910	32,250	53,000	67,800	-	-	-	-	6,840
Attapeu	18,525	38,450	64,200	73,500	-	-	-	-	7,800
Total distributed	481,370	755,100	1,229,100	1,454,000	15,650	235,400	142,900	195,700	214,270

Figure 3. Animal vaccine supply chain in Lao PDR (Source: The CIE, 2006)

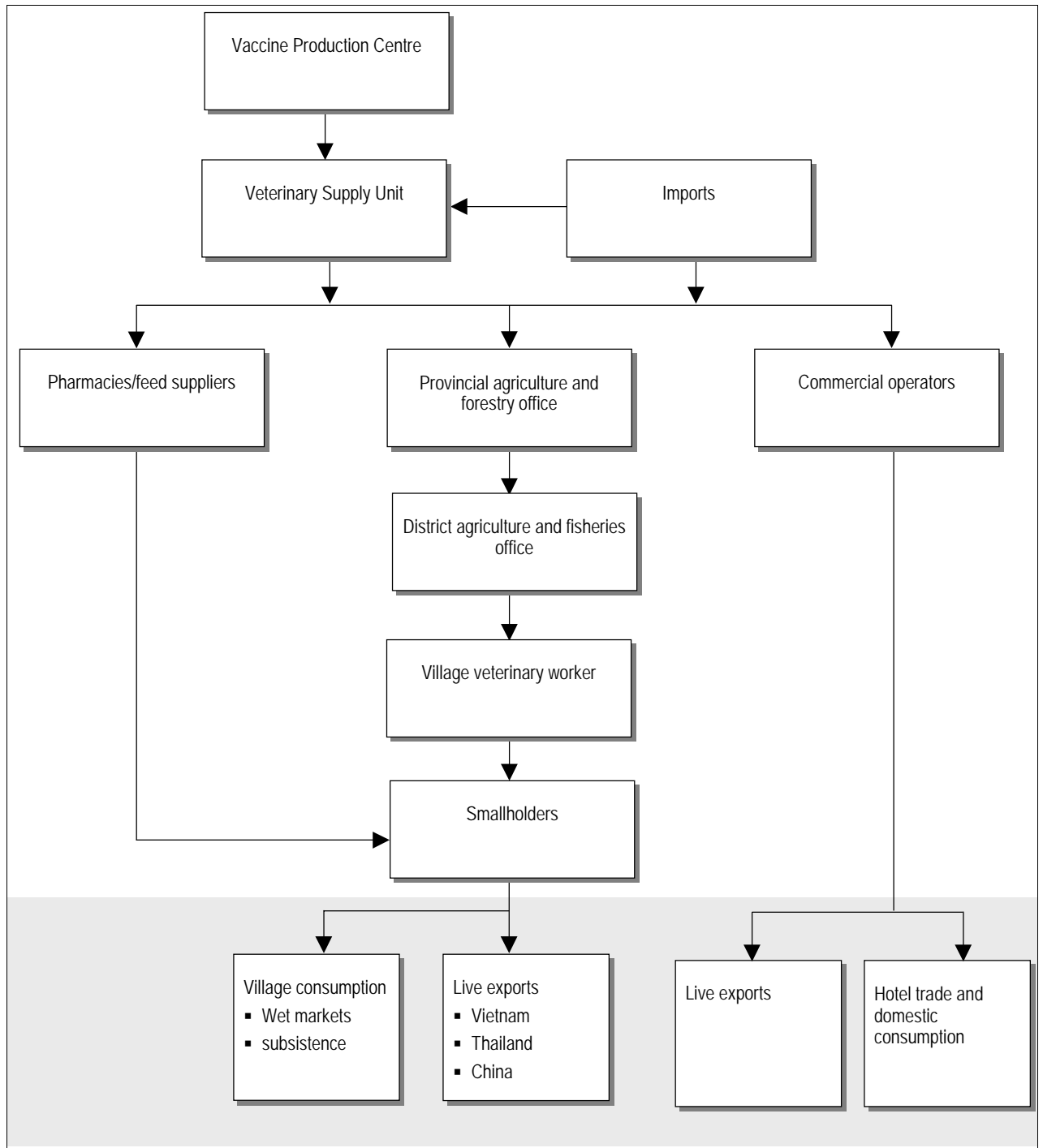
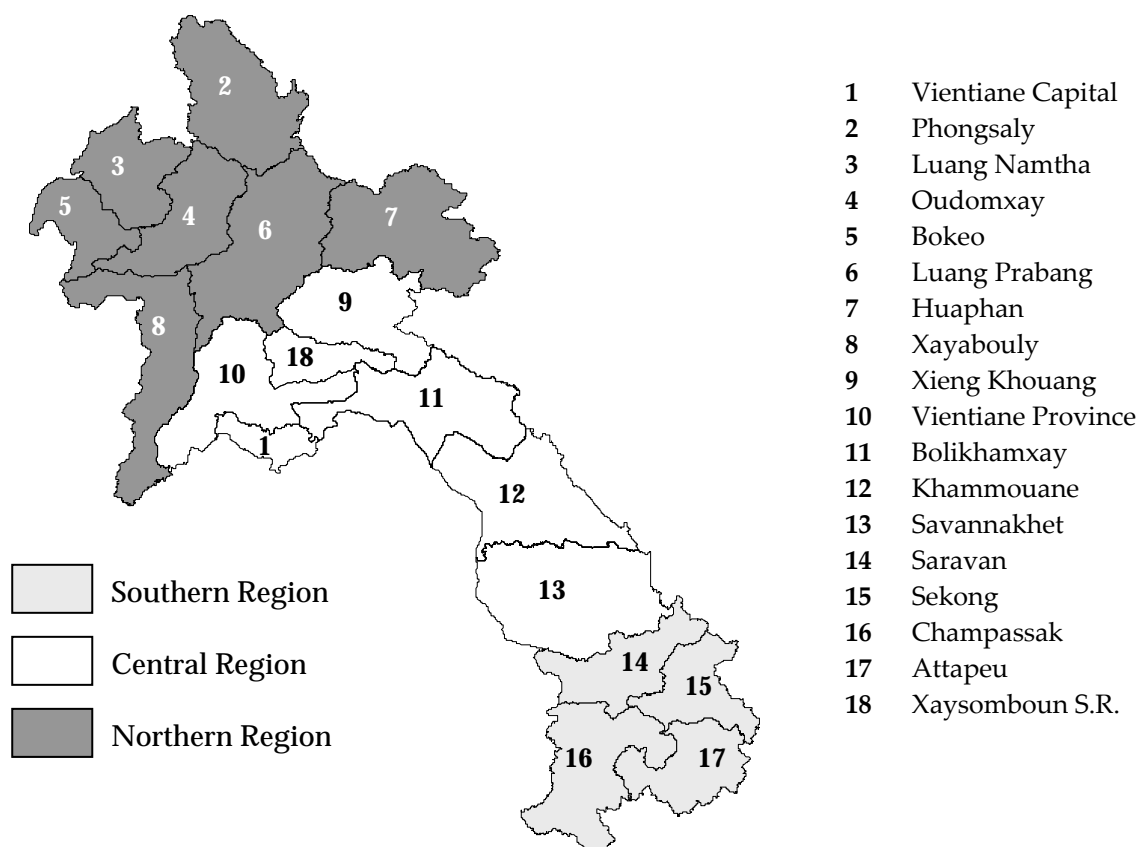


Figure 4. Provinces and regions of Lao PDR (Source: WHO, 2002, courtesy of J Conlan)



Vaccine Coverage and Use

The Lao Agricultural Census in 1998-99 reported that vaccine was used on 36% of cattle, 48% of buffaloes and 8% of pigs. As vaccinations are often confused by farmers with other injectable animal health treatments, such as antibiotics, these were probably significant overestimates. Senior animal health staff advised that they thought that current vaccine coverage was probably about 25% for cattle and buffalo and 12% for poultry.

In 2000, the Director of the VPC estimated the numbers of doses of each vaccine that would be needed to attain target levels of coverage for different types of production animals (Table 5). The actual total VPC production last year was only about a quarter of the target of the 21.4 million doses projected for 2005. The production of HS vaccine was also about a quarter of the target and CSF vaccine production was about a half of the target.

The ratios of the numbers of doses of four VPC vaccines produced last year to the estimated populations has been calculated in Table 6. This is an estimate of the maximum rate of inoculation of Lao livestock that could have had to these vaccines. That is, if all the doses produced were inoculated once into different animals, about 21% of cattle and buffalo would have been inoculated for HS and 12% of pigs would have been inoculated for CSF. The proportions of poultry inoculated with FC and DP vaccine would have been 3 and 6%.

However, not all of the vaccine produced was distributed and not all the distributed vaccine would have been administered. Also, two doses per annum are recommended for three of these four vaccines. The estimated numbers of “animal-equivalents” that may have been vaccinated according to recommendations against those diseases is also presented in Table 6. These calculations have used the actual 2005 VPC production figures, with adjustments for the average proportion of VPC’s production that was distributed over the period 1990 to 2005 (85%), an assumed wastage of 20% and the recommended numbers of doses of each vaccine that should be given to an animal annually. These numbers of “animal equivalents” are then expressed as a percentage of the estimated livestock populations to give an estimate of effective coverage. Inoculation of poultry with ND vaccines is similar or a little higher than estimated for FC and DP but estimates were not calculated because of the more complicated recommended usage of the three vaccines for different types and ages of birds.

The results suggest that, HS and CSF vaccines from VPC could have only been administered according to recommendations to less than 10% of the estimated populations and FC and DP vaccines to about 1-2% of the target populations. The proportions of the populations that would have been effectively immunized would be lower, given concerns about production quality and the cold chain. “Informally” imported vaccines would have increased the coverage by some amount that could not be quantified by this present review but there is still considerable opportunity to increase the usage and quality of vaccines to achieve the target coverage rates of 30-50% that were proposed by Sithong in 2000 (Table 5).

There is no central control on the prices charged to farmers for vaccines sold by the provinces, districts or VVWs. However in the Vientiane capital region, the maximum fee for a VVW vaccinating a bovine for HS should be Kip 5,000 or USD 0.50. Most of this is retained by the VVW as in that province, the markup on the VPC/VSU price of about USD 0.02 (from Table 7) by the province and district is very small to cover only the cost of collection and distribution.

The total income that could have been expected from sales of VPC vaccines is presented in Table 7, given the 2005 production figures and assuming an 85% distribution. This amounts to approximately USD 40,000, which is used for running most of the operations of the VPC, including employing casual staff.

Table 5. Estimated need for vaccine production in 2005 (Dr. Sithong 2000).

Vaccine type	Livestock type	Number of animals (M)	Proposed vaccination coverage %	Number of vaccination per year	Number of doses needed per year (M)	Sub-totals (M doses per year)
HS	Buffaloes Cattle	2.1	50	2	2.1	2.1
CSF	Industrial pigs	0.12	100	1	0.12	0.48
	Native pigs	1.2	30	1	0.36	
FC	Ducks	1.3	30	2	0.78	8.01
	Layer chicken	0.4	100	2	0.8	
	Native chicken	9.4	30	2	5.64	
	Other poultry	0.2	30	2	0.12	
	Yellow chicken	1.12	30	2	0.67	
IB	Broiler chicken	1.43	60	1	0.86	1.66
	Layer chicken	0.4	100	2	0.8	
NDF	Broiler chicken	1.43	100	1	1.43	4.79
	Layer chicken	0.4	50	1	0.2	
	Native chicken	9.4	30	1	2.82	
	Yellow chicken	1.12	30	1	0.34	
NDM	Layer chicken	0.4	100	1	0.4	3.56
	Native chicken	9.4	30	1	2.82	
	Yellow chicken	1.12	30	1	0.34	
DP	Ducks	1.3	30	2	0.78	0.78
TOTAL						21.38

Table 6. Estimated vaccination coverage of Lao animal populations using VPC vaccines, 2005.

Vaccine	Produced	85%	80%	Recommended	No. animal-equivs	Species	Estimated	Ratio of doses	Effective
	VPC	Distributed	Usage	doses per year	fully vaccinated		population*	produced:animal s	coverage of animal-equivs
	<i>C</i>	<i>D=0.85C</i>	<i>E=0.80D</i>	<i>F</i>	<i>G=E/F</i>		<i>P</i>	<i>R=C/P</i>	<i>C=F/P</i>
HS	500,695	425,591	340,473	2	170,236	Cattle, Buffalo	2,430,000	21%	7%
CSF	216,670	184,170	147,336	1	147,336	Pigs	1,750,000	12%	8%
FC	793,100	674,135	539,308	2	269,654	Chickens, Ducks	24,200,000	3%	1%
DP	201,700	171,445	137,156	2	68,578	Ducks	3,200,000	6%	2%

*FAOStat 2005

Vaccine Key:

HS: Haemorrhagic septicaemia

CSF: Classical swine fever

FC: Fowl cholera

DP: Duck plague

Table 7. Price per dose of vaccine (incl. distilled water) and estimated income generated by sales from VPC, 2005.

Vaccine	Produced	Distributed 85%	Doses per vial	Price per vial	Price distilled water	Total price per dose	@ 10,500 Kip per USD	Gross Income
	<i>N</i>	<i>D=0.85N</i>	<i>U</i>	<i>V</i>	<i>W</i>	<i>K=(V+W)/U</i>	<i>Cents</i>	<i>I=D*K</i>
Haemorrhagic Septicaemia	500,695	425,591	30	7000	0	233	2.2	99,304,508
Fowl cholera	793,100	674,135	50	4000	0	80	0.8	53,930,800
Newcastle F strain	1,293,900	1,099,815	100	3000	1000	40	0.4	43,992,600
Newcastle M strain	1,513,800	1,286,730	100	3000	2000	50	0.5	64,336,500
Newcastle I2 strain	79,800	67,830	50	2000	1000	60	0.6	4,069,800
Infectious bronchitis	344,800	293,080	100	4000	1000	50	0.5	14,654,000
Fowl pox	306,300	260,355	100	3000	1000	40	0.4	10,414,200
Duck plague	201,700	171,445	50	3000	2000	100	1.0	17,144,500
Classical swine fever	216,670	184,170	10	5000	1000	600	5.7	110,501,700
						Lao Kip		418,348,608
						USD @ 10,500		39,843

Factors affecting supply and demand for vaccines

Supply

Vaccine production has remained at about 5-6 million doses per annum in recent years which is about a quarter of targeted coverage projected by VPC in 2000. According to VPC management, the production levels are well below capacity but are very largely dictated by the demand from the existing government and private customers. This demand has apparently not increased significantly in recent years.

The VPC and VSU do not promote their products and this may be largely the result of a service culture but concerns about funding limitations, equipment failures and slow receipts of limited income from the long supply and payment chain in the field may also contribute. Government has maintained prices at 2000 levels in an attempt to keep vaccines affordable for smallholders so as to encourage vaccination uptake. This policy is understandable but it has not resulted in increased demand for VPC vaccine by smallholders and has constrained the VPC in its capacity to adequately fund production of a quality product. The VPC has a limited annual income of only USD 40,000 from sales. The slow payment for vaccines from the field (from the VVW to the district to the province to the VSU and eventually the VPC) exacerbates cash flow problems and leaves the VPC carrying a significant and presumably increasing deficit. At the moment this is covered from a revolving fund established by the EU project in 2003.

The VPC staff has contracted in size but, at 21, is still considered by management to be adequate for the current demand. However, the loss of skills has been noted previously in this report and two more skilled veterinary staff have recently been diverted from operational duties at the VPC and relocated to the NAHC in Vientiane to coordinate the new EU livestock project (Dr Sithong) and the proposed ACIAR vaccine project (Dr Phouth).

The EU's *Strengthening of livestock services and extension activities project*, ALA/96/19, included a review of the VPC at the start of the project. The consultant conducted a second review mission in 2002 (Guilloteau, 2002) and the VPC was again reviewed in the final evaluation of the EU project, along with broader vaccination issues (HTEP Limited, 2005). Their findings bare many similarities to concerns raised in both the CSIRO/NAHC proposal and by this study.

These reviews noted that VPC production was meeting the demands of smallholders but that the sustainability was compromised and the quality of some vaccines was unlikely to meet ASEAN standards. Constraints that were identified included,

- loss of skilled staff,
- costly imported raw materials,

- having to produce large numbers of vials with only small volumes of vaccine,
- equipment breakdowns,
- unreliability of the cold chain,
- poor cost recovery through low priced sales,
- inability to offset depreciation costs, and
- poor cash flow.

In 2002, the EU consultant was also concerned that recommendations from the 1998 review on improving quality control and documentation of production processes had not been addressed (Guilloteau 2002). Recommended equipment had been procured and a separate QC section established but deficiencies still existed in,

- documentation of production methods and quality control,
- characterisation of vaccine seeds,
- controls on raw materials and “in-course bulks”, and
- controls on finished products

The size of the total imported vaccine supply could not be estimated by this study because none of it is officially licensed or approved at the national level. It is expected that the “informal” supply of imported vaccine could be significant in the developing intensive pig and poultry sector where individual producers can place relatively large orders. They may also play a more significant role in border areas that are more distant from the VPC supply in Vientiane, although the VPC distributes vaccine widely across the country (Table 4).

Although the total Lao market may be small by international standards, the low estimates of coverage in Table 6 indicate that most of that existing market remains untapped and therefore the opportunity exists for one or more vaccine suppliers both within and outside Laos. Vaccine distributors in neighbouring countries such as Vietnam and Thailand may be more interested in a greater share of that market in future as commercialisation of livestock production progresses gradually.

Demand

Smallholders

At first sight, the most obvious factor influencing whether or not smallholders vaccinate their animals would appear to be the annual or biannual vaccination campaigns that are encouraged by the DLF nationally and executed through the provinces, districts and VVWs. However these campaigns are not conducted free of charge to smallholders. District officers and VVWs sell vaccines and charge fees for inoculations they administer.

Vaccination is not compulsory, but these fees are a major income source for the active VVWs and it is likely that there is some pressure brought to bear on smallholders to participate in the campaigns. Smallholders' awareness of the benefits and availability of vaccination will be affected by the enthusiasm and activity of local district staff and VVWs and their confidence in the effectiveness of the products sold or inoculated by the VVW. The reasons for the low estimated vaccination coverage in Table 6 are not known but they suggest that the vaccination campaigns are not effective drivers in their current form.

Several experienced people with whom we consulted consider that the most important factor affecting demand is the farmer's ability to realise a return on his or her investment of labour and cash, which depends on his or her having a surplus of product to sell and access to a market. In the absence of these factors, they consider that it is unlikely that smallholder demand will increase substantially. The EU program officer considers that, at this stage, there are probably few market incentives for most smallholders to use vaccines as many still have limited surplus and/or access to markets. Experience in CIAT's Livestock and Forages Project indicated that the ability to realise a cash return on their investments in labour and cash increases farmers' interest in animal management and health and leads them to actively seeking information and taking up practices that improve their production and returns, including feeding management, animal housing where appropriate, biosecurity and vaccination. For this reason recent and current livestock projects have sought to help smallholders develop surpluses of marketable livestock (especially cattle, buffalo, goats and pigs) and thereby increase cash returns.

To help keep purchase prices low for users and reduce vaccine wastage, the VPC packages its vaccines in vials that contain 15 and 30 doses for HS for cattle and buffalo, 10 doses for CSF in pigs and 50-100 doses for poultry. Resulting prices per dose that are shown in Table 7 assume that all doses are used. This will rarely be the case where a smallholder buys their own vials and it could be in the VVW's interest to optimize his or her income by selling as many vials as possible. On the other hand, where a VVW vaccinates villages in an organised manner during campaigns and charges a set fee for vaccination, he or she can use a vial over a number of households, thus reducing their own costs and increasing the return from their service.

We consider that current vaccine prices in Laos are unlikely to be a major impediment to vaccination where people who can market their increased production. This is illustrated by the high price of Kip 5,000 that smallholders pay for HS vaccination in the Vientiane Capital region, compared to the vaccine purchase price of about Kip 250 per dose in 30 dose vials. The poor uptake of vaccination by smallholders generally contrasts with their paying such a premium where they can recoup investment. This indicates that the current low VPC/VSU vaccine prices are

probably not adversely affecting demand and there may be room to increase the prices if the other factors inhibiting vaccination are addressed.

Other significant factors that are considered to be important considerations for people deciding whether or not to use vaccines include:

- Local experience of the success of vaccination in their own or neighbours' animals.
- Continued confidence in the quality and effectiveness of vaccines.
- Ease of access to vaccine supply.
- Awareness of diseases that occur in their animals and area.
- Understanding of concepts of infection.
- Understanding of the role and limitations of vaccines.
- Community, DLF and VVW encouragement to participate in campaigns.

The EU project review (HTSPE Limited 2005) also noted that some livestock owners did not use the VPC vaccines because of past anecdotal reports of its being unreliable. Underpinning confidence in the VPC vaccines and producing demonstrable positive outcomes from vaccinating are at the heart of the CSIRO/NAHC proposal which focus particularly on manufacturing practice and maintenance of the cold chain. While these are critical issues underpinning successful disease prevention through vaccination, they are only part of the larger mosaic described above.

In the absence of good animal disease surveillance, it is understandable that smallholders and indeed their advisers may not be aware and will not be well informed about the risks of specific diseases occurring in their area and the impact of those. Gleeson (2005) also noted that Lao farmers may fail to see the benefits of preventive strategies in the long term, and so when the threat of disease appears to have disappeared (for example if there has not been a disease outbreak for some years because of vaccination) then the intervention is no longer applied. This is in part due to lack of understanding about the nature of disease which is also common among farmers elsewhere. Improved education and marketing would help to address this factor. Extension on the use of ND vaccines in Africa (in the Southern African ND Control Program, SANDCP) focused on increasing people's understanding of how infectious diseases work and of what vaccines can, and cannot, do in controlling diseases.

As an aside on the potential use of I-2 vaccine in Laos, the SANDCP project successfully implemented a tightly controlled campaign approach to ND control using thermostable I-2 vaccine in southern Africa where villagers were able to both see the effectiveness of ND vaccination and market their surplus at a premium compared to commercial broilers. However, although I-2 overcomes many of the cold chain issues and has been produced in small quantities by the VPC since 2003, CIAT staff consider that there is a low probability of a significant market developing

for scavenging village chickens in Laos as there is no premium in city markets. Even near Vientiane, scavenging native chickens are rarely vaccinated and the total vaccination coverage of chickens for ND and FC in this region in the nine months of this financial year has only been 10%, and that is mainly of commercial layers. In a recent planning report on small scale poultry production Pym and Alders (2006) noted that successful to achieve successful ND control in Laos there was “a great need for a country-wide re-evaluation of the recommendations relating to ND vaccines for smallholder use, and for an education and training program for Village Animal Health Workers and farmers”. HTSPE Limited (2005) also recommended that further education and retraining of the remaining active VVWs as extensionists and taking a campaign approach to vaccinating was going to be necessary to increase the effectiveness of vaccination.

Commercial producers

The commercialisation of livestock production increases the demand for vaccination as producers realise the risks posed to their operations and profits by major infectious diseases. The large intensive piggery we visited vaccinated against FMD, CSF, Aujeszky's disease and porcine parvovirus with imported vaccines, in which the manager and his adviser had confidence. They could also source all their vaccines and many medicines through the one Thai distributor. They did not use the VPC's CSF vaccine because it was perceived to be quite virulent and its label recommended against its use in sows in late pregnancy and in pigs under three months of age, despite the LAAHR project demonstrating it to be safe and effective in piglets over one week of age. (This label warning was also cited by district staff in Vientiane as the reason that they did not recommend vaccination of piglets that would be sold at about 3 months of age; the vaccination coverage of pigs in that district for the first nine months of 2006 was only 10%).

The SEAFMD regional coordinator considers that commercial producers in general prefer to source vaccines from large reputable vaccine companies and have little confidence in the small government vaccine producers in the region. In the main, he felt that the multinational companies were already sending large quantities of pig and poultry vaccines into the surrounding region and would compete where the markets were big enough. HS vaccine is the one vaccine that is not available from these large vaccine producers (and for which each country produces its own vaccine). Although its true incidence is not known, HS is regarded as a significant cause of death among cattle and buffalo. It would be important that supplies of effective vaccine was available and desirable that coverage increases from the current low levels as the cattle and buffalo industries become more commercialised.

Development projects

In addition to the wider demand for vaccine from smallholders and commercial producers across the country, some projects have promoted vaccination as a means of protecting assets and increasing household income in their areas.

The recently completed *Lao PDR-Australian Animal Health Research Project (LAAHRP, AS1/2003/001)* focused on controlling CSF in 24 villages in the provinces of Xieng Khouang and Bolikhamxay by extension, surveillance and subsidised vaccination that, in turn, increased pig numbers for sale and allowed people to invest in improved housing and feeding with the profits from additional sales of pigs. Pig owners in two villages we visited as part of the review of ACIAR's animal health projects in 2005 (AusVet and ARECS, 2006) attributed a doubling of piglet survival to CSF vaccination. With about 12-16 pigs now reared and sold per sow per annum, they were able to sell their surplus production as young growers to traders from Vientiane for about USD 8-10 per pig. The project also introduced superior boars to help improve the genetic base of the pigs in the project villages.

In his working paper for the *Participatory Livestock Development Project*, Gleeson (2005) noted that vaccines were important tools to control several production limiting infections including HS, CSF and ND and that it was important to monitor vaccine performance and the cold chain. He recommended that a very heavy emphasis should be placed on proper vaccine delivery management from the point of production to the point of use and that responsibility for vaccination programs should not rest with the village veterinary workers (VWV) but subject to greater control. In an accompanying working paper on transboundary animal diseases (TAD), Hoffman (2005) noted that "national and regional capacity in disease surveillance and reporting, common regional strategy to animal movement and quarantine, and availability of efficacious, safe and affordable vaccines are key ingredients to disease control programs in the region such as the GMS." The ADB participatory livestock project has been largely modeled on aspects of the former CIAT forages project and the LAAHR FMD and CSF surveillance and control projects. It will be run in 400 villages in five northern Lao provinces for a period of six years and cost USD 18.4 million. The nominated Lao co-director is the deputy director of NAHC, Dr Syseng Khounsy, who is closely associated with the proposed CSIRO/NAHC vaccine improvement project.

Although the EU had strongly supported the VPC in the past and the new EU Livestock Farmer Support project (AIDCO/2003/4681) is to be co-directed by the Director of the VPC, Dr Sithong Phiphakhavong, it does not have any objectives related directly to improving vaccines or vaccination coverage. The EU's Senior Program Officer advised that experience in the first livestock project has left the EU cautious about the role of the government in vaccine production and concerned about the distribution and use of animal vaccines. Although the Lao government sought support from the new EU project for the VPC, this is not being provided. This

is effectively strong encouragement from the EU to seek alternative sources of imported vaccine or to greatly improve the business management and technical operations of the VPC and its distribution mechanisms.

The new ADB and EU livestock projects that are starting in Laos present opportunities for collaboration to improve the understanding of animal disease and its occurrence and the role of vaccination through extension and demonstration of its uses and advantages in the project regions.

Regional transboundary animal disease (TAD) control programs

Lao PDR is strategically located in south-east Asia and is expected to play an increasing role in the control of FMD and other major TADs, such as CSF and highly pathogenic avian influenza (HPAI). Laos is a member of ASEAN, which is increasingly looking to control TADs on a regional basis. ASEAN is expected to take over the management of OIE's long standing SEAFMD program on regional control of FMD next year.

Currently the Lao government's approach to controlling FMD outbreaks, when they occur, is to manage movements and ring vaccinate. However, it does not restrict the use of FMD vaccine. Cattle and pig producers can import it informally from distributors or through the VSU who source it from the Thai government's vaccine production plant at Pakchong. Pakchong and a small plant in Myanmar are the only manufacturers of FMD vaccine in the Greater Mekong Subregion (GMS). According to the regional coordinator of SEAFMD, Pakchong is running to its capacity and largely meeting Thailand's needs but it has little capability to supply the wider region. Despite this, SEAFMD is not expecting that other government vaccine centres will produce FMD vaccines. The VPC has not and does not currently produce FMD vaccine and is unlikely to do so in the near future. It appears that likely that imported FMD vaccines may be used to a greater extent in future.

Laos is also located in the GMS for which FAO has been coordinating an overarching control program for major TADs (including FMD, CSF and AI) funded by ADB, ASEAN, JICA and OIE. In September 2005, the FAO-ADB Project, *Control of Transboundary Animal Diseases in the Greater Mekong Subregion (GMS)* (GCP/RAS/206/ASB) was initiated in Bangkok. At the opening the FAO's Assistant Director-General and Regional Representative for Asia and the Pacific noted that

“The demand for livestock products in the region is projected to increase by 3.5 to 4.0 percent annually to the year 2020. To fully participate and exploit these market opportunities, poor smallholders in GMS countries will have to produce healthy and productive animals. Unfortunately, they are currently constrained by transboundary animal diseases. These diseases kill animals and reduce productivity, threaten livelihoods of poor smallholders, drain public sector resources, hinder efforts to alleviate poverty, and restrict regional and international trade. The morbidity and mortality rates of

livestock due to these diseases are often as high as 50–80 percent in many parts of the GMS. It is now becoming increasingly apparent that in the GMS and other Southeast Asian countries that a long-term capacity in the control of transboundary animal diseases is required in all the affected countries to be able to achieve success.”

Currently Phase I of the program is focussing on epidemiological studies but Phase II should commence next year, when there are plans to use FMD and CSF vaccines in the GMS countries, particularly in Lao PDR, Cambodia and Vietnam (Mozaria personal communication, July 2006). This project may increase the medium to long term expectations on Laos to supply, distribute and use CSF vaccine more effectively. As previously mentioned, the VPC has been increasing its production of the live lapinised CSF vaccine over recent years and produced about 217,000 doses in 2005. However, there is considerable ongoing concern about the stability of this vaccine and its distribution and handling. These have been the main drivers behind the CSIRO/NAHC vaccine improvement project proposal to ACIAR Gleeson 2005).

Conclusions

Lao PDR is developing its animal industries in a region where infectious diseases are important causes of lost production and death in livestock and where vaccination and control of animal movements are becoming increasingly important in managing the regional spread of TADs. The ongoing development of Lao’s livestock industries will require sustainable, viable local and/or international suppliers of the major animal vaccines as one component of its animal health programs, along with improved surveillance, farm and village biosecurity and area movement controls. The VPC and VSU need sound financial and technical footings to continue to operate and contribute to animal health and production in the Lao PDR.

It is clear from this study and from previous reviews that:

1. The demand for vaccines by commercial livestock producers will increase steadily as the number and size of such enterprises increases.
2. Commercial producers can access vaccines from a number of sources and do not need to rely on the VPC. They will use vaccines that are of high quality, conveniently sourced, promptly supplied and appropriately priced for their production systems.
3. International distributors are already supplying an unknown quantity of vaccine in relatively small consignments and appear interested in supplying a larger market as it develops over the next 10 years.

4. Current imports have tacit government support at the national level and some provincial governments may be actively importing vaccine.
5. When they become active, regional TAD programs will increase demand for specific vaccines, of which CSF and HS vaccines are manufactured in Lao PDR.
6. Smallholders can buy animal vaccines or have their animals vaccinated on a fee for service basis through village veterinary workers who are supplied through the government vaccine distribution network.
7. Smallholders' access to vaccines and good animal health advice in remote areas is poor at this stage but should improve with rural development.
8. The current demand for vaccine from VPC by smallholders and the vaccination coverage of their livestock by VPC vaccines is low compared to the potential use.
9. Smallholders' vaccine use will probably increase slowly, driven by their ability to supply cash markets and their awareness and understanding of infectious animal diseases and the role of vaccination in protecting their investment in their livestock and the income from them.
10. Interested smallholders' awareness and understanding would be increased by more active and educated advisers.
11. Quality control in manufacturing at VPC and in distribution by VSU is compromised by inadequate government funding and poor cost recovery through underpriced sales and variable compliance with ASEAN standards of production.
12. There is significant potential to improve the quality and effectiveness of VPC vaccines through better quality control in production and distribution as proposed by the CSIRO/NAHC proposal to ACIAR.
13. The government policy of maintaining artificially low vaccine prices to encourage smallholder vaccination is not increasing demand and should be reviewed.
14. There are no major donors committed to funding the operations of the VPC/VSU in future.
15. A new business model for the VPC and VSU is needed to ensure financial and operational sustainability.

Improvements to Proposal

The issues that have been identified by the CSIRO/NAHC proposal would be critical to the future quality and effectiveness of vaccines manufactured by VPC and distributed by VSU. However, the vulnerable positions of the VPC and VSU, and the limited ability of their largely smallholder customers to significantly increase demand for their products in the short term, will undermine a project that only focuses on technical improvements.

It is recommended that the current CSIRO/NAHC proposal to ACIAR be improved by the following:

1. Include an initial “go/no go” milestone of **developing a new business plan** for animal vaccine supply and distribution with the Government of the Lao PDR.
2. This business plan should include:
 - a) Assessing and planning for the medium to long-term market for vaccines by the various livestock industries in light of projected development and commercialisation especially of the cattle, buffalo and pig sectors.
 - b) Identifying and assessing the viability of alternative suppliers of these vaccines nationally and at provincial and local levels.
 - c) An analysis of skills and equipment required for high quality business management, manufacturing and distribution for the priority vaccines to be manufactured in Laos.
 - d) A sustainable funding and operations plan that is independent of donor inputs.
 - e) Training senior VPC staff in managing the business.
3. This plan should then be used to review the Lao government’s commitment to local manufacturing of major animal vaccines at the VPC using the new business plan or an alternative sustainable model.
4. If the Lao government commits to and implements a new business plan, the technical project could proceed.
5. There should also be more formal collaboration between this project and other field-based projects that are aimed at improving smallholders’ livestock production and animal health through better animal management and feeding and through disease surveillance and biosecurity. The Lao coordinators of the new ADB and EU projects are closely aligned with the proposed ACIAR project, so that management links already exist. However, the means of collaboration in the field needs to be described and formally agreed.

Additional Research Opportunity

In addition to this laboratory based project, it is recommended that a **complementary field based project** investigates more closely the factors affecting smallholders' management of animal health, including vaccine use. This project would require personnel with social science and participatory skills to effectively work with the current field projects and with smallholders.

The outcomes of this research should then be considered in future training of field staff and improvements to marketing aspects of the VPC business plan. The outcomes will also be of value in implementing more appropriate animal health strategies in livestock development projects in the Lao PDR.

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ASEAN VACCINE STANDARDS

<http://www.aseansec.org/13578.htm>

Manual of ASEAN Standards for Animal Vaccines (Livestock Publication Series- 2A
Second Edition)

Manual of ASEAN Rules and Procedures for the Registration of Animal Vaccines
(Livestock Publication Series– 2B)

Manual of ASEAN Standards for Good Manufacturing Practices (GMP) for Animal
Vaccines (Livestock Publication Series– 2C)

Manual of ASEAN Accreditation Criteria for Animal Vaccine Testing Laboratories
(Livestock Publication Series– 2D)

Manual of ASEAN Code of Practice for the Commercial Storage, Transportation and
Handling of Animal Vaccines (Livestock Publication Series– 2E)

Protocol for Accreditation of Animal Vaccine Testing laboratories in ASEAN
Member Countries (Livestock Publication Series– 2F)

Guidance on Registration for Animal Vaccines (Livestock Publication Series– 2G)

APPENDIX 1

Country Visits to Lao PDR and Thailand

July 23-30, 2006

Date	Activity
Sun 23 July	pm: Fly OAG-SYD-BKK (overnight)
Mon 24 July	am: Arrive Vientiane 10.00am pm: Meet with vaccine project and NAHC staff
Tue 25 July	am: Visit DLF, VSU and Director VPC pm: Visit VPC
Wed 26 July	Field trip – Commercial producers
Thur 27 July	Field trip – DA/VVW/smallholders
Fri 28 July	am: Fly VTE-BKK, arrive 1030. pm: Meet SEAFMD/OIE; Contact commercial vaccine distributors.
Sat 29 July	am: Report writing pm: Fly BKK-SYD (overnight)
Sun 30 July	am: arrive SYD 0615; fly SYD-OAG.

APPENDIX 2

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Glossary

ADB	Asian Development Bank
CIAT	International Center for Tropical Agriculture
FAO	Food and Agriculture Organization
FMD	Foot and Mouth Disease
HS	Haemorrhagic Scepticaemia
MLA	Meat and Livestock Australia
NGO	Non-government organisation
WTO	World Trade Organization

Summary

This report is concerned with the economic, policy and institutional environment that shapes decision making by households raising cattle and buffalo in Cambodia and the Lao People's Democratic Republic (referred to as Laos in this report). It was commissioned by ACIAR as part of its Policy Linkages and Impact Assessment Program, to assist in the development of relevant research projects in these countries.

Cambodia and Laos are both classified as Least Developed Countries by the United Nations, in which around a third of the population live under their national poverty lines. They remain predominantly rural economies: over 80 per cent of the population live in rural areas and agriculture, which is dominated by the production of rice, accounts for over a third of GDP. Raising livestock is an important part of the smallholder rural economy in both countries, where animals are a source of cash income, provide a subsistence source of protein, are used for draught power, and are used as an asset or savings bank.

The environment for livestock development

The World Bank and other agencies have identified a range of strongly binding constraints on agricultural growth in these countries, including insecurity of land tenure, weak infrastructure and complementary services, low human capital, high costs of and limited access to finance and a generally poor rural business climate. Both countries are dealing with the legacies of protracted periods of internal and external conflict, and the challenge of making the transition from isolationism and strong state control of economic activity towards more open, internationally integrated market economies. In both countries, the formal and informal institutions that are needed to underpin market transactions, investment and specialisation are poorly developed.

These general constraints translate into a difficult environment for the development of more intensive commercially oriented livestock sectors. Raising livestock is a high risk proposition with low returns to smallholder labour inputs. This situation is exacerbated by limited access to knowledge, underdeveloped input supply and technical support services, weak

extension services and institutional practices that compound geographical constraints on market access and development of an integrated domestic market for livestock. The current markets are characterised by factors such as:

- lack of formal marketing arrangements and infrastructure such as saleyards or mustering points;
- the black market nature of many of the transactions, including the unofficial export trade to Vietnam and avoidance of the range of official transactions costs involved in officially selling and moving cattle and buffalo;
- thin, opportunistic and erratic trading due to the nature of smallholders cash requirements (as outlined in chapter 3);
- the fact that very few cattle or buffalo are sold against an objective description of their age, weight and their condition score; and
- lack of government resources or incentives to collect and distribute livestock market information in a regular or systematic way.

There are very few specialist cattle producers in either country, and almost all cattle are raised within a complex smallholder production system. These systems are generally based around a combination of subsistence agriculture, with cash-generating agricultural activities and off-farm activities. The diversity of these ‘outputs’ are how the risk of failure of one activity — such as a poor rice crop or incapacitation of one of the heads of a household is managed. While cattle production systems vary across both countries, they typically involve free range grazing on common land; limited hand feeding, primarily using cut and carry forages; and virtually no selective breeding.

Market prospects

Consumption of meat in Laos and Cambodia is low by broad regional standards but is probably equivalent to that observed in areas of neighbouring countries with similar income levels, household structures and ethnicity. Seafood, freshwater fish and aquaculture products also play a significant role in protein consumption by households in certain regions. Domestic demand for protein derived from meat products is growing as incomes rise, and this will continue.

Therefore there is significant potential to increase meat consumption in these and ‘catch-up’ to consumption levels observed in adjacent countries — especially Thailand and Vietnam. Per person meat consumption

(excluding seafood) in Thailand is presently around 24 kg per year compared with around 14 kg for Laos and 16 kg for Cambodia.

A recent driver of demand for the livestock industries of Laos and Cambodia has been demand for meat from neighbouring countries. This effect has been particularly significant in areas with good access to these markets. Income and population growth in Thailand, Southern China and Vietnam are driving strong demands for meat, which are expected to continue to grow quite rapidly over the coming decades.

While the prospects of live cattle and buffalo exports to Vietnam from both Laos and Cambodia look strong for the short to medium term, there are risks to the longer term viability of the trade. Within the region, it is likely that Vietnam and Southern China will be the dominant sources of demand for cattle and buffalo. As these countries develop, it is also inevitable that the markets for cattle and buffalo will become more sophisticated. To meet the increased demand for beef, there are two possible scenarios:

- imports of beef will expand significantly as the infrastructure develops, replacing live cattle imports; or
- an intensive feedlot industry will develop with imported feeder cattle and grain supplying the market.

Under both these scenarios, there are long-term risks for Laos and Cambodia. If Vietnam and China become significant importers of meat, it is unlikely that Laos and Cambodia will have developed a beef industry competitive with major low-cost suppliers such as Brazil and the United States. However, large-scale imports of beef into Vietnam and China are likely to be relatively long-term outcomes. Over the shorter and medium term, it is likely that there will continue to be strong demand for live cattle for slaughter in the local wet market system.

If Vietnam or China were to develop an intensive feedlot industry, demand for high quality feeder cattle would be significant. For Laos and Cambodia to successfully supply such cattle would require significant intensification and the development of a cattle industry. The present demand for cattle from Vietnam is being supplied by what are effectively cull animals from Laos and Cambodia. To supply a feeder market would require a consistent supply of feeders at the correct specification. It is likely that this would require a reconfiguration of the gene pool in Laos and Cambodia to supply appropriate animals into a feedlot system. In addition to this, competition from other suppliers — primarily Australia — would also be significant under this scenario.

Implications for adoption of new technology and ACIAR research

The risk aversion of smallholders in Laos and Cambodia is a rational response to experience, and the limited availability of mechanisms to manage risk and cope with adverse developments. There are no state-provided security systems, and the financial sectors have limited reach and functionality for rural people. This means that smallholders are reluctant to specialise, and to allocate scarce cash and time to investments that may or may not yield benefits in the future. The poor state of market, transport and communication infrastructure, and the often counter-productive impact of government regulation work against the development of production and processing chains for livestock that smallholders can easily fit into. These all translate into a decided reluctance for smallholders to move to more intensive livestock production systems and adopt new technologies.

Uptake of the outcomes of technical research in these countries is also affected by the serious capacity constraints in key parts of the agricultural research, extension and policy systems:

- government extension systems are very weak, and have very limited ability to effectively translate research finding into practical advice relevant to producers and to transmit this advice;
- research institutions have limited technical skills; and
- there is a very limited pool of people who are qualified, technically and managerially, to lead collaboration with Australian researchers.

For animal health and disease projects — such as those funded by ACIAR — the number of people with sufficient capacity to work in laboratories or in the field is very limited:

- in both countries, there is no capacity to train veterinarians through the university system. Very few in livestock-related government departments have a science background; and
- most of those in-country with such capacity were trained in the Soviet bloc in the 1970s and 1980s.

The absence of this basic infrastructure of technical skill, poses real challenges for projects aiming to transfer technology and know-how to the smallholder. What it suggests is that technical research projects probably need to be embedded in larger initiatives that are attempting to deal with these constraints. To have an impact, projects dealing with ACIAR's focal area have to be integrated into a whole-of-system approach — otherwise it is impossible to address the complex web of incentives that shape smallholders' interest in adopting project outputs.

These suggestions are in broad conformance with the observations and recommendations of ACIAR's recent review of its role in animal health research (ACIAR 2006). This review observed that in the past, many research projects had no means of implementing the results in the communities for which they were developed. It recommended that ACIAR should work more closely with bilateral and multilateral agencies to plan for the implementation of the outcomes of its research projects, arguing that impacting community welfare in a sustainable way at the smallholder level is extremely difficult without institutional support throughout the government animal production and health service. Given the significant disincentives that the current economic environment in these countries creates for further investment in livestock activities — by smallholders and agribusinesses — it makes sense for ACIAR to collaborate with agencies that are helping to address the policy, institutional and infrastructural constraints that create these disincentives.

1

Introduction

ACIAR is interested in undertaking research related to raising cattle and buffalo in Cambodia and Laos. A number of projects dealing with this activity have recently been started, and an older project dealing with, among other things, foot and mouth disease has recently been extended.

The projects are:

- AH/2005/086: *Best practice health and husbandry of cattle, Cambodia;*
- ASEM/2005/124: *Extension approaches to scaling out livestock production in northern Lao PDR;*
- AH/2006/155: *Vaccine business development in Lao PDR;* and
- AH/2003/001: *Management of CSF and FMD at the village level in Lao PDR*

Raising cattle and buffalo in Cambodia and Laos are predominantly smallholder activities, frequently part of largely subsistence, multi-activity livelihoods. Their willingness to undertake the investment of resources and time required in adopting the results of technical research, and to incur the associated risks, is shaped by a range of factors, including the stance of government policies and the quality of formal and informal institutions affecting economic transactions. Recognising the importance of these economic, policy and institutional factors, and consistent with its strategy regarding policy scoping studies (box 1.1), ACIAR commissioned the Centre for International Economics (CIE) to conduct a review of the policy and economic environment facing the cattle/buffalo sector in these countries and its likely impact on the adoption of new technology. This report presents the findings of the review.

1.1 ACIAR's policy scoping studies

In May 2004, ACIAR's Board of Management approved a strategy where the Centre would make greater use of pilot or scoping studies that assess policy and institutional issues before making major technical research investments. The Board felt that it may be important to have research on important policy issues and their economic implications undertaken alongside or integrated with the technical research.

Understanding the policy environment is important to ensure that technical research takes the impact of policy into account or endeavours to change policies that act as constraints. The logic of this decision was reinforced in a recent review of ACIAR's research on agricultural policy (Pearce 2005), which argued that policy settings have the potential to be a major influence on the effectiveness and impacts of particular technical research projects. The review pointed out that policy settings could negatively affect the incentives that shape the willingness of producers to undertake the investments associated with adopting the results of technical research.

Policy distortions can also lead to situations where the introduction of new techniques that have counter-intuitive and sometimes counter-productive effects. Undertaking policy and related economic assessments at the same time as the technical research can therefore be important to ensure maximum uptake and adoption of the technical results.

This report

This report draws upon an analysis of the available literature on the livestock sector in Cambodia and Laos, the CIE's work on development issues in these countries and the CIE's previous work on world meat markets. It also draws on findings from field visits to the Cambodia, Laos and Thailand. The CIE team visited Laos and Thailand with David Kennedy from AusVet Animal Health Services in July 2006, looking mainly at animal health diseases and the market for vaccines in the Laos.

In a second visit to Cambodia and Laos in October 2006 with Dr Peter Windsor from the Faculty of Veterinary Science at the University of Sydney, the team consulted with national provincial and district level officials and village leaders, smallholders and experts working on relevant livestock and rural development projects. During this visit, workshops were held in Vientiane and Phnom Penh to gather information on what animal health related projects and programs were underway, identify opportunities for collaboration, explore approaches to promote adoption of research results and ensure sustainability of project outcomes. Appendix A lists the people consulted during the course of the study.

2

Background

Cambodia and Laos are home to 20 million people, and while in the past 15 years there have been significant inroads into poverty, around a third of their populations live below the national poverty lines (table 2.1). And social indicators in Laos and Cambodia remain very low, consistent with their classification as Least Developed Countries.

Gross domestic product (GDP) growth in both countries has been strong. Cambodia averaged 6.9 per cent GDP growth in the decade to 2004 and Laos around 6.3 per cent, and growth in both countries accelerated in the last couple of years (reaching 13.4 per cent in 2005 in Cambodia and 7.0 per cent in Laos). But population growth rates remain high (over 2 per cent annually) so the growth has not translated into a rapid expansion of per person incomes. Further, with labour forces growing more rapidly than population, there is pressure on the economies' ability to generate adequate employment opportunities.

2.1 Economic and social indicators for Laos and Cambodia

		<i>Cambodia</i>	<i>Laos</i>
People			
Population 2005	m	14.1	5.9
Population growth rate	% pa	2.0	2.3
Rural population 2005	%	80.0	79.0
Labour force growth rate 2005	%	3.1	3.0
People below national poverty line 2004	%	34.7	32.7
Economy			
GDP 2005	US\$b	5.4	2.9
GDP growth rate last decade	% pa	6.9	6.3
GNI per person 2005	US\$	380	440
Agriculture share of GDP 2004	%	32.9	47.1
Manufacturing share of GDP 2004	%	21.5	20.4
Investment/GDP 2004	%	21.5	na
Exports/GDP 2004	%	64.7	27.6
M2/GDP	%	20.8	18.8
Social indicators			
Life expectancy at birth	yrs	53.4	59.0
Infant mortality rate (per '000 live births)		167	106
Adult literacy rate	%	73.6	68.7
Rural access to safe water	%	8	19
Urban access to safe water	%	81	67

Source: World Bank World Development Indicators 2006a, ADB Key Indicators 2006b

The economies are rural based...

Despite some recent industrialisation, the bulk of the countries' population lives in rural areas, and Cambodia and Laos remain primarily agrarian economies. Agriculture accounts for over a third of GDP (table 2.1), with much of this being subsistence production. Subsistence consumption is estimated to absorb 60-65 per cent of agricultural production in Cambodia (FAO 2003). The labour forces in both countries are growing much faster than population, and agriculture is absorbing most of the new entrants to the workforce. However, agricultural productivity is low, as evidenced by low crop yields (table 2.2) and recent GDP growth in both countries has been driven largely by urban activities or natural resource development projects.

2.2 Comparative crop yields (kg/ha)

<i>Indicator</i>	<i>Cambodia</i>	<i>Laos</i>	<i>China</i>	<i>Thailand</i>	<i>Vietnam</i>
Rice	2 150	3 316	3 849	2 455	4 634
Maize	2 111	2 333	3 485	3 913	3 225
Cassava	6 318	19 762	16 249	17 552	14 066

Source: World Bank 2005.

As table 2.3 shows, agriculture grew by only 2.7 per cent a year in Cambodia, and accounted for just 16 per cent of growth in the decade to 2004. In Laos, agricultural growth was much faster, and the sector accounted for over a third of total GDP growth in the decade.

Both countries' agricultural sectors are strikingly undiversified: more than 90 per cent of the land under cultivation in Cambodia is planted to rice: the proportion for Laos is 80 per cent, whereas for neighbouring countries Vietnam and Thailand the proportion is 62 per cent and 57 per cent respectively (World Bank 2005).

Laos' exports are now dominated by copper and gold from two (Australian invested) mines: these minerals have overtaken hydro-electricity, garments and timber as the main non-aid sources of foreign exchange revenues. Textiles and garments have been an important source of manufacturing employment and exports from both countries: but Cambodia has been much more dependent on this sector for export earnings and industrial employment. The termination of the Multi-Fibre Arrangement, which gave both countries access into the quota protected markets of the United States and Europe, poses a problem for producers in both countries. Tourism is a growing, if poorly recorded, sector in the region, based on unique cultural heritages and strong geographic advantages.

2.3 Sectoral composition and growth in Cambodia and Laos, 1994-2004

	Cambodia			Laos		
	Share of 2004 GDP	Growth rate	Share of growth	Share of 2004 GDP	Growth rate	Share of growth
	%	% pa	%	%	% pa	%
Agriculture	32.8	2.7	16.0	47.1	4.5	34.7
Mining	0.3	8.2	0.3	1.5	27.4	3.0
Manufacturing	23.2	18.8	39.0	20.4	10.5	29.2
Electricity, gas, and water	0.5	10.9	0.7	2.7	15.8	4.1
Construction	6.8	9.5	8.4	2.7	1.3	1.8
Trade	14.8	5.6	13.6	10.5	8.6	13.1
Transport and communications	7.0	7.8	7.3	6.5	8.8	8.4
Finance	6.0	5.5	5.2	0.3	-8.1	-0.6
Public administration	1.9	1.6	0.4	2.9	4.4	1.8
Others	6.8	11.7	9.2	5.4	4.3	4.5
GDP	100.0	6.9	100.0	100.0	6.3	100.0

Source: ADB Key Indicators 2006b.

...and have quite strong links with other countries in the region

Laos and Cambodia are members of ASEAN and are implementing commitments of the ASEAN Free Trade Agreement, including reductions on intra-ASEAN tariffs to 0-5 per cent by 2010. Cambodia joined the World Trade Organization (WTO) in 2004, and Laos is moving slowly down the accession path.

Thailand has been a major source of investment into Laos, accounting for over 60 per cent of all recorded investment from 1993 to 2002 (CIE 2004). Thailand has also been the primary destination for Lao exports of hydro-electricity. But China and Vietnam are also pursuing economic interests in the North and East of the country. Thailand is an important destination for temporary and permanent migration from Laos and Cambodia, and hence a source of remittances. There is a tradition of informal cross-border trade among provinces in neighbouring countries and between ethnic minority groups that straddle national boundaries.

The Mekong River links the countries with its neighbours, and plays a critical role in the livelihoods of large proportions of their populations. For Cambodia, Lake Tonle Sap is a major source of livelihoods and protein for a significant share of the population, and it is dependent on backflows from a wet-season Mekong.

Transport corridors in the region are developing, mainly as a result of the Greater Mekong Subregion initiatives led by the Asian Development Bank

(ADB). Laos is highly dependent on Thailand as a link to the export markets: but other corridors to the sea through Vietnam are developing. Thailand and Vietnam, with more developed agroprocessing and export sectors, have interests in the efforts of Laos and Cambodia to deal with animal diseases.

Political and security relations reflect historical, ethnic and strategic influences. Laos and Cambodia have complicated relationships with Thailand, but commercial and cultural links are quite powerful, especially for Laos. Vietnam's past role in Cambodia and the shared legacy with Laos of the American war create quite different contexts for political and government links between these countries. The leaderships of Laos and Vietnam are very close: relations between Vietnam and Cambodia are more complex.

Both countries continue to deal with the legacies of conflict and central direction of the economy

Both countries have gone through protracted periods of internal and external conflict. Both were caught up in the regional spillovers of the war between Vietnam and the United States, and both experienced internal battles for power in the aftermath of gaining independence from France in the early 1950s. Civil war in Cambodia in the 1970s is estimated to have killed one in five Cambodians, and both countries were subject to extensive covert bombing during the war US-Vietnam war: Laos is reputed to have had more bombs dropped on it than fell on all of Europe during World War II.

Cambodia

Since the early 1990s, Cambodia has gone through a three-fold transition: from civil war to peace, from single to multi-party politics, and from an isolated, low-growth, state-managed and subsistence oriented economy to a very open market based economy. Social capital and trust are still very low, however, and the formal, impersonal institutions that underpin modern market economies are weak or non-existent. The World Bank has said that (World Bank 2006b):

Cambodia's contemporary poverty is largely a legacy of over twenty years of political conflict, which resulted in destruction of physical infrastructure, decimation of human capital and distortion of social, economic and political institutions.

The effects of conflict, which really only ceased in the early to mid 1990s, are still present, and are particularly visible in that most public institutions are still oriented primarily to sustaining the state rather than promoting the interests of the citizenry (World Bank, op cit). The Khmer Rouge reduced the country to an isolated subsistence oriented economy, and carried out a systematic process of destroying any 'social institution or form of identity — the family, Buddhism, locality or region — that might compete with the party-state for loyalty' (World Bank op cit). This eroded traditions of trust and collective identity that underpin willingness to cooperate and consider the well-being of other members of the community, and has proven to have implications for efforts to mobilise community or collective action to deal with development or resource management issues.

Laos

Laos is a sparsely populated, land-locked country, with a difficult terrain. Its geographical constraints were exacerbated by the intensive bombing it received during the war in Indochina, and significant tracts of land are still unusable because of unexploded ordinance. The country also suffered a major loss of human capital during and after the internal conflicts associated with the war: it is estimated that the population halved during the war and a further 10 to 15 per cent of the population is estimated to have left as refugees between 1975 and 1985 (CIE 2003a).

Central economic planning was introduced in 1978 based on self-sufficiency within the country's 16 provinces. The country received considerable financial and technical assistance from the Soviet Union to facilitate central planning. But because of the isolation of the various provinces, a lack of a strong pre-existing ideology and general anarchy in government at the time, Laos did not proceed as far along the central planning track as neighbouring centrally planned countries.

In the face of considerable dissatisfaction with collectivisation and general economic stagnation, and after some failed experiments with partial relaxation of controls, the government embarked on a broad-ranging program of economic renewal and renovation in the late 1980s. This program involved recasting the role of the state and 'catching up' with the rest of the world.

Constraints to growth and development are significant...

Both countries have had to address major infrastructure deficits (table 2.4), and are working slowly to develop the legal and judicial underpinnings of modern market economies. A consequence of the large role that the state has played in resource allocation, and the suppression of the formal private sector is a low level of financial sector development. In both countries, the money supply is very small compared with GDP (table 1.2), and the Thai baht and the US dollar are widely used in transactions.

2.4 Infrastructure services coverage, 2000

<i>Indicator</i>		<i>Cambodia</i>	<i>Laos</i>	<i>China</i>	<i>Thailand</i>	<i>Vietnam</i>
Percentage roads paved	%	16	44	22	97	25
Main telephone lines per 100 inhabitants	no	0.24	0.93	13.8	9.39	3.75
Percentage population with access to electricity	%	16	22	na	82	76
Percentage rural population with access to improved water source	%	26	29	66	81	72
Percentage rural population with access to improved sanitation facilities	%	10	19	24	96	38

Source: World Bank 2005

The general environment for doing business is also fairly poor in both countries. Cambodia is ranked 143 and Laos 159 (out of 175) in the World Bank's measures of the ease of doing business (table 2.5).

2.5 Ease of doing business — rankings in 2006^a

<i>Ease of...</i>	<i>Cambodia</i>	<i>Laos</i>	<i>China</i>	<i>Thailand</i>	<i>Vietnam</i>
Doing Business	143	159	93	18	104
Starting a Business	159	73	128	28	97
Dealing with Licenses	159	130	153	3	25
Employing Workers	124	71	78	46	104
Registering Property	100	148	21	18	34
Getting Credit	174	173	101	33	83
Protecting Investors	60	170	83	33	170
Paying Taxes	16	36	168	57	120
Trading Across Borders	114	161	38	103	75
Enforcing Contracts	118	146	63	44	94
Closing a Business	151	151	75	38	116

^a Rankings are for 175 countries.

Source: World Bank 2006d.

Recent diagnostic exercises for both countries have identified major institutional constraints to agricultural growth. In Cambodia, the World Bank has identified the following problems (World Bank 2006b).

- Insecurity of land tenure and uncertain access to common property resources.

- All land titles were destroyed by the Khmer Rouge, and traditional claims were also ruptured by the large population displacements occurring during the conflict period. Many small farmers work on land acquired essentially through allegiance to local commanders in peace deals brokered in the late 1990s.
- Rural livelihoods are very dependent on common property natural resources: uncertainty of access and the growing threat of appropriation by powerful interests add to the already high risks that rural households face.
- Weak infrastructure and complementary public services.
 - Transport and irrigation infrastructure and water control systems are very poor.
 - Only 46 per cent of villages have a primary school.
 - Institutions serving rural areas are ‘challenged by problems of capacity, public financial management and allocation of resources and corruption’ (World Bank 2005).
- Low human capital.
 - This is partly a legacy of the destruction of the education system under the Khmer Rouge.
- High costs of and limited access to finance.
 - Formal and informal financial services do not serve the majority of rural areas.
- Poor rural business climate.
 - Corruption is perceived as the main constraint.
 - Agribusiness development is constrained by the proliferation of informal fees.

Similar types of constraint are identified for Laos. Customary land tenure systems are not secure, and traditional swidden agriculture systems are coming into conflict with alternative demands for land and resources. Agribusiness development, so essential to the transition from quasi-subsistence agriculture, is held back by the regulatory and institutional environment. The World Bank (2006b) has characterised the business environment as one where:

The problem of high cost of critical services, such as transport or telecommunications, is exacerbated by a cumbersome regulatory environment, at the national level as well as at the provincial level. Adding to the magnitude of the challenge is relatively low level of entrepreneurial experience and know-how in Laos, which is an emerging market economy trying to compete regionally with its more developed and experienced neighbours...

...Lack of a clear and well-communicated government policy towards the business sector creates an unpredictable operating environment, undermines business confidence, and discourages investment.

Further to this, the legal and judicial underpinnings of a market economy are still in embryonic form. This impedes contracting and transactions between unrelated parties. The absence of effective mechanisms to enforce security for loans, and of an effective bankruptcy system stand in the way of the development of larger private firms that are not well-connected to government and the ruling party.

...they constrain development of the livestock sectors...

These general constraints translate into a difficult environment for development of more intensive, commercially oriented livestock sectors. In its Master Plan for National Agricultural Research, the Cambodian Ministry of Agriculture, Forestry and Fisheries (MAFF 2005) identified a list of weaknesses of the sector which reflected these broader development constraints. They included:

- poor linkages between public and private institutions;
- insufficient veterinary services and lack of recognised veterinary medicine suppliers;
- insufficient market information;
- lack of meat processors;
- low salary structure for government personnel;
- lack of government strategy and planning for research/development;
- limited extension services;
- limited research and research facilities;
- high unofficial export import charges;
- illegal trade in meat products; and
- deteriorating security.

The plan stressed the need for development of integrated agribusiness systems to address feed and processing elements of the value chain, and improvements in rural infrastructure and support services. It highlighted the limited capacity of the research institutions dealing with livestock, and the fact that nearly all research programs depended on donor funding. It also pointed out that large (donor funded) expenditures on buildings and

equipment had not translated into an efficient laboratory system for research and development, because of the lack of operational funds. The links between research institutes and the extension services provided by the Ministry's Department of Agricultural Extension are all project based.

The report presenting the design of the ADB's Participatory Livestock Development Project Report (ADB 2005a) argued that sector deficiencies underlying the main causes of high mortality, low growth rates and low fertility in the livestock sector that in turn made livestock raising such a high risk proposition generating low returns to smallholder labour inputs included:

- limited access to knowledge on disease prevention and feed requirements and weak disease reporting and diagnostic mechanisms;
- underdeveloped in supplies and technical support services;
- a technically weak and under resourced extension service that is more familiar with directives from above for developing interventions rather than understanding the process of change needed at the smallholder level; and
- institutional practices that compounded the geographical constraints on market access and development of an integrated domestic market for livestock.

The report argues that these factors leave smallholders with little incentive to increase labour inputs for animal production activities.

...which suffer excessive and confusing regulation

Livestock regulations in Cambodia and Laos have evolved largely around the needs of the state at central, provincial and district levels to generate revenue in the absence of an effective, systematic tax system. Public service wages are low and as a result, public officials rely on local, regional and provincial revenue generated from areas such as the livestock sector and trade.

The high degree of provincial autonomy in the government systems of both countries means that there is the potential for wide differences in how regulations are legislated and enforced between provinces. This has consequences for livestock management and the delivery of services to the sector.

The main effect of regulation on livestock marketing is to reduce incentives for producers to participate in the market. This has significant implications for interventions targeting animal health, as the willingness of producers to bear the costs of adopting new systems is closely related to the degree of intensity of production and marketing in the industry. In addition to regulations that directly affect livestock industries and reduces incentives to specialise and engage in intensive production, the unfriendly environment for agro-business in both countries is also a constraint on the sector. These regulations increase the cost of operating commercial livestock enterprises and discourage the private investment that is necessary to establish commercial operations. Long delays in registration and licensing for private enterprises are common and approval processes for business registration are not transparent and are often at the discretion of individual officials. As a result rent seeking throughout the approval process is commonplace. Taxes are also inconsistently applied and often negotiated individually.

Cambodia

The livestock sector in Cambodia is affected by the same exercise of informal power as the rest of agriculture. A recent paper from the FAO Pro-poor Livestock Policy Initiative (Ear 2005) describes the systematic structures of decentralised corruption and patronage that underpins extensive informal taxation of most forms of economic activity in the country. The paper reports unofficial payments that a villager must pay on selling a cow amount to between 6 and 10 per cent of the price. Sellers need a letter from the authorities proving the provenance of the cow, and giving permission for the sale. Acquiring these documents involves payments to the chief of the commune, the government veterinarian, the provincial governor, the police and the military police. Truck and barge transport of cattle to Phnom Penh for slaughter attracts further unofficial charges paid to the provincial governor's office, the veterinarian, the Livestock Office, the military police, the economic police and the district police.

Laos

Regulation in the livestock sector in Laos reflects the status of the transition from centralised planning. Official and unofficial regulation affects almost every level of economic activity. In many situations, the objectives of regulation are not clear — often merely reflecting a view that the State should regulate economic activity. Frequently, the effect of regulation is constrained by the absence of appropriate instruments and capacity for effective enforcement. While regulation in the livestock sector is often

inconsistently applied, it impacts significantly on the incentives facing industry participants to engage in intensive production and hence the demand for a range of inputs. An example of regulation at the national level is regulation No.0036/DLF was issued in 2000 and included the following regulations (ILRI 2002):

- onerous regulations surrounding the importation of livestock, feed and veterinary supplies, including application to import 15 days before scheduled importation, different application forms for different products, certification from exporting country and samples in the case of veterinary drugs;
- in addition to general certification for exports in line with import requirements, additional certification and associated paperwork is required for movement of animals within Laos;
- compulsory vaccination of cattle, pigs and poultry against major diseases; and
- comprehensive regulations surrounding the reporting of disease epidemics including provisions restricting the movement of livestock, the destruction of affected animals and vaccination of surrounding areas.

Regulation 0036/DLF is not regularly enforced, and regulations surrounding importing and exporting are regularly circumvented by importing and exporting informally (ILRI op cit). In addition to this, there are special directives imposed on livestock industries at the provincial level. During the development of the new ADB project, a detailed review of livestock marketing was undertaken (ADB 2005b). The study focused on the Northern provinces of Luang Prabang and Xieng Khouang and found a range of fees and charges are levied on livestock movement. In addition to this, it found that ‘most of these payments are aimed at generating revenue at the local level, with little practical relevance to animal health and controlling the spread of livestock diseases’ (ADB 2005b). A summary of some of these fees and charges is shown in table 2.6.

2 BACKGROUND

2.6 Summary of fees and charges on livestock in Northern Laos

Type of charge/fee/tax ⁷	Collection office	Luang Prabang Province		Xieng Khouang Province	
		Phou Khoune	Nam Bak	Nonghet	Pek
Annual livestock tax	Village headman	N/A	N/A	N/A	KN1000 per year
Certificate of sale/purchase	Village headman	KN10 000-15 000 per head	KN10 000 per head	KN5 000 per head	KN2000-50000 per head
Transit fees to collection centre	Check points	KN200 000	None	N/A	N/A
Letter of approval for internal movement of animal	District agriculture and forestry office	KN10 000 per head	KN5 000 per head	KN10 000 per head	KN10 000 per head
Veterinary certificate and registration card	District agriculture and forestry office	KN12 000 per head	KN5 000 per head	KN10 000 per head	KN13 000 per head
Letter of approval for internal movement of a commodity	District commerce office	KN10 000 per head	Included in trade license	KN3 000 per head	KN10 000 per head
Property tax	District commerce office	KN60 000 per shipment	Included in trade license	KN3 000 per head	KN10 000 per head
Tax payment for moving animal including form	District finance office	2 per cent of value of animal	KN3 000 per head	KN47 000 per head	KN3 000 per head and KN3 000 form
Revenue taxes	District finance office	KN20 000 per head	Included in trade license	<ul style="list-style-type: none"> ▪ 5 per cent ▪ 35 per cent ▪ KN5 000 per sheet 	<ul style="list-style-type: none"> ▪ 5 per cent ▪ 35 per cent ▪ KN5 000 per sheet
Trade licence	District finance office	N/A	KN5 000 per year for export, KN0.8 million for internal	N/A	N/A
Export charge	Provincial finance office	N/A	KN10 000-15 000 (unofficial)	N/A	N/A
Veterinary export certificate	Provincial agriculture and forestry office	N/A	N/A	N/A	N/A
Transit fees to market	Provincial agriculture and forestry office	KN200 000	KN40 000	N/A	N/A

Source: ADB 2005b, p4.

3

Cattle and buffalo in Laos and Cambodia

Livestock industries make an important contribution to the economy of both Laos and Cambodia, with the livestock sector (including pigs and poultry) accounting for around 10 and 6 per cent of GDP respectively. Most livestock are raised by smallholders, for whom they serve a variety of functions. Livestock are a source of cash income, provide a subsistence source of protein, are used for draught power, and are used as an asset or savings bank. It is important to note however that Laos and Cambodia remain largely subsistence based economies, and growing staple crops such as rice for human consumption is the highest priority. Indeed, the major function of large animals in some areas is as an input into the rice production process as a source of draught power and manure for fertiliser.

According to the Food and Agriculture Organization (FAO), the total population of cattle and buffalo in Laos is around 2.4 million, while in Cambodia this figure is 3.8 million. Of these, buffalo account for around 57 per cent in Laos and 17 per cent in Cambodia. Both cattle and buffalo are used for draught purposes.

Exports of live cattle are important in both countries. Estimates suggest that around 100 000 head of cattle are exported from each country each year. Complex regulation both in domestic and export markets mean that exports through formal channels represent a small proportion of total exports. In Laos for example, out of total exports of around 100 000 head, only around 10 000 are exported formally. Strong demand in the region has driven a significant increase in exports, with demand growth particularly strong in Vietnam. Up until recent years, the majority of cattle exports from Laos were to Thailand. However, evidence suggests that a significant proportion of this trade has shifted to Vietnam. This has occurred both as demand has increased in Vietnam, but also in response to increased beef imports in Malaysia and associated reduction in cattle imports. A majority of exports from Cambodia are also to Vietnam.

Broadly, cattle production systems are similar in Laos and Cambodia, but there are subtle differences. These are discussed further below.

Cattle and buffalo in the smallholder system

Smallholders overwhelmingly dominate cattle and buffalo production in both Laos and Cambodia. In this respect, it does not make much sense to look at cattle and buffalo as a standalone production system. In reality, there are very few specialist cattle producers, and almost all cattle are raised within a complex smallholder production system. These systems are generally based around a combination of subsistence agriculture, with cash-generating agricultural activities and off-farm activities. The degree to which smallholders engage in intensive cattle activities depends on a range of factors, including:

- food security
- ethnicity
- access to markets
- land availability
- road access.

Chart 3.1 illustrates a typical smallholder production system in Laos and Cambodia.

Smallholders effectively have two inputs — land and labour — at their disposal to generate a variety of outputs. Land in both Laos and Cambodia is relatively constrained. Some reports suggest that Laos has the potential to expand land area devoted to agriculture. However the land tenure issues outlined in chapter 2 mean that it is difficult for smallholders to expand their land holdings. The situation is similar in Cambodia. In both countries, feed availability is already a serious constraint on cattle productivity. Problems with growing forage to feed cattle, particularly in the dry season are common and feed shortages limit the ability to expand cattle numbers.

The average farm size among the rural poor in Cambodia is 1.5 hectares, but 40 per cent of rural poor live off less than 0.5 hectares (World Bank 2006b). Food security for smallholders with only 0.5 hectares of land is particularly poor — only able to supply half of the average household's rice requirements annually. While there are large areas of unutilised land in Cambodia, as the World Bank (2006b) notes:

Over the past decade, the Government has constituted a system of economic concessions by providing 70-year leases covering 889 399 hectares of land to 49

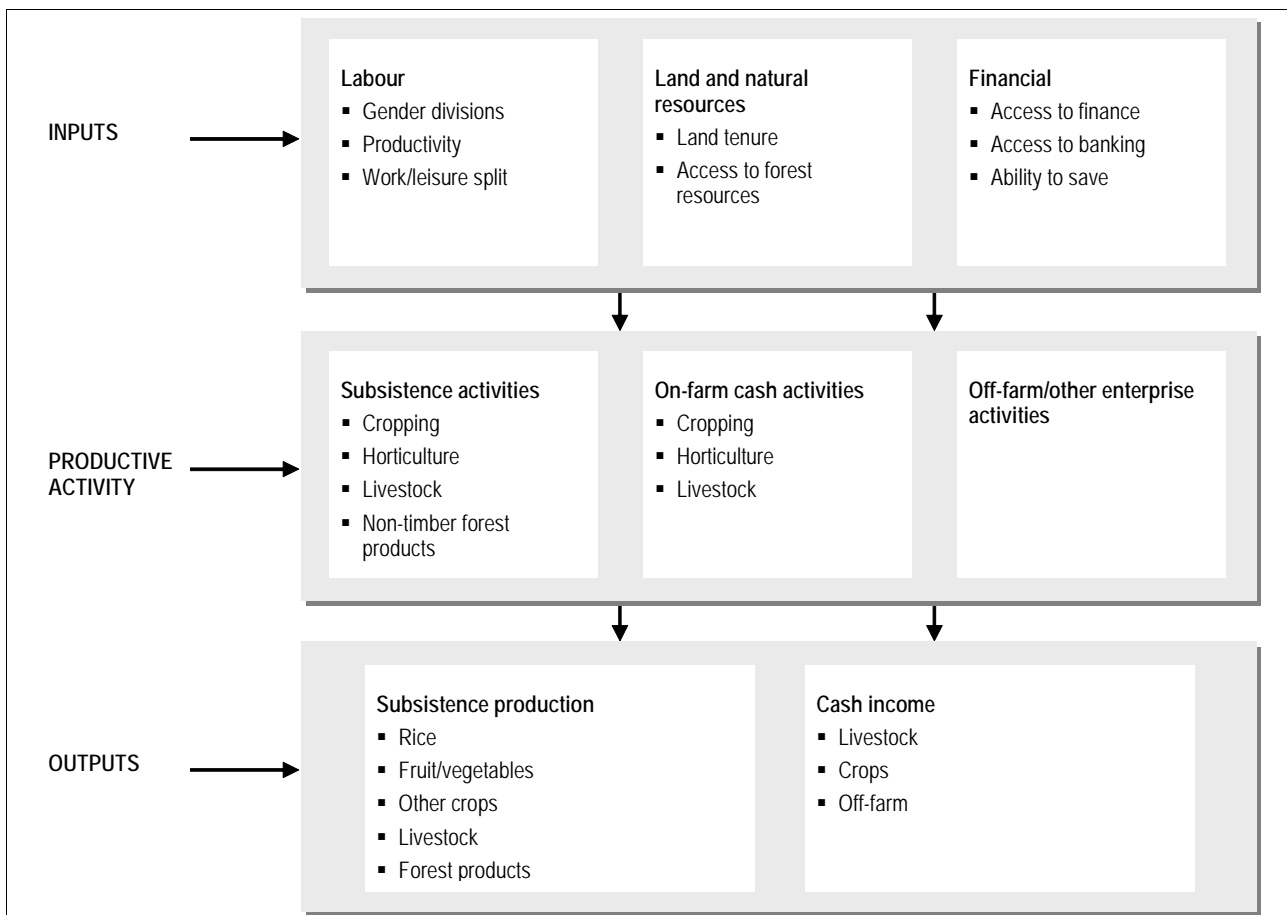
private companies. Ostensibly motivated by a perceived need to commercialise agriculture, in practice few (only about 10) are operational.... Suspicion over the motives for awarding these concessions is fuelled by the fact that 14 concessions exceeded the 10 000 hectare limit above which a special review is required — yet no review has been implemented.

A significant expansion in cattle numbers in either country is unlikely to be a viable option unless there is a significant intensification of production and a shift away from the current smallholder subsistence based production system.

The role of animal health and management in the production system

Chart 3.1 provides an illustration of the overall smallholder production system. This shows the complex array of activities that smallholders participate in, and how they effectively have just their labour with which to manage risk and achieve certain outcomes. However, in the context of

3.1 Smallholder production systems

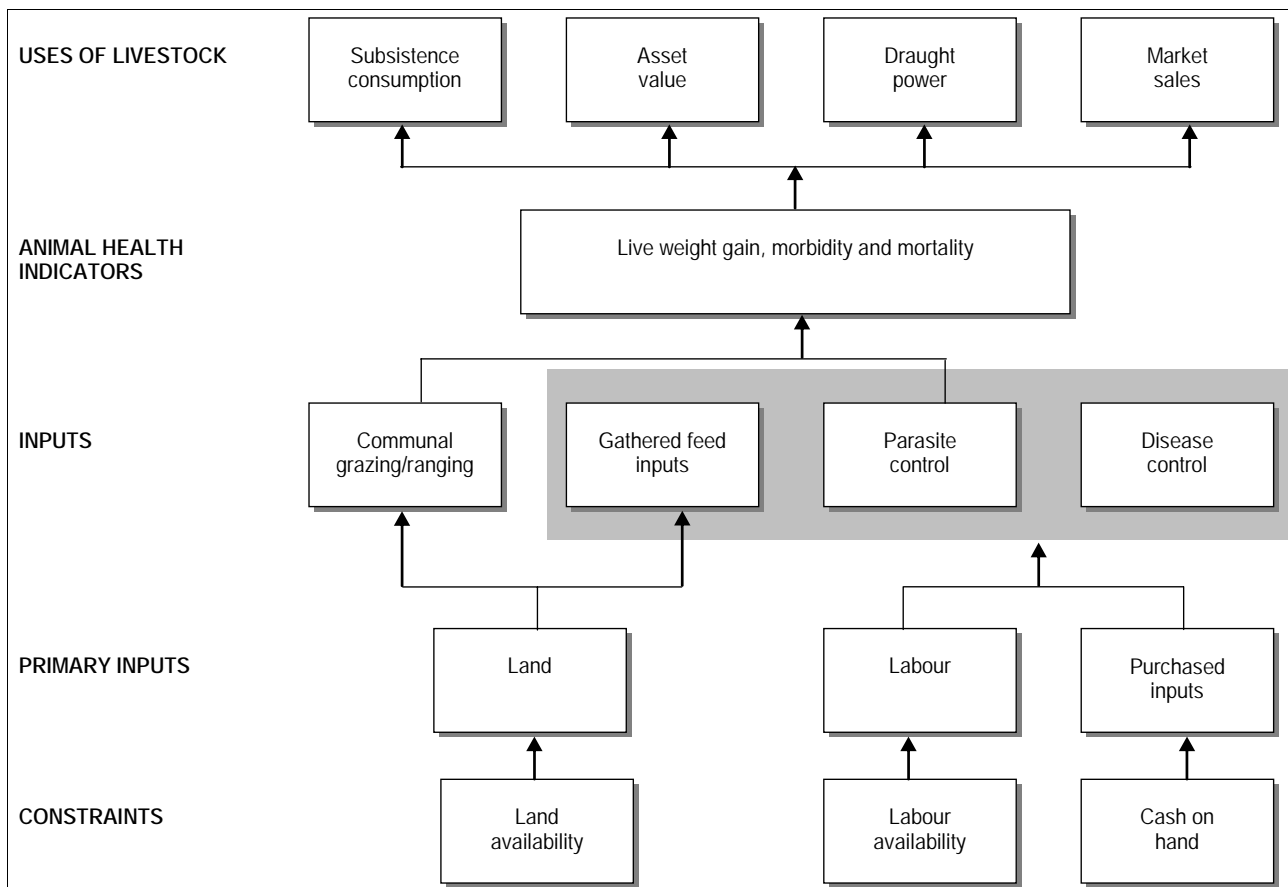


Source: The CIE.

animal health, it is useful to expand the cattle and buffalo component of the production system to look at where animal health fits in with the other inputs into cattle and buffalo and their uses (chart 3.2).

There are four basic uses of livestock in Laos and Cambodia: for subsistence consumption, as an asset or savings bank, for draught power, and market sales for cash income. In a development sense, the goal is to move more producers into market sales. However, many smallholders are still in full or quasi-subsistence, and there are limited interactions with the market economy especially on the income side of the household equation. In this system, the primary use of cattle and buffalo is as an asset, which can be liquidated when a significant cash outlay is required. This often occurs when a medical emergency arises. In a full subsistence system, draught power is important for rice production. As smallholders move out of full subsistence towards a market oriented system, the use of cattle and buffalo move towards market sales (right hand side of 3.2). This will only happen as food security improves, and the risk of intensifying and specialising in cattle production decreases. As this change occurs, more

3.2 Smallholder livestock production systems



Source: The CIE.

inputs will be required to produce cattle. The demand for animal health and management inputs such as disease and parasite control and husbandry and breeding will increase.

Chapter 4 looks in more detail at the smallholder system and the incentives and constraints that they face.

Features of cattle production systems in Laos and Cambodia

There are a variety of cattle production systems that operate in Laos and Cambodia. Whilst each system is different, there are common features. These include:

- free range grazing on common land
- limited hand feeding, primarily using cut and carry forages
- virtually no selective breeding.

These features are found to different degrees in both Laos and Cambodia, with the interaction varying mainly with geographical location and ethnic group. The following section attempts to characterise cattle production systems in both countries.

Laos production systems

The cattle herd in Laos consists of mainly of native yellow cattle, with H'mong cattle present in the H'mong areas of northern Laos. These breeds are small and well adapted to the prevailing conditions in Laos. Attempts have been made in the past to introduce exotic breeds such as Brahman for cross breeding but in most cases these have been unsuccessful. Mortality in introduced breeds is extremely high, as they are not suited to the climate and their feed requirements are much higher than native cattle. Box 3.3 discusses two examples of attempts to introduce Brahman cattle in Laos that were highlighted during consultations.

In general, cattle and buffalo are raised in extensive systems largely based around seasons and cropping cycles. During the wet season when crops are grown, animals required for draught power or manure are generally tethered in makeshift housing near the smallholder's home away from cropping areas, while others are taken into forest areas to prevent crop damage. During the dry season, cattle usually graze freely on cropping land and on communal land with feed shortages common. However, there are some variations within this system that are worth noting.

3.3 Examples of introducing Brahman cattle in Laos

Examples of problems with introduced breeds were highlighted during consultations. A farmer in Southern Laos had purchased two Brahman bulls, which subsequently died in reasonably short time (Mr Bountem, personal communication, 28 September 2006). Another example was found at the Cattle Bank in Xieng Khouang, which was set up through an IFAD project. The Cattle Bank received a donation of Brahman cattle from Vietnam. However, as the cattle arrived near the onset of the dry season, there have been significant problems with growing adequate feed supply, even though the Cattle Bank ostensibly has much greater capacity than most other areas for growing feed. There were also problems encountered in attempting to cross breed the Brahmans with the native cattle (Mr Hong Thong, personal communication, 27 September 2006). ADB (2005c) concludes that 'at this stage of the region's development, the pursuit of any genetic improvement program through introductions of exotic cattle breeds is counter productive'.

There has been some development in feeding forages to cattle in parts of Laos. But feed availability is still constrained in many areas. In southern Laos for example, there is very little feeding of cattle using forages. This is due mainly to the harsh conditions and poor land quality. The most fertile land is taken up with rice production, and while there is significant common land for grazing, overstocking and general poor land condition mean that feed for cattle is in extremely short supply. At the time of consultations for this study, pasture had already been eaten out even though it was at the end of the wet season. Growing forages is a difficult proposition in this environment, with suitable land and a lack of water in the dry season being significant constraints. Overstocking is therefore a major problem, and one that is exacerbated by the fact that there is no formal system for using common land. Cattle numbers are not limited, and since they are largely an insurance policy for smallholders, the natural inclination for smallholders is to keep more, not less cattle on the common land. This in turn puts even more pressure on the condition of the land.

In other areas, free range grazing is combined with some limited growing of forages to intensively feed cattle – the 'cut-and-carry' system. This is most notable in the parts of Central and Northern Laos, particularly among the H'mong ethnic group. The H'mong people are 'well known for their skills in raising cattle' (ADB 2005c). This capacity with cattle is attributed to the H'mong's culture of breeding fighting bulls.

The increase in forage growing for feed in some areas of Laos has been partly driven by the involvement of donor projects aimed at increasing uptake of forage systems. Key factors that affect the adoption of systems of growing forages and feeding cattle are access to markets to sell fattened cattle and good quality land to grow forages. The areas that have been

successful in moving to a more intensive system through projects in provinces such as Xieng Khouang generally exhibit these characteristics. Strong demand for live cattle, particularly from Vietnam has also played a role. Smallholders in this system typically have a number of cattle on the common land, and periodically either bring one of their own animals in to feed or buy in an animal to fatten for a period when a specific cash requirement needs to be met (Mr Chikilo, personal communication, 26 September 2006). This is the equivalent to a finishing system, but cattle are often bought in poor condition at low prices. Cattle are also fed when they become pregnant or sick in many instances. Table 3.4 outlines the key features of the major production systems in Laos.

3.4 Cattle production systems in Laos

<i>System</i>	<i>Key features</i>
Free ranging cattle on common land and forest areas	<ul style="list-style-type: none"> ▪ Periodic checking of cattle by owners ▪ No inputs aside from labour to check on animals ▪ Animals can remain in forest unchecked for lengthy periods ▪ No market orientation – animals kept as asset/bank
Free ranging with cows bought to village around calving and fed with cut and carried feed	<ul style="list-style-type: none"> ▪ Limited inputs – mainly feed for pregnant animals and labour ▪ Little market orientation – inputs focused on protecting asset
Tethered or free ranging near village by day, housed in village at night and fed cut and carry feed	<ul style="list-style-type: none"> ▪ Can be areas with limited land for free ranging ▪ More market orientation, depending on location ▪ Animal still mainly used as an asset
Free ranging with cut and carry feeding for finishing cattle	<ul style="list-style-type: none"> ▪ Several animals per household free ranging only ▪ Finishing purchased or own animal for market ▪ Finishing generally when cash required ▪ Some market orientation, but animal still largely form of savings

Source: ADB 2005c.

Selective breeding of cattle in Laos is virtually non-existent. Castration of surplus males is not practiced in Laos, and farmers have little understanding of other managed breeding practices such as segregation. As noted in ADB (2005c):

Males are left entire, cows mate with any available bull and calves are weaned naturally. Management inputs are minimal and animals are left to their own devices for much of the year.

In this system, in-breeding is a significant problem. Low body weight and poor condition reflects not just poor nutrition, but also poor breeding stock and widespread in-breeding. Farmers with animals on common land have very little control over breeding, since there are usually a large number of

bulls available and no way of selecting or controlling mating. During consultations, a farmer was visited who owned a total of 70 head of cattle had in excess of 20 bulls and little understanding of the breeding process. Other anecdotal evidence uncovered during consultations suggested that when there was any bull selection, males were selected for features such as the longest horns, particularly in H'mong areas where there bull fighting is practiced and culturally significant.

Cambodian production systems

Agriculture in Cambodia is dominated by rice production. Nationally, rice accounts for over 76 per cent of agricultural revenue and 84 per cent in poor households (World Bank 2006b). Livestock accounts for around 10 per cent of household income. Rice cultivation takes up much of the arable land, with little crop diversity and as a result, the cattle raising system is largely centred around rice.

There are several breeds of cattle in Cambodia. The native yellow cattle are the most prevalent, while the other major breeds are Haryana and Brahman. Haryana cattle were introduced from India, and are mainly concentrated along the Mekong where more forages are available. The native cattle typically reach weights of between 250-300 kg, while the Haryana and Brahman crosses reach around 400-450 kg.

There are two basic cattle production systems in Cambodia: lowland and upland. In the lowland areas, land use is dominated by rice. This creates significant constraints for feeding cattle. Unlike other systems where feed is a major problem in the dry season in particular, in the lowland areas of Cambodia the reverse is true. Because of land constraints and to avoid damaging the rice paddy, cattle spend most of the wet season tethered near the house or on the side of the roads. They are periodically taken out to graze on the paddy line, and there is some cut and carry feeding where feed is available. It is common to see children just home from school leading cattle and buffalo out for grazing along paddy lines or roads. Maintaining animals in the wet season is crucial so that animals are in reasonable condition for ploughing at the end of the wet season. Estimates of draught animal use vary, but between 60 and 80 per cent of rice is harvested using draught power. Despite the Cambodian government's policy to maintain the use of cattle for draught power, mechanised harvesting is increasing, but high diesel and maintenance costs are limiting factors (Terry O'Sullivan, personal communication, 3 October 2006). In the dry season, cattle in lowland areas graze on the rice stubble, where they actually gain condition. This is an important facet of this system, as it

allows the cattle to survive the wet season with enough condition to provide draught power.

In upland areas, there is more land available. As noted earlier, a significant proportion of this land is unavailable for cattle production because the government has conceded it to private companies. This means that in spite of the land availability, only around 10 per cent of total cattle and buffalo are in upland areas (Dr Sothoeun, personal communication, 3 October 2006). A characteristic of the upland areas is a long dry season which would naturally lend itself to a system based on moving cattle in and out in accordance to feed availability. Currently, a proposal is being developed for ACIAR which involves a forage project based on new techniques of managing the wet season pasture flush while retaining soil moisture by the maintenance of ground cover.

Constraints imposed by these systems

While a possible objective of any research in this field would be to determine the relative importance of each factor contributing to poor animal health, the single largest constraint faced by cattle and buffalo producers in Laos and Cambodia is feed availability. This is in turn linked to the labour constraint faced by smallholders and the availability of grazing land. Some areas have begun to adopt forages for feeding to cattle, mainly through aid projects, and these work partially by reducing the burden on smallholders in other areas such as time taken to gather and prepare feed for pigs. The severity of feed shortages varies between regions, but poor nutrition is a common problem. Even in areas where there is some feeding to fatten cattle, nutrition remains a problem for cattle grazing on the common land. As noted earlier, overstocking is common and the primary use of the cattle and buffalo as an asset increases the incentives for smallholders to keep cattle, which adds to the overstocking problem.

Poor nutrition also increases susceptibility to diseases and parasites. There is no doubt that the disease and parasite burden of cattle and livestock in both countries is in large-part due to poor nutrition. Virtually all smallholder cattle viewed during the consultation were significantly underweight, with a large and visible external parasite burden including ticks and mites which caused severe dermatitis and skin irritation. It would also be expected that these same livestock carried a large internal parasite burden. A key question for a possible project would be to examine the prevalence of disease and parasite in a livestock population which is on an adequate nutrition plane.

Workshops were held in Laos and Cambodia during which constraints facing cattle and buffalo producers were discussed. Animal health and disease featured heavily as a constraint, and while this is no doubt true, it is likely that the general animal health focus of the workshops contributed to this. The major diseases that affect cattle and buffalo in Laos and Cambodia are Haemorrhagic Septicaemia (HS) and Foot and Mouth Disease (FMD). The main implication from FMD is trade related — as a production disease it is relatively minor. HS is an important disease, but hard data on prevalence rates is non-existent. Estimates during consultations ranged from 2 per cent to 20 per cent. Accurate diagnosis and reporting of HS is a major contributor to these discrepancies. Vaccination for HS is widely promoted in both countries, with government driven vaccination campaigns one of the main delivery mechanisms. Estimates of vaccination coverage vary by province from 20 per cent to 80 per cent, but it is likely that these are significant overestimates in some instances. Blackleg was also mentioned during consultations, but it is not viewed as a major problem.

The other main cattle and buffalo health problems experienced in Laos and Cambodia are parasites, with toxocara and fasciola (liver fluke) being the major internal parasites, and external parasites such as ticks and flies also cause problems. Toxocara mainly affects buffalo calves, and can result in low growth rates and in some cases mortality. Treatments for parasites are available in both countries, but their use is limited by a lack of understanding and the cost of treatment.

Besides animal health, the major constraints that were identified during the workshops in Laos and Cambodia in order of priority were:

1. Poor nutrition and lack of feed
2. Poor reproduction management and husbandry
3. Poor marketing
4. Breeding.

Whilst the methods for dealing with most of the constraints faced by smallholders in Laos and Cambodia are well known (see box 3.5 as an example), the environment in which smallholders operate means that adopting these methods is not simple. In the current system of subsistence farming combined with limited cash generating activities (especially in rural areas), there is limited capacity to divert labour towards animal health and management. Incentives in this system are naturally skewed towards ensuring basic food needs are met in the first instance, with other cash generating activities largely a secondary priority. In other words, the risk

adjusted returns of additional investment in livestock production are not sufficient in the current system.

3.5 Feeding options in lowland Cambodia

There are a number of options for supplementary feeding of cattle in the lowlands of Cambodia. These regions are devoted almost wholly to rice – so any supplementary feeding option involves a rice product or by-product. The options are:

- rice straw and supplemented by urea;
- a feed based on broken rice; and
- fodder or feedstuffs usually purchased from a roadside vendor - many times imported from another district.

All of these options have limitations. Urea must be purchased or diverted from rice production. When combined with rice straw, it represents only a supplement but not a long-term feed solution because it lacks nutritional balance. Broken rice is relatively high valued, between 40 and 50 per cent of the value of normal rice, and most likely has to be diverted from other uses such as feed for pigs where the weight-gain conversion performance is better than for cattle or buffalo.

Forage bunches, cut from local grasses, are available for purchase by vendors on the main feeder roads around Phnom Penh or are transported directly into the capital for sale. Again, cost and availability are key issues for this feeding option.

Any move towards better animal health and management practices will largely be predicated on a move into more intensive production system. At the present time, there isn't a 'cattle and buffalo' production system at least in a conventional sense. General economic development will, in time, reduce the risk of intensifying production. There is no real social security system in Laos or Cambodia, so spreading risk over many activities in the smallholder system makes sense. During consultations it was clear that the producers who had specialised to a degree were generally better-off, and as such the risk to them of a shock — for example a major decrease in prices — is relatively low.

During consultations, there was a consensus that each constraint related to animal health and management was related, and that the best way to address them was within a broad 'whole of system' approach. But this approach needs to work within the system that smallholders operate in and the incentives that they face. More discussion on these factors is presented in chapter 4.

4

Smallholder incentives

The previous chapter provided an overview of beef production systems in Laos and Cambodia. Smallholders keep virtually all of the cattle and buffalo in these countries, so any project or program designed to increase specialisation and productivity has to be directly targeted at that group. It also has to be recognised that production and use of cattle and buffalo:

- is *not* separable from any other household operations including production or consumption activities; and
- is directly the result of choices and tradeoffs made in a very risky environment where choices are conditioned by food and income security.

It is not relevant to consider these production systems in the same framework as production in western countries — that is a specialised cattle enterprise. Any activity designed to improve cattle and buffalo production is really about improving smallholder incomes through rural development. Because both development and risk is about change, the management of this change is very important to the outcomes of a proposed project.

Therefore, a key component of this project was to understand the incentives and constraints face by smallholders — who are the focus of any research.

Integrated smallholder systems

In a fully subsistence system smallholders have no interaction with the market economy. In such a system, staple food crops are produced in either a stationary or moving (swidden) cropping system depending on the agronomy and topography of the land. Swidden cropping, usually involving slash and burn practices, is a response to declining fertility and productivity of soils.

Around these subsistence cropping systems, smallholders are also dependent on a number of complementary activities that involve:

- livestock raising of cattle and buffalo, pigs and chickens;

- hunting and gathering from forest areas or fishing for coastal communities or those next to freshwater resources like the Mekong; and
- exchanging labour with other households within the village context.

These activities, plus family and village structures, provide mechanisms to manage the risks of adverse events such as food shortages or ill-health. Characteristics of those in full subsistence are that they:

- are located in remote areas where access is poor;
- have very poor levels of education and health; and
- often belong to small ethnic groups viewed as being significantly different from the majority of the population.

The transition from a fully subsistence system to that observed in the current quasi-subsistence system has been slow, but has forced significant changes on the way smallholders behave.

Road access is a major driver of this transition — and the distance to the nearest major town is the primary indicator of the rate of the transition. Once a locality can be accessed, then the transition generally begins quickly. This is because of access to a range of goods and services previously not available. Some of these services may not be provided through markets — such as basic health care and education.

Roads also provide access to markets for sales of cash crops and livestock. It is of little surprise that communities that are closer to a major centre are more likely to have road access and therefore will be more exposed to the market economy.

Engaging a market economy

While improved access to markets and services has played a role in the transition, many smallholders have also been brought into the market economy by their requirements to purchase goods and services for cash.

In terms of household expenditures, cash payments are now required for a range of goods. In many cases these goods and services were simply not available in the locality or were supplied free of charge by the state. These expenditures include essential needs such as:

- payments for basic health services and emergency care;
- education expenses – mainly contribution to school fees;

- requirements for festivals, weddings and funerals; and
- at the most basic level — rice and other foodstuffs for those with poor food security.

In addition, there is now a wide range of consumer goods and services that are highly desirable such as:

- building materials for home improvement
- motorbikes, radios and televisions.

Inputs into agriculture are in demand and include:

- hand tractors (rotary hoes) that not only save labour but can be attached to a trailer and used as transport; and
- fuel, fertiliser, vaccines and other chemicals to improve productivity.

While some of these expenditures are discretionary, those that are not such as health and school fees have forced most smallholders into the market system to some extent.

While the transition to the market economy has happened on the expenditure side, the production technology for the staple crop, based on low or no inputs, has changed little over the same period.

Integrated systems and income security

It is important to view smallholder activities as an integrated system where decisions on production and consumption cannot be separated. The smallholder unit is the household. In both Laos and Cambodia the average household size is 6 persons, and the key objective is to maximise firstly food security and secondly income security.

Household responses in terms of cattle and buffalo production will depend on a complex set of decisions and tradeoffs that aim to maximise food and income security while minimising risk. This is why smallholders are multi-product enterprises producing:

- rice
- other vegetable or fruit crops
- livestock including cattle and buffalo, pigs and chickens.

Smallholders will also have arrangements where they either sell or exchange their labour for cash for other goods and services. The diversity

of these ‘outputs’ are how the risk of failure of one activity — such as a poor rice crop — is managed. Another important risk is incapacitation or death of one of the heads of a household.

Virtually all smallholders in Laos and Cambodia in rural areas grow rice. Food security in rice depends on the productivity of their system — which in turn depends on:

- the size of smallholding relative to the size of their family; and
- the productivity and reliability (in terms of yield) of the smallholding.

Cash-earning opportunities available to quasi-subsistence households may include:

- the production and sale of other crops, including grains, fruits, vegetables and freshwater and marine fishing products and the proceeds of forestry and hunting;
- the sale of livestock including cattle, buffalo, pigs and poultry; and
- the sale or exchange of their own labour or that of their children.

Food security

Population pressure on limited land is becoming a large constraint to the sustainability of these smallholder systems by compromising food security. Box 4.1 illustrates how food security is a priority for many smallholders and how it affects smallholder’s decisions concerning other cash-earning opportunities.

Overall, productivity per hectare in terms of yields depends on soil fertility and climate — particularly the length and the reliability of the wet season. Much has been written about the productivity of rice production in both of these countries and steps required for improvement in yields. The System of Rice Intensification (SRI) project in Cambodia, funded by AusAID, looked at a range of interventions that centred on:

- higher-yielding varieties and moving from long season (traditional) rice varieties to newer short season cultivars with the potential for double cropping; and
- a range of management improvements including better soil cultivation and transplanting techniques to water management and weeding practices.

4.1 Food security in Laos and Cambodia

The World Bank provides the following example. The average size of a farm in Cambodia is 1.5 ha. However, 40 per cent of the rural population live off less than 0.5 ha. With average yields of 1.8 t/ha and an average size of 6.1 people, a household with 0.5 ha will produce 900 kg of paddy or 585 kg of milled rice. This represents 96 kilograms per person per year – sufficient to meet only half of the average per person milled rice requirement of 165 kilograms per year.

This example excludes the likelihood of post-harvest losses of between 10 and 15 per cent. In Laos the usual practice is to allow 180 kg of milled rice per person per year or 493 grams per person per day - which meets 75 per cent of the average energy requirement – 2 338 Kcal/day (<http://www.fao.org/docrep/004/v9479e/v9479e00.htm>).

Evidence from the consultation in Laos suggested that food security was very poor in some southern provinces in Laos. These smallholders are producing subsistence rice in a harsh savannah-like climate that is characterised by a pronounced and extended dry season. In these regions, rice is harvested at the end of the wet season around September/November. Where smallholdings are around 0.5 hectares, and accounting for variations in yields, some households are short of own-consumption rice by as early as March in the following year. These people then have to sell-off livestock, exchange their own labour or exploit local fishing and forestry resources to provide food for their families.

Source: World Bank 2006b and the CIE.

Appendix B summarises the results from the household expenditure survey from Laos that further highlight the poor food security facing many smallholders and that food availability and population pressure will vary naturally between regions within the same country (NSC 2004). This would indicate that it is not appropriate to use a blanket approach to improving smallholder's outcomes.

Income security

Better income security would generally translate to improved food security because food can be purchased when required. But this is not always the case where poor infrastructure and government regulation stifles trade in food between provinces and countries — particularly for rice.

Anecdotally, consultations revealed that both food and income security in more northern areas of Laos appear to be significantly better than in southern Laos, and indeed the provinces visited in Cambodia. This had a lot to do with the quality of the resource base (land and climate) and lower population pressure.

To assess income security more objectively, the net income-expenditure situation for average rural households in Laos was analysed from the

consumption and expenditure survey summarised in appendix B. Table B.1 shows that across rural households, total income averaged US\$632 and while expenditure was over US\$1 000. These estimates include production for own-consumption. This leaves an average cash deficit per household of around US\$395 per year. This deficit ranged from US\$350 in the northern region to US\$592 in the southern provinces.

While this data probably overstates the cash flow deficit faced by rural households because the survey does not capture all income generating activities, the picture is clearly one where smallholders are not income secure. But because the data averages over a year, it is likely to understate the cash flow difficulties faced by smallholders at certain times of the year especially when own-consumption food is short and expenditures are required.

While there is no corresponding income and expenditure data for Cambodian households, there isn't any compelling reason to believe that income security in Cambodia is any higher than Laos.

Natural resource depletion

Another factor that is threatening smallholder's livelihoods is the acceleration in the exploitation of natural resources that represent part of the safety net for villages. This is especially true for:

- logging in northern Laos which has included forced resettlement
- over-fishing in the Mekong River in southern Laos
- over-fishing in coastal Cambodia.

Development in China, including damming the Mekong, will have important impacts in reducing flows and fish availability, especially if they affect the wet season flows that fill Ton Le Sap in Cambodia.

Managing risk is the bottom line

A characteristic of smallholders in Laos and Cambodia is that they are very risk adverse. Apart from the reality of being thrust into a market economy, the history of both countries is one of war, conflict and food shortages. The experience of these times strongly conditions behaviour in the face of change. This has implications for how transition to a modern economy is best supported by government and donors.

The need for cash to pay for basic requirements is exacerbated by the absence of a state-provided security network and the limited reach and functionality of the financial sector. People cannot rely on institutional structures to deliver goods and services, even if paid for, because of corruption or incompetence.

Because of relatively poor food security and the necessity to have cash on-hand for expenses (both expected and unexpected), smallholders are largely risk adverse. This constrains much of their behaviour, with scarce resources including labour and land spread across a number of subsistence and cash-earning activities. If one activity fails, then all is not lost. That is, there is no real incentive to specialise.

In developed countries, there are a number of mechanisms to mitigate risk. These include the ability to save money in a functional financial system and, as a last resort, a social security net provided by the state including a health system. In Laos and Cambodia these mechanisms simply are not available.

Mechanisms to deal with risk

In times of financial need, smallholders have a number of contingencies that are called-on depending on the level of cash requirement. These include:

- sale of livestock;
 - poultry and pigs for small requirements;
 - cattle and buffalo for larger outlays;
- borrowing money from extended families, which may or may not be in the same village or could be in town;
- sale of labour or temporarily moving into the nearest town for employment;
 - if smallholders do not have a buffalo or steer for draught, they are most likely to exchange their own labour for the draught power;
 - this may include sending children away for work to the city or even neighbouring countries; and
- selling land is the last resort.

These findings are largely based on the consultation process and are supported by the Participatory Poverty Assessment for Attapeu Province in Laos, which reported the following (MWB 2006):

Livestock production functions as a savings mechanism in times of need. When small amounts of cash are needed, people can sell chickens. For example, villagers of Sen Keo often sell chickens to purchase white salt, kerosene, cooking powder or paying for a boat trip to Sanamxay. However, almost all people said that when in need, they sell chickens or pigs first, cattle are last except when they require lots of money or family members fall sick.

While smallholders face many risks, the most significant one is illness or death especially of the heads of the households. This has a double impact because their labour input is lost, impacting on the household's food supplies and income, while in addition the expenditure required for medical treatment and/or for funeral arrangements can be significant (see box 4.2).

4.2 A health shock is often more serious than a harvest failure

Results from surveys in two villages south of Phnom Penh suggest that while crop failures and illnesses are both devastating experiences, entailing similar magnitudes of economic damage (averaging a few hundred thousand Riels), households find it harder to cope with illness. The negative consequences from health shocks are more damaging to both immediate and long-run livelihood because they require an immediate lump-sum of money for urgent treatment. Because most households do not have sufficient savings (and rural credit markets do not operate well), households are often forced to resort to distress sale of productive assets (including land) and/or enter long-term debt, reducing their future income streams and increasing their non consumption expenditures, respectively. This broadly confirms the findings of earlier Oxfam studies which found that half of all distress sales, or around 40 per cent of cases of once-landowning families losing land, involved health crises.

Source: World Bank 2006b.

While smallholders keep cattle and buffalo primarily to act as a bank and an insurance policy, they largely will not view large ruminants as an activity that is likely to provide a regular income. As such, there is little or no incentive to specialise and devote more scarce resources to that activity under the current system.

Resource base is highly constrained

As noted in chapter 2, a significant constraint on improving production of ruminants is the availability of land and labour. In terms of land, the system of land tenure and the sharing of communal land at the village level impacts significantly on how cattle and buffalo production could be intensified.

As already noted the production systems for smallholders are based on a plot of between 0.5 and 2 hectares. On the plot the house is sited, and rice and vegetable planted and livestock kept. In addition smallholders also have access to communal lands. In Laos, these communal lands include the transition area between the fertile flats and forest areas. In Cambodia, communal lands in the lowlands are essentially those areas that are not sufficiently flat or fertile for paddy.

While in some instances a cattle or buffalo may be fed on the house block using cut-and-carry feed, remaining cows, calves and bulls not being fed generally share the communal grazing land.

To improve the efficiency of the cow-calf segment of the production system on the communal land, smallholders within a village would have to cooperate to improve management and breeding practices. Under the communal system, choices of smallholders are highly influenced by the hierarchy within the village setting including the head man and Village Veterinary Worker. Changing practices under this system is a long-term proposition.

Our understanding of the communal grazing arrangements is that stock numbers are not actively controlled on a village basis. That is, the reality of communal lands is that all villagers have access rights to communal lands. At minimum, each household will have one animal that would be grazed on communal lands. With increasing population pressure the communal resource becomes a real constraint.

During the consultation, which was at the end of the wet season, every communal grazing area had little or no pasture — reflecting that these areas were significantly overgrazed. During the dry season, even in the more productive grazing areas, smallholders are moving their cows and calves to scavenge along roads. While cut-and-carry is easing the feed constraint for those smallholders intensively feeding cattle and buffalo in northern Laos, communal grazing remains a significant constraint throughout Laos and Cambodia.

Functions of large ruminants

One of the primary objectives of the consultation process was to identify and rank in importance the functions of large ruminants in smallholder households. In terms of their functions, they provide a number of services:

- an asset or a mechanism to manage money and deal with risk;

- source of income — cash revenue;
- meat for household consumption especially for weddings, funerals or auspicious occasions;
- draft power for cropping; and
- manure for fertiliser.

The relative importance of each function

The ranking of these functions has vital implications for the type of research that could be conducted and how this research would be delivered to smallholders.

To determine the relative importance of each of these functions in Laos and Cambodia would require a detailed study over a long period of time. This study would involve valuing each of the functions within a household budget context. Such a study would not just look at decisions at one point of time or over the period of one year — but would consider the dynamics over time between the different production seasons and account for expected and unexpected expenses.

However, we can provide an insight by using a recent report for the Vietnam livestock sector. A recently completed study by Huyen et al (2006) surveyed livestock producers in Vietnam during 2002 with the objective of providing insights into the role and importance of large ruminants to integrated smallholder systems. Key results from the study are summarised in appendix C. The functions of large ruminants depended on three main factors:

- the remoteness of the smallholders in terms of road access and distance to a major town;
- altitude of the area, which influences the production system; and
- the ethnic background of the smallholders.

Across all villages surveyed livestock contributed 12.4 per cent of total income — this being significantly higher for villages closer to town. While cropping remains a dominant source of income across all villages, off-farm employment was becoming significant for those villages near to town. This finding is supported by the household income and expenditure survey from Laos summarised in appendix B. This showed that over all rural households, sales of all livestock and their products accounted for 25 per cent of smallholders' incomes. If half of this income came from large ruminants, then it would be similar to the survey results from Vietnam.

In gross margin terms (revenue less variable costs) of the 'enterprise', cattle and buffalo provided only small or negative returns. Restocking costs were the largest single cost item indicating that cattle and buffalo were turned-over regularly.

The value of stock or asset value of large ruminants provided the largest benefit to surveyed smallholders accounting for 75 per cent of the total benefit to smallholders. This value ranged from US\$294-760 per year per household or an average of \$517 per household across the surveyed villages. Value of draft power was the next largest contributor which averaged US\$73 per household per year.

While the results for Vietnam are not perfectly applicable, due to ethnic and other environmental factors, we believe that the study gives a good representation of the current situation in Laos and Cambodia. During the consultation, even where supplementary feeding and fattening of cattle was being undertaken, smallholders were asked 'do you sell your bull when it is fat or when you need the money?' In all cases the answer was: 'when we need the money'. So even in these systems where some intensification is underway, there appears to still be a strong asset or bank function to large ruminant production.

How the asset function works

In absence of other financial instruments, smallholders have livestock and in particular large ruminants as a way of managing and accumulating large amounts of cash. As pointed out, assets or savings are required for expected expenses such as school fees or significant occasions or for unexpected expenses or emergency.

For example, assume that a smallholder needs US\$200 for an unexpected expense. The only asset that they have that can be liquidated is a bull worth US\$500. The bull is therefore sold off and after the expense is settled, the smallholder is left with US\$300. He could choose to spend it or 'bank' it by purchasing a bull worth US\$300. This animal would inevitably be inferior to the original animal as it would be younger and be in poorer condition. This animal would be most likely purchased from another smallholder forced into a distressed sale in the local area.

In a country with a functioning financial system, smallholders could choose between a number of instruments to finance large and lumpy outlays:

- drawing on savings held with a financial institution;
- borrowing the money from a financial institution; or

- taking out an insurance policy to payout the required amount of money.

With a land tenure system that offers no realisable equity in land or housing, and limited access to banks, smallholders have no choice but to rely on other mechanisms such as an asset that can be sold off as required. Large ruminants are the most effective at filling this function, particularly as they can be walked out from the village to be sold.

5

Market analysis for beef and buffalo

The prospects for the emerging cattle and buffalo industry will be an important consideration in the decision by ACIAR to contribute to these industries in Laos and Cambodia. This chapter looks at developments within each country and the region, as well as the future prospects for cattle and buffalo. Little reliable data is available for Laos and Cambodia, and data for the wider region is also patchy at best. This chapter presents available information, as well as anecdotal information and data uncovered during the consultation phase for this report.

Thailand has traditionally been the major destination for live cattle exports from Laos and Cambodia. Much of this trade has been driven by the demand for cattle from Malaysia. Recently however, Vietnam has emerged as an important growth area in the region's livestock markets. This has coincided with increasing demand in Vietnam, as well as a shift in imports in Malaysia away from live cattle towards imported beef. In the short term, it is likely that sustained growth in demand in Vietnam will continue to drive the informal trade in live animals, and China may become a significant source of demand. However, there are some reasons to be cautious about the sustainability of this trade over the medium and longer term. Much will depend on development in neighbouring countries, including the pace of infrastructure development and income growth. Development in Laos and Cambodia will also be a factor, as they move away from a subsistence based production system to increasing intensification and specialisation.

There are several drivers that will affect the prospects for livestock industries in the region. Broadly speaking these are:

- population growth
- income growth
- productivity growth in segments of the livestock industries
- prospects for trade with adjacent countries
- the institutional environment.

Domestic markets

Whilst there are some differences in the environment and production systems for raising cattle and buffalo in Laos and Cambodia, the issues relating to domestic market opportunities and future prospects are similar.

Chapter 1 has outlined a broad picture of income and population growth in these countries. Table 5.1 outlines estimated per person meat production in Laos and Cambodia used as an indicator of per person consumption. As mentioned earlier, the only real data source is the FAO, for which production and net trade data is unreliable at best, so these figures can only be viewed as indicative.

5.1 Estimated meat production on a per person basis

	1990	1995	2000	2005
	Kg per person			
<i>Laos</i>				
Beef and buffalo	3.8	6.1	6.3	6.9
Chicken	1.5	1.9	1.8	2.7
Pigmeat	5.0	6.1	5.2	4.7
<i>Cambodia</i>				
Beef and buffalo	1.9	4.5	5.3	5.4
Chicken	1.7	1.7	2.1	1.8
Pigmeat	6.2	7.2	8.3	9.3

Source: FAO 2003.

This data suggests that total per person consumption of meat in Laos and Cambodia is low by broad regional standards but is probably equivalent to that observed in areas of neighbouring countries with similar income levels, household structures and ethnicity. However, these consumption levels are likely to be greater than those that may be observed in Myanmar. Seafood, freshwater fish and aquaculture products also have a role in protein consumption by households in certain regions. Domestic demand for protein derived from meat products is also growing as incomes rise, and this will continue.

Therefore there is significant potential to increase meat consumption in these and 'catch-up' to consumption levels observed in adjacent countries especially Thailand and Vietnam. Per person meat consumption (excluding seafood) in Thailand is presently around 24 kg per year compared with around 14 kg for Laos and 16 kg for Cambodia.

Characteristics of domestic markets

The beef supply chain, in terms of infrastructure and sophistication of processing and products produced is in its infancy in both countries.

In the provinces, smallholders selling cattle and buffalo will most likely walk the animals to a village with road access for purchase by a trader. Animals for consumption in regional markets will be trucked or walked to the point of slaughter. If the animals are destined for the respective national capitals — transport could take more than a day.

Many of the characteristics of supply are dictated by temperature and the absence of a cold chain. Cattle and buffalo arriving at an abattoir are held overnight and slaughtered very early in the morning between. The carcasses are usually broken up, at the point where killing takes place, for transport and distribution to markets. Evidence from the consultation suggests that carcasses are broken up, distributed and sold to final consumers the same day.

Post-slaughter, there appears to be little or no differentiation between cuts and offal. Also, there appears to be little or no differentiation between types of cattle on the basis of weight, age or sex of animals to be slaughtered. That is, processing does not target animals with certain characteristics for local consumption. In Laos, many of the cattle and buffalo observed being sent for slaughter were cows and bulls around 8 years of age or greater – what in Australia would be considered to be culls. Many animals are apparently slaughtered as calves — which would be significantly easier in a village context than slaughtering larger animals.

This absence of different ‘products’ is due to the logistics of the supply chain and the uses to which consumers put the beef and buffalo. Meat and offal appear to be of equal value to consumers because of their contribution to flavour in local dishes and protein value. Much of the beef and buffalo are consumed minced, shaved or cubed (see box 5.2). Meat from any part of the carcass can be used in these dishes.

In regional wet markets visited during consultations, beef sold to consumers was generally cut off in chunks from parts of carcasses — typical of South East Asia. The only cut that was readily identified was fillet — partly because of its value to local niche consumers and foreigners.

One of the strengths of the current supply chain is the speed with which product is used by final consumers. This speed is the main factor in maintenance of reasonable food safety outcomes throughout the supply chain.

5.2 Traditional uses for beef in Lao and Khmer food

In Laos, Laap is considered to be the national dish. It is made from chopped meat – and can comprise buffalo, beef, chicken or duck. The finely chopped meat, spices and broth is mixed with uncooked rice grains that have been dry-fried and crushed. Laap is eaten with a plate of raw vegetables and sticky rice.

Pho or noodle soup is another staple which can be found everywhere in Laos. It can also contain most meats – in some southern provinces it is more likely to contain shaved beef or buffalo and offal.

In Cambodia, a common use for beef or buffalo is Samlao Ko Phet or Tamarind Beef Curry using meat cut into thin strips. Loc Lac is another dish common to Cambodia and Vietnam that uses marinated cubed beef cooked on skewers. Beef is also used in noodle soup along with the other meats.

The lack of different products, refrigeration and uncertainties about food safety are all contributors to the fact that most western hotels and restaurants in both countries import frozen boneless beef.

Overall, there is not yet sufficient desire or capacity to pay for more sophisticated beef and buffalo 'products' which are sought after in western countries. But experiences in other developing countries suggest that these preferences will develop as incomes rise in these countries. For the foreseeable future, a large part of the expansion of markets for beef and buffalo will be from other countries based on the live animal trade.

Current market indicators

Analysis of livestock markets on a regular basis is simply not possible in Laos and Cambodia as it is in western countries. The concept of what constitutes a market is also quite different. There are a number of reasons for this:

- lack of formal marketing arrangements and infrastructure such as saleyards or mustering points;
- the black market nature of many of the transactions, including the unofficial export trade to Vietnam and avoidance of the range of official transactions costs involved in officially selling and moving cattle and buffalo;
- thin, opportunistic and erratic trading due to the nature of smallholders cash requirements (as outlined in chapter 3);
- the fact that very few cattle or buffalo are sold against an objective description of their age, weight and their condition score; and

- lack of government resources or incentives to collect and distribute livestock market information in a regular or systematic way.

The best information we can provide for this study is a snapshot of prices at the time of consultation to both countries in October 2005. These prices are presented in table 5.3.

5.3 Indicative prices of cattle and buffalo

	<i>US\$ per head</i>
<i>Laos</i>	
Nong Haet district (North) – into Vietnam for 400kg animal	Up to 800
Borikhamxay province (South) – local 3 year old cattle	150-250
Borikhamxay province – local 5 year old buffalo	300-350
<i>Cambodia</i>	
Kampot province – into Vietnam, native/mixed breed cattle: 200-400kg	500

Source: Personal communication, Nong Haet district office, Borikhamxay provincial office, and Thaphabat district office.

These prices are only indicative and the capacity to compare prices between countries and regions depends on what is often a purely subjective assessment of the animal sold by those supplying the information. For example, there is only a recent trend towards purchasing cattle on the basis of judgement about weight and condition. Because there is no weighing, there is no way of confirming the weights estimated in table 5.3. Indeed, some of the prices and weights quoted during consultations suggest implausible unit values, and it is highly likely that in many cases the weight estimates are inaccurate. Previously, criteria used included the size of horns, colour of the hide and the shape of the face. This is why Chinese yellow cattle maintain relative premiums over other breeds in both Laos and Cambodia. Livestock officers in Southern Cambodia suggested that there was a significant premium for native cattle over mixed breeds — as much as 50 per cent on a weight basis, but again, this assumes that the weight estimates are accurate.

The key points to arise from the consultation in Laos were:

- cattle prices between central and southern regions in Laos, including the capital district, and Thailand were similar indicating:
 - that in practice the trade across the Mekong was more or less unrestricted; and
 - the absence of a readily accessible border crossing through to Vietnam for the central region;

- prices in northern Laos were substantially higher than for central and southern Laos. This reflected:
 - the accessibility to the Vietnamese market through Nonghet District in Xieng Khouang province and similar border crossings into Vietnam and China further north; and
 - the dislocation of Vientiane and the northern provinces of Laos due to lack of road infrastructure.

Our exposure to Cambodia was heavily time constrained and we only visited Kampot province on the Vietnam border. In this province anecdotal evidence suggested that traders were purchasing slaughter cattle for export to Vietnam for strong prices.

Regional markets

One driver of demand for the livestock industries of Laos and Cambodia has been demand for meat from neighbouring countries. This effect has been particularly significant in areas with access to these markets. In turn, key drivers of the total demand for meat are population and income growth. In addition to this, changes in the composition of total meat consumption is driven by the relative prices — most often a function of relative rate of productivity growth.

Population growth

In terms of population, average annual population growth in China, Thailand and Vietnam has been around 2 per cent over the past 20 years. Forecasts for growth over the next 10 years are between 0.5 and 1 per cent per year. While this is a function of government policy in China, it is also a hallmark of economies with strong income growth.

Income changes will shape trade

Average annual income growth for these countries in the next 5 years is forecast to be robust: 5 per cent for Thailand, 7 per cent for Vietnam and 7.5 per cent annual growth for China. Malaysia is also a strong regional player in livestock markets with annual economic growth in the order of 5.5 per cent.

A key factor to consider is the substantial divergence in income prospects between rural and urban areas. This divergence has been driven by rapid industrialisation and the employment it generates. Therefore, growth tends

to occur around urban areas, and in the case of China in the coastal and southern regions. This is also the case for Vietnam where it has been estimated that one million people migrate to the major urban areas every year to take-up employment in industries located in the export processing zones. This leaves those remaining in rural areas to commence the transition from subsistence to greater specialisation. Given these trends, Laos and Cambodia appear to be centrally located in a region with potentially strong demands for meat.

One way to assess the potential demand for meat from these countries is to look at historical trends. Table 5.4 summarises readily available data of trends in per person meat consumption for the past 20 years for China, Thailand and Vietnam.

At the relatively low levels of meat consumption for the region, compared with those observed in western countries, per person meat consumption is highly correlated with income. Per person meat consumption has increased at an average annual rate of 2.6 per cent in Thailand, 7 per cent in China and 5 per cent in Vietnam.

While some of these growth rates are off a low base, it would not be difficult to extrapolate these trends into strong demands for meat over the next ten years. This growth is especially driven from the urban areas of eastern and southern China and Ho Chi Minh City in Vietnam.

5.4 Per person meat consumption by country

<i>Meat consumption by country</i>	<i>1980</i>	<i>1990</i>	<i>2000</i>
	Kg per person per year		
<i>Beef</i>			
Thailand	5.9	5.7	3.7
China	na	1.0	4.2
Vietnam	1.5	1.4	1.5
<i>Pig meat</i>			
Thailand	4.9	6.0	7.5
China	na	19.6	32.5
Vietnam	5.0	11.0	17.5
<i>Poultry meat</i>			
Thailand	4.0	9.4	14.0
China	na	2.8	10.2
Vietnam	2.0	2.5	4.0
<i>Total (excl. fish)</i>			
Thailand	14.8	21.1	25.2
China	na	23.4	37.9
Vietnam	8.5	14.9	23.0

na: Not available.

Source: GMI database and FAO 2003.

Another feature of this table is how the composition of meat demand in these countries has changed in favour of pig and poultry meats. While there may be small cultural elements to this trend, relative productivity of each meat is also a key driver. Pigs and poultry production are more amenable to intensification through the use of feed inputs — which in turn depends on access to energy-dense feeds such as grains and oilseeds. The result of this intensification is stronger production growth in pig and poultry meats and lower relative prices than for beef and buffalo.

While incomes in these countries have been growing, meat consumption is still dependent on sale through wet markets and home-consumption. This is largely because the necessary infrastructure for a cold-chain is still being developed. This fact has some important implications for how trade will satisfy future demands.

Vietnam

With Vietnam emerging as the major destination for live cattle exports from both Laos and Cambodia, it makes sense to examine the data available on recent developments in this market.

Table 5.5 shows recent production data across meats. Nearly all growth in production in volume terms has come from pork and poultry meat — which is starting off a surprisingly small base. That said, the production of beef has been growing at over 10 per cent per year but in 2007 is expected to account for just over 4 per cent of total meat production.

5.5 Meat production in Vietnam

	2004	2005	2006	2007	Growth ^a
	kt	kt	kt	kt	%
Pork	2 012	2 288	2 446	2 617	8.9
Poultry	316	322	748	894	48.5
Beef	120	142	153	164	10.7
Buffalo	57	60	62	65	4.0
Other	7	10	12	16	28.1
Total	2 513	2 821	3 421	3 755	15.0

^a Average annual growth rate 2004 to 2007.

Source: USDA 2006.

Of the total cattle and buffalo population of 5.54 million in 2005, it is estimated that 90 per cent are raised in backyards and by smallholders. The remainder are on commercial farms — some of which are located adjacent to border areas that source feeder cattle from Thailand, Laos and Cambodia.

Vietnam's government currently has policies to encourage commercial farms by tax concessions, land-use preferences, support for artificial insemination, policies to increase available grass forage and vaccine and agricultural extension training (USDA 2006). We have already noted that the government of Vietnam chooses not to recognise live imports but does little in practice to stop trade. One direct threat to the trade would be if the government chooses to practically close the trade for a variety of reasons such as disease concerns or self-sufficiency objectives.

An indirect threat to the emerging live cattle trade to Vietnam apart from booming pigmeat and poultry production are imports of beef, especially from low cost suppliers such as South America and India. The USDA (2006) reports that beef is Vietnam's largest meat import — with a total value of US\$3.3 million or 730kt at a unit value of \$US 2.20 per kg. This implies that imports account for around 84 per cent of beef consumption.

Because of data availability is very patchy in these countries, it is difficult to cross-check these data from other sources. Nevertheless this data is summarised in table 4.5. The USDA report that sources of imported beef for 2006 included Argentina, New Zealand, India and Malaysia. It is interesting to note that Vietnam is actively trading with declared FMD countries.

Due to low domestic production relative to demand, imports of beef are expected to continue especially in hotels and restaurants in the large cities. This could explain the large jumps in both fresh and frozen product shown in table 5.6.

5.6 Production and value of imported beef by Vietnam

		2004	2005	% change
Production	kt	119	142	19.0
Import volumes	kt	Na	730	na
<i>Import values^a</i>				
Fresh or chilled	US\$m	1.160	1.620	39.7
Frozen	US\$m	1.296	1.673	29.0
All beef and veal	US\$m	2.456	3.293	34.1

Na: Not available. ^a HS 0201 and 0202.

Source: USDA 2006.

Feedgrain use

Vietnamese corn production has increased significantly over the past decade, corresponding to a rapid increase in demand for animal feed.

According to government figures, corn production in 2005 was 3 730kt, an increase of 9.5 per cent from 2004.

Vietnam's corn consumption is mainly used for animal feed production including commercial feed and homemade feed. Annually, Vietnam produces about 10 million tons of feed, 33 per cent of which is commercial feed. Corn used for feed currently accounts for 75 to 80 per cent of Vietnam's total corn consumption and the majority of this would be used in the production of pigmeat and aquaculture.

The Vietnamese animal feed production sector now relies heavily on imported feed ingredients. USDA (2007) suggests that Vietnam imports 60 per cent of the materials used in feed production. In recent years, corn imports have been driven by this demand. In 2004, Vietnam imported around 53kt from Thailand. In 2005, total imports grew to 222kt of which 141kt was from Argentina and the remainder from China and Thailand. Imports for 2006 increased substantially to 660kt — an almost three-fold increase over 2005. Imports from Argentina reached over 200kt, whilst imports from Thailand were 300kt (USDA 2007).

China

China is a potentially large market for cattle. Laos presently exports a small quantity of live cattle into Southern China, but this trade is all unofficial, so precise numbers are not known.

Presently, beef consumption is relatively low at around 5 kg per person annually, but this masks large differences between urban and rural consumption. In urban areas where incomes are greater, beef consumption is higher. However, China is still a small importer of beef, with a large majority of consumption met by domestic production. The big unknown is how the Chinese market will develop as incomes continue to rise. It is clear that beef consumption will increase significantly, but how this consumption will be supplied is difficult to predict. It would seem reasonable to suggest that the market for beef in southern China would evolve in a similar way to developments in Vietnam.

There are two distinct possibilities:

- China could develop an intensive beef industry, in which case it would most likely be an importer of grain (corn) and live cattle and be potentially a beef exporter; or
- China could become a large importer of beef and divert feedgrains to pigs and poultry.

Laos and Cambodia could be in a position to take advantage of market developments in China in the future, but the uncertainty surrounding how China will develop means it would be risky to construct a strategy based solely around exporting cattle to China.

Malaysia

Within the South-East Asian market, Malaysia along with Vietnam has traditionally been a major market for live cattle. While Cambodia and Laos do not directly border Malaysia, exports to Thailand are often staged there with local cattle then moved through to Malaysia. Malaysia has also traditionally been a market for live cattle from Australia. However, trade statistics for imports of live cattle into Malaysia are unreliable.

Table 5.7 provides a summary of statistics on the Malaysian beef sector.

5.7 Malaysian beef production, imports and consumption

		2000	2001	2002	2003	2004	2005
Beef production	kt	14	15	18	19	21	23
Beef imports	kt	133	133	137	140	176	203
Live cattle imports	'000 head	65	100	107	95	62	46
Per person consumption	Kg per year	6.4	6.4	6.5	6.6	8.0	8.4

Source: GMI database and CIE estimates.

It is likely that the live cattle import figures are an underestimate, as unofficial movements across the border are not included. However, there has been a clear trend for beef imports displacing live cattle imports. This has occurred as the infrastructure for handling meat imports has developed and as such, cheap imports of beef (primarily carabeef imports from India) have become available. This is discussed further below.

The consultation process revealed that during 2006 few cattle from Cambodia and Laos had been exported to either Thailand or to Malaysia and that the focus of the export trade had switched to Vietnam. This would fit with the trends outlined above. However as mentioned before it is difficult to confirm these trends, as a large proportion of the trade is informal.

Australia currently supplies a significant amount of live cattle to Malaysia. In 2005, 36 000 cattle were exported to Malaysia at an average live weight of 330 kg. These cattle are fed for around 30 days only to achieve an average slaughter weight of 195 kg carcass weight. In 2005, we estimate that Australian live exports contributed 38 per cent of Malaysian

production. The live cattle trade into Malaysia tends to be variable, and it has slowed somewhat in recent years due to the competition from imported beef. In 2006, Australian live exports rebounded to around 55 000 head — but it is difficult to take any information from this trend as it included an exceptional export month for October of over 16 000 head. In the six months to July 2007, MLA reports that live cattle exports to Malaysia have decreased 30 per cent on the same period for 2006 (MLA 2007).

One of the strengths of the Australian suppliers to the Asian markets like Malaysia and Indonesia is the capacity to deliver large numbers of consistent cattle at target weights.

Thailand

To complete the regional picture, table 5.8 summarises available data for Thailand. Overall, beef and buffalo struggles to compete with the intensive pig and poultry industries in Thailand as well as the dominance of seafood and aquaculture in consumption (seafood consumption in Thailand is roughly the same as the combined total of beef, pork and poultry consumption). Total estimated slaughter by the FAO, well above the official slaughter, has been falling from 2003 onwards. Little is known about the supply side drivers of beef production in Thailand.

Imports of beef are negligible. Estimates of live cattle imports, mainly for Laos and Myanmar, are highly unreliable. Also, as noted earlier, Thailand has traditionally exported significant numbers of cattle to Malaysia, and imports of cattle tend to be based around this system — either passing through Thailand to Malaysia or replacing domestic Thai cattle that have been exported to Malaysia.

5.8 Thai beef production, imports and consumption

		2000	2001	2002	2003	2004	2005
Official production	kt	92	96	99	102	72	73
Total production ^a	kt	223	234	241	249	175	177
Beef	kt	171	176	183	190	115	115
Buffalo	kt	52	58	58	59	60	62
Beef imports	kt	2	1	2	1	1	2
Live cattle imports	'000 head	90	165	121	77	152	90
Per person consumption	Kg per year	3.7	3.8	3.9	4.0	2.8	2.8

^a Total official plus estimated unofficial.

Source: GMI database, FAO 2003 and CIE estimates.

Export market prospects

Within the South East Asian region, meat production will inevitably become more intensive with livestock operations primarily sited adjacent to urban areas based on purchased feeds. This will focus on pig and poultry production, where conversion of feed is higher than for cattle. Relative prices will put pressure on demands for cattle and buffalo meat. Without a significant policy shift by governments in favour of cattle or feedlotting, these developments should put an upper limit on demand for live cattle.

Specification of cattle becomes more important

During the consultation, we observed that the types of cattle for export to Vietnam from both Laos and Cambodia varied. It was not clear that traders were after a particular type of animal — those purchased could range from smaller cattle that could be fed-on for slaughter to older types that would be slaughtered immediately. These observations reflect both the current stage of development in the Vietnamese market and the strength of demand and relative shortage of cattle.

If livestock industries in the regions become more specialised and commercially oriented, they will demand higher quality and more consistent inputs — including both feed and cattle. Laos and Cambodia now provides Vietnam with an opportunity to purchase feeder and slaughter cattle that are cost-competitive. In addition, Vietnam does not have the infrastructure in place for importing live cattle by ship.

While price is a major factor at the moment, future demand for live cattle could depend on the availability of large numbers of consistent quality cattle at similar weight and specification for entry into feedlots. Effectively, Laos and Cambodia could be competing with Australian exporters under such a scenario. However as noted, another strong possibility for the future is that imports shift away from live cattle and towards beef with livestock production concentrated on intensive production of pig and poultry..

Trade and disease barriers

Both trade barriers and movement controls in livestock that attempt to contain the spread of diseases have the potential to shape regional markets.

Control of foot and mouth disease is a major justification for controls on trade in live animals between regions. The South East Asian FMD campaign involves the coordinated control of FMD by eight countries in

the ASEAN region including Laos. The campaign is coordinated by the World Organisation for Animal Health (OIE) Regional Coordination Unit in Bangkok.

Policies in the region can be vague, and restrictions on movement are often circumvented. However, enforced controls on cattle movement in relation to FMD could seriously affect smallholders who develop production systems geared towards exporting live cattle. This is a potential risk of increasing specialisation for smallholders in a region where regulations and enforcement are unreliable.

Laos and Cambodia are also members of ASEAN and the ASEAN Free Trade Area (AFTA), which also provides impetus to general economic and trade development. Within the region, factors such as Vietnam's accession to the WTO and Laos's own negotiations to join the WTO will also encourage more openness to trade. That said, the most significant unknown is the variation in how authorities choose to implement official policies between countries and between provinces within the same country, such as how sanitary and phytosanitary (SPS) policies are implemented and coordinated within the region.

Infrastructure and foreign ownership

Currently a significant amount of inter-regional trade (both formal and informal) is restricted to live animals due to poor transport infrastructure plus a lack of processing facilities and cold chain. The majority of the live trade is in cattle because walking the cattle out to a road is a viable option.

But over time, as incomes and road and other market infrastructure develops, these countries should follow trends in other parts of the world. These trends would comprise two developments:

- improved road access will allow more inputs to be imported, particularly feed; and
- better roads and development of a cold chain will facilitate opening-up to fresh and frozen meat imported from suppliers, most likely from outside of the region.

Intensive livestock production of pigs and poultry is already emerging in Laos and Cambodia — a significant proportion of this production is based on imported compound feeds. The commercial scale pig production now happening in Cambodia is contracted to CP Thailand using weaners and feeds imported from Thailand (see box 5.9). Also, some commercial pig production in southern Laos uses bagged imported feed from Thailand.

These linkages depend on road access and both formal and informal barriers.

5.9 CP Thailand

CP Thailand is one of the largest vertically integrated feed and livestock producers in the world producing poultry, duck and pigmeat products. Its operations include animal feed production, breeders, farming systems, meat processing, food production and value-added products, both for the export and local markets.

CP operates feedmills, producing food for poultry, swine and shrimp as well as pet food for dogs, cats and fish, in Thailand, Cambodia, China, India, Indonesia, Malaysia, Myanmar, Singapore, Turkey, Taiwan, USA and Vietnam.

The bottom line

While the prospects of live exports to Vietnam from both Laos and Cambodia look strong for the short to medium term, there are risks to the longer term viability of the trade. Within the region, it is likely that Vietnam and Southern China will be the dominant sources of demand for cattle and buffalo. As these countries develop, it is also inevitable that the markets for cattle and buffalo will become more sophisticated. To meet the increased demand for beef, there are two possible scenarios:

- imports of beef will expand significantly as the infrastructure develops, replacing live cattle imports; or
- an intensive feedlot industry will develop with imported feeder cattle and grain supplying the market.

Of these, the first option is probably most likely, as the feed requirements of an intensive feedlot system would be high, and pigs and poultry offer better productivity in terms of feed conversion.

Under both these scenarios, there are risks for Laos and Cambodia. If Vietnam and China become significant importers of meat, it is unlikely that Laos and Cambodia will have developed a beef industry competitive with major low-cost suppliers such as Brazil and the United States. However, large-scale imports of beef into Vietnam and China are likely to be relatively long-term outcomes. Over the shorter and medium term, it is likely that there will continue to be strong demand for live cattle for slaughter in the local wet market system. A key consideration in this context is the nature of the current trade and whether it is replacing cattle in local markets across the border that are being absorbed into the major population centres. If this is the case, shift in the major cities into a supermarket system and imported beef will have a knock-on effect on

demand for live cattle in Laos and Cambodia. This shift over time is somewhat inevitable, but placing a timeframe around it is difficult.

The risk of beef imports displacing live cattle imports is highlighted by experience in Malaysia, where anecdotal evidence suggests that live cattle imports from Thailand (at least partly sourced from Laos and Cambodia) have fallen significantly in recent years. This, along with strong demand in Vietnam, has driven a switch in the focus of live cattle and buffalo exports from Laos and Cambodia. A significant driver of the lower demand for live cattle in Malaysia is an increasing emphasis on beef imports, particularly carabeef imports from India.

If Vietnam or China were to develop an intensive feedlot industry, demand for high quality feeder cattle would be significant. For Laos and Cambodia to successfully supply such cattle would require significant intensification and the development of a cattle industry. The present demand for cattle from Vietnam is being supplied by what are effectively cull animals from Laos and Cambodia. To supply a feeder market would require a consistent supply of feeders at the correct specification. It is likely that this would require a reconfiguration of the gene pool in Laos and Cambodia to supply appropriate animals into a feedlot system. In addition to this, competition from other suppliers — primarily Australia — would also be significant under this scenario.

It is also important to note however, that whilst there are reasons to be cautious about the long-term prospects of the current market situation, there are undoubtedly significant benefits of this demand even in the short and medium term. Moving towards increased specialisation and intensification in response to favourable market conditions can assist smallholders more generally in moving away from subsistence based livelihood. The most significant opportunity for cattle and buffalo producers in Laos and Cambodia should be the transition of economies within the region that drives meat demand and permits more specialisation in the livestock industries.

Another key ingredient in the future development in the cattle and buffalo supply chains in these countries is investment by large-scale commercial enterprises. Experience in other countries suggests that this involvement is critical in the development of an effective supply chain and the effective delivery of information and extension services. The experience of CP in Thailand and other countries including Vietnam is an example noted earlier. In reality, it isn't 'research' or new technology that is needed in Laos and Cambodia's cattle and buffalo sector. But commercial involvement in the supply chain could facilitate more effective transfer and communication

of information on existing technology that could allow smallholders to gain better returns from the current strong demand within the region.

To an extent, the current situation where a majority of exports are informal means that the involvement of commercial players is limited. As noted earlier, the general commercial environment in Laos and Cambodia is not conducive to doing business. However, other policies (in particular, the policy in Vietnam not to recognise imports of live cattle) further restrict the involvement of large-scale, integrated commercial players in more developed neighbouring countries from actively investing in the domestic supply chain. The informal nature of much of the trade also means that little is known of the composition and structure of the trade aside from anecdotal evidence. Ideally, a shift in policy in neighbouring countries (particularly Vietnam) towards formal recognition of trade would increase incentives for more formal participation in the supply chain by commercial players and increase the supply of information both directly to smallholders and more generally on livestock markets in the region.

6

Implications for ACIAR research

There are a number of factors emerging from the review of the policy and economic environment facing the cattle/buffalo industry in Cambodia and Laos, and the implications of these for ACIAR research. They include:

- the implications of the predominantly smallholder production systems and the weak incentives for intensification and commercialisation of cattle production;
- the uncertainty surrounding the potential demand for beef, both domestically and within the regions;
- the serious capacity constraints that pervade agricultural research and support systems;
- the extensive donor and non-government organisation (NGO) involvement in rural development in the countries; and
- the costs of running successful projects that have adoption outcomes.

Chapters 3 and 4 provided an overview of the smallholder system and the role that cattle and buffalo play in it. They noted that incentives for the adoption of technology and other outputs of research are limited in the current system, where cattle and buffalo raising occurs in a complex quasi-subsistence smallholder system aimed at minimising risk and maximising outcomes such as food and income security. This leads to a conclusion that research aimed at improving productivity of cattle and buffalo production needs to be embedded within a broader program that is dealing with the myriad of constraints faced by smallholders that affect their incentives to adopt methods that could improve cattle and buffalo productivity. Whilst the current market environment does help by creating market incentives in terms of high demand and prices, as noted in chapter 5, there are risks to the sustainability of these conditions over the longer term.

The implications for ACIAR are that research in this area inevitably needs to be linked with other donor projects that are addressing more broad issues that are generally outside ACIAR's core jurisdiction. This observation is in broad conformance with the recommendations of ACIAR's recent review of its role in animal health research (ACIAR 2006).

This review observed that in the past, many research projects had no means of implementing the results in the communities for which they were developed. It recommended that ACIAR should work more closely with bilateral and multilateral agencies to plan for the implementation of the outcomes of its research projects, arguing that impacting community welfare in a sustainable way at the smallholder level is extremely difficult without institutional support throughout the government animal production and health service. Given the significant disincentives that the current economic environment in these countries creates for further investment in livestock activities — by smallholders and agribusinesses — it makes sense for ACIAR to collaborate with agencies that are helping to address the policy, institutional and infrastructural constraints that create these disincentives.

In-country capacity is a significant constraint...

The previous section outlined a case for collaboration between ACIAR and other donors; however this raises questions about the current donor environment and capacity constraints that exist in both Laos and Cambodia. To an extent, the capacity constraint from ACIAR's point of view is linked both directly to the real constraints that are inherent in each country, but also to the activities of other (often much larger) donors, who effectively compete for available in-country capacity.

The consultation process identified that in-country capacity, both in research and extension, is probably the largest single constraint to the successful delivery of new projects in these countries. This constraint has a number of implications for potential ACIAR projects:

- government extension systems are very weak, and have very limited ability to effectively translate research findings into practical advice relevant to producers and to transmit this advice;
- research institutions have limited technical skills; and
- there is a very limited pool of people who are qualified, technically and managerially, to lead collaboration with Australian researchers.

Each project requires an in-country representative of government, typically within the agriculture portfolio, to take the lead as its interface with government at all levels and with other projects. The major role here is one of advocacy especially in the competition for scarce government resources.

For animal health and disease projects — such as those funded by ACIAR — the number of people with sufficient capacity to work in laboratories or in the field is very limited.

- in both countries, there is no capacity to train veterinarians through the university system. Very few in livestock-related government departments have a science background; and
- most of those in-country with such capacity were trained in the Soviet bloc in the 1970s and 1980s.

The absence of this basic infrastructure of technical skill, poses real challenges for projects aiming to transfer technology and know-how to the smallholder.

...and projects need to deal with capacity and functions at all levels of government

At the national level, the capacity shortage in Cambodia and Laos is illustrated by the fact that the same people often fill both administrative and technical roles. That is, the available capable and motivated people within government have been moved from the specialised technical roles to manage donor projects, thus at the same time reducing technical capacity.

At the provincial and district level, the issue shows itself in the variation in capacity and motivation of staff. This is important because the provinces and districts are the primary vehicle through which extension and vaccination and other services are delivered to smallholders, and because of the considerable autonomy exercised at provincial levels within the government systems in both countries. Provinces may choose not to enforce national level policies (for example with respect to control of stock movements) or to regulate and tax transactions through informal as well as formal means.

Whilst this appears to be a source of frustration for national level government, it may offer possibilities for projects. Having policy and extension driven largely autonomously by provinces is a way of managing risk, as opposed to centralising power within the national government. Provinces are more likely to act in the interest of smallholders because they are closer to them. Also, this autonomy allows for experimentation with a diversity of approaches.

Projects also have to deal with the decision making functions exercised at the village level. Village chiefs (assisted in Laos by representatives from

party organisations and Village Veterinary Workers) make decisions on issues such as the use of communal resources and approve sales of livestock.

Extensive donor activity in agriculture

Donor funding plays an important role both in animal health and livestock extension programs in Laos. Appendix C discusses some of the projects. The scope of this activity has implications for ACIAR, and there are important lessons from the experience of other projects.

At one level, the extent of donor activity adds to the problem of finding capable counterparts for research projects: but at another level they provide an opportunity for leverage to assist in ensuring that the proceeds of their research have a long-term, sustainable impact. ACIAR is primarily a research organisation, and in the context of the environment they operate in, a relatively small player. With a majority of development projects focusing on extension, it makes sense for ACIAR to link any research they undertake closely with an appropriate existing project.

This opportunity is important because of some of the lessons that seem to emerge from project experience within the countries. Consultations with stakeholders in country and our own assessment emphasised four key points:

- The importance of sustained in-country presence by the project leader. A continuous presence provides confidence to counterparts and project staff and also ensures that problems do not drag on too long.
- Four years appears the absolute minimum duration for a project to deliver outcomes beyond completion of research. This is especially true of a livestock based project that will be attempting to deliver not only new techniques but a quantum shift in the philosophy of livestock management. Because smallholders are risk adverse, they need to have new technology or techniques demonstrated to them repeatedly. They also need to trust the person delivering that extension.
- Projects have to find ways of dealing with the weakness of extension systems. Most successful projects have specialist extension components and that this is the main mechanism for promoting adoption of the through which the outputs of a livestock project.
- A strength of previous forage work in Laos is that the International Center for Tropical Agriculture (CIAT) — who were leading the research — are based in-country all of the time. CIAT has also

developed a strong network, with an example highlighted during consultation of a highly competent local working with CIAT maintaining links with the provincial and district governments and problem solving.

It would be strategic to utilise these types of capacities in-country by linking an ACIAR project to a larger project.

Box 6.1 summarises some important lessons that seem to emerge from the ADB-funded forage project managed by CIAT and the EU livestock project in Laos. It suggests some reasons why these projects are having some successes (albeit largely anecdotal and unquantified at this stage), and also lays out some challenges for moving towards integrated projects and promoting the development of more focused cow-calf production systems.

Project costs and linkages to government

A common perception is that operating a project in Laos and Cambodia is cheap because the cost of living is low compared with Australia and because people are paid low wages.

However, project start-up costs are likely to be significant and run over an extended period. While it is not possible to quantify these costs on the basis of the study field visits, discussions left a lasting impression of their significance, both in terms of financial cost, but more importantly the time component of administrative tasks. In particular, a number of points should be noted:

- the in-country costs of finding capacity and establishing linkages with government at all levels are significant;
- take-up of the outputs of a project often takes much longer than initially anticipated; and
- the government has little financial capacity to take over the implementation of project outputs. This is highlighted.

For these reasons it is often makes sense to extend existing projects in where there is sufficient justification.

6.1 The lessons from the ADB and EU projects in Laos

The ADB and EU projects are both extension focused. The objective of both projects is to improve smallholders' incomes through the introduction of hand feeding and fattening of cattle using forages. This cut-and-carry technique is based on native grasses grown in smallholders' blocks and collected from communal areas and specifically introduced forages grown from seed, supplied by the project, and grown instead of rice or other cash crops.

Why they work

As pointed out in chapter 3, feed is the single largest constraint to improving cattle productivity. While the impact of both projects has not been determined in a formal evaluation to our knowledge, there is broad consensus that they represent a sound first step to increasing intensification and specialisation in cattle production. Three factors have contributed to the successes that the ADB and EU feeding projects in northern Laos have managed to date:

- smallholders in this part of the country are better placed to participate in such a project because of their superior food and income security compared with those located in central and southern regions;
 - this in part explains why donors are running rural development style projects in these less productive regions rather than a livestock extension project;
- access and proximity to Vietnamese market where the price received makes the feeding enterprise more attractive;
- related to the previous factor – although cut-and-carry is a highly labour intensive activity, there is a payoff from switching labour out of cropping into growing, cut and carrying forages, and
- whilst predisposition towards increasing inputs is an important starting point for the smallholders involved, feeding cattle still complements the 'bank' function of cattle and facilitates increasing the value of the asset.

Challenges of an integrated system

Apart from the challenge of attracting more participation in the forage projects, the long term challenge for the ADB and the EU projects will be the integration of the feeding systems with the cow-calf breeding systems at a village which level based in grazing of communal lands.

Currently, these systems are quite separate. In fact, many of the cattle and buffalo that are fed are not smallholders' own calves – the obvious source of feeder cattle. As observed in chapter 3, animals that are fed are often reasonably old when they are purchased, usually from distressed sales.

To go to the next step beyond feeding, smallholders within a village context will be required to confront the communal land problem and manage the cow-calf system using a whole of system approach as would a individual owning the same area. As already identified this would involve:

- significantly reducing stocking rates on communal lands;
- restricting and improving timing of calving to match seasonal pasture availability through the use of fencing, castration and selective breeding; and
- a systematic approach to animal health more generally.

The bottom line

The practical issues raised here indicate to us the imperative of ACIAR working with an established project funded by a larger organisation. This is because of the following.

- To have an impact, projects dealing with ACIAR's focal area have to be integrated into a whole-of-system approach — otherwise it is impossible to address the complex web of incentives that shape smallholders' interest in adopting project outputs.
- ACIAR is a small player.
- In-country capacity in each country is already taken — this is especially the case in Laos.
- There are large start-up costs in finding personnel and establishing necessary relationships with stakeholders in government and in the project area. The larger projects have already made these investments, and while the structure of the linkages they have established may not perfectly fit with any particular ACIAR project, at the very least they represent a useful resource and starting point.
- These projects already have a continuous in-country presence which is desirable to achieve a sustainable outcome.

It is important to note that linking with established projects in Laos and Cambodia will by no means ensure success. The environment facing smallholders is difficult in both countries and changing their behaviour is a difficult proposition. However, given the relative size of ACIAR as a funding organisation is small, and their core business is research rather than extension and implementation, tapping into networks and establishing linkages with large-scale projects is the most obvious way of improving the likelihood of successful outcomes.

Projects should account for the high project start-up costs and be based on the assumption that government will *not* provide the required ongoing funding to continue project activities when the donor's program finishes. This is the key reason why ACIAR projects should attempt where possible to link with a broader project, which will allow the proceeds from ACIAR research to be implemented on an ongoing basis.

A

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A.1 List of people consulted

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B *Characteristics of rural households in Laos*

A useful source of information is the third household income and expenditure survey for Laos. It was undertaken by the National Statistical Centre (NSC) and funded by the Swedish International Development Agency. Selected results are summarised and presented below (NSC 2004).

Food security

Table B.1 summarises the income and food security — summarised by rice consumption — dimensions of households across Laos.

B.1 Income and rice consumption by Lao province – 2002-03^a

<i>Province</i>	<i>Rice consumption</i>		
	<i>Income per household</i>	<i>With road access</i>	<i>Without road access</i>
	US\$	gram/day/person	gram/day/person
<i>Lao PDR</i>	614	595	591
<i>North</i>	739	667	635
Phongsaly	564	629	585
Luangnamtha	671	735	594
Oudomxay	586	658	666
Bokeo	719	643	521
Luangprabang	532	601	662
Huaphanh	691	634	654
Xayabury	1 191	759	645
<i>Central</i>	587	572	536
Vientiane M	401	589	NA
Xiengkhuang	771	712	637
Vientiane	671	569	599
Borikhamxay	599	542	535
Khammuane	644	733	714
Savannakhet	609	455	415
Xaysomboun SR	591	762	NA
<i>South</i>	486	535	569
Saravane	496	597	596
Sekong	591	545	495
Champasack	458	514	513
Attapeu	533	571	551

^a For rural households only.

Source: Lao consumption and expenditure survey 2002-03.

The key points from table B.1 are that:

- incomes by other developing country standards remain very low and average across Laos around US\$614 per household;
- northern provinces have significantly higher incomes than the central and southern provinces;
 - this difference would be made even larger if Xieng Khuang province was classified to the north rather than central group; and
- per person rice consumption is region and location specific but does not appear to vary considerably with road access.

Income versus outlays

Table B.2 uses income and expenditure of Lao households in 2002–03 to show the challenges facing smallholders — the majority of whom hold cattle and buffalo. The average rural household in Laos has 6.2 persons — this varies from 6.0 in the southern provinces to 6.3 persons in the north.

B.2 Agricultural income and expenditure per household for Lao PDR, 2002-03

	<i>North</i>	<i>Central</i>	<i>South</i>	<i>Total rural</i>
	US\$	US\$	US\$	US\$
<i>Income</i>				
Grain	413	275	250	360
Vegetables and fruits	87	60	66	80
Meat	150	123	85	146
Others	41	30	37	46
Total income ^a	690	487	438	632
<i>Expenditure</i>				
Cash expenditure	532	642	543	579
Own-consumption expenditure	509	437	377	447
<i>Cash deficit^b</i>	-350	-592	-483	-395

^a Includes production for own-consumption. ^b Equals total income less cash expenditure and value of own-consumption.

Source: Lao consumption and expenditure Survey 2002-03.

On average, the sale of livestock and products (meat) contributes between 20 and 25 per cent of household incomes in Laos. However, the consumption and expenditure survey does not identify the contribution of cattle and buffalo. A reasonable assumption would be that large ruminants could make up half of the total category — say 10 to 15 per cent. Rice and corn make up the majority of farm income supplemented by vegetables and fruits.

Table B.2 also shows the regional dimension of household performance. Households in the northern regions have higher agricultural production and better self-sufficiency relative to those in the central and southern regions. On a household basis, it is found that households across all regions have apparent cash deficits, which is partly a function of the survey design.

The income categories in table B.2 fails to account for a number of other income-generating opportunities outside of agriculture that are listed in table B.3. The estimate of hours per day involved in income-generating activities reported in the survey is misleading because it represents an average over all people in all regions above 10 years of age. Obviously, if children and the elderly were excluded from these figures, time spent on income-generating activities would be more meaningful.

B.3 Income generating activities in Lao PDR, 2002-03^a

<i>Activity</i>	<i>Average time spent</i>	
	hours per day	per cent of total
Work as employed	0.5	10
Own business work	0.7	15
Agriculture work	2.4	50
Collecting firewood fetching water	0.3	6
Hunting and fishing	0.5	10
Construction	0.1	2
Handicraft	0.3	6
Total	4.8	100

^a Persons greater than 10 years of age.

Source: Lao consumption and expenditure Survey 2002-03.

Road access

Tables B.4 and B.5 illustrate the impact of road access on smallholders behaviour. In table B.4 cash expenditure is an indicator of exposure to the market economy. In most regions, the cash requirement of a household with road access is twice that of one without —also an indicator that those households will be oriented to income from local markets. The table again shows the higher living standards of those households in northern regions of Laos.

These outcomes are offset by the fact that households without road access tend to be larger in the north where households without road access average 7 persons versus 6 for those with access. This contrasts with the south where there is little difference between household size with and without road access.

B CHARACTERISTICS OF RURAL HOUSEHOLDS IN LAOS

B.4 Rural consumption per household, 2002-03

	<i>North</i>	<i>Central</i>	<i>South</i>	<i>Total rural</i>
	US\$	US\$	US\$	US\$
<i>Cash expenditure</i>				
With road access	622	703	628	659
Without road access	327	370	330	341
Total rural	532	642	543	579
<i>Own-consumption expenditure</i>				
With road access	494	429	367	436
Without road access	541	470	402	482
Total rural	509	437	377	447

Source: Lao consumption and expenditure Survey 2002-03.

When considering these results, it should be noted that the quantification and valuation of own-consumption is very difficult to assess through a expenditure survey because such surveys typically do not adequately record consumption outside of formal meals within the household.

B.5 Household consumption by region and expenditure group, 2002-03

<i>Region and expenditure group</i>	<i>Urban</i>	<i>Rural with road access</i>	<i>Rural without road access</i>	<i>Total rural</i>
	US\$	US\$	US\$	US\$
<i>Cash expenditure</i>				
North	1711	622	327	532
Central	1935	703	370	642
South	1729	628	330	543
Lao PDR	1865	659	341	579
<i>Own-consumption value</i>				
North	209	494	541	509
Central	182	429	470	437
South	155	367	402	377
Lao PDR	184	436	482	447
<i>Total expenditure</i>				
North	1920	1116	868	1040
Central	2117	1133	840	1079
South	1884	995	732	920
Lao PDR	2048	1094	823	1026

Source: Lao consumption and expenditure survey 2002-03.

C

Large ruminants in Vietnam

A survey in Vietnam during 2002 provides some insights into the role and the importance of large ruminants to integrated smallholder systems. The study found that the function of ruminants varied across three main characteristics:

- the ethnic background of the smallholders;
- the remoteness of the smallholders in terms of road access and distance to a major town; and
- altitude of the area which influences the production system.

The characteristics of the survey villages are summarised in table C.1.

C.1 Vietnamese villages in livestock survey

<i>Village</i>	<i>Ethnicity</i>	<i>Distance from town</i>	<i>Altitude</i>
Ban Buon	Black Thai	Close	Lowlands
Ban Bo	Black Thai	Close	Lowlands
Na Huong	Black Thai	Intermediate	Slopes
Bo Duoi	Black Thai	Intermediate	Slopes
Tong Tao A	H'mong	Remote	Upland
Pa Dong	H'mong	Remote	Upland
Tong Tao A'	H'mong	Remote	Upland

Source: Huyen et al (2006)

The H'mong are the same ethnic group as that found in northern Laos.

Roles of large ruminants

Table C.2 summarises the ranking of ruminant functions from the study. Black Thai farmers use ruminants for draught and transport. Closer to town the use of mechanical ploughs, buses and motorbikes has led to falling buffalo numbers. Away from town, where smallholder plots are less accessible to machines, there has been less substitution away from draft

C.2 Importance of large ruminant functions in Vietnam

Function	Thai villages near town		Thai villages away from town		H'mong villages	
	Cattle	Buffalo	Cattle	Buffalo	Cattle	Buffalo
Draft and transport	✓✓	✓✓✓	✓✓✓	✓✓✓	✓	✓✓
Cash sale ^a	✓✓✓	✓✓	✓✓	✓✓	✓✓✓	✓✓✓
Payment for hired workers	✓	✓	✓	✓		
Home consumption	✓		✓			
Religion and festivities	✓	✓	✓	✓	✓✓	✓✓
Manure supply					✓✓	✓✓

^a Significant uses for cash are large unexpected outlays and for home improvements.

Source: Huyen et al 2006.

animals: however, the use of buses and motorbikes for transport as been increasing. The survey also found that:

- buffalo were viewed as superior draught animals, but with higher feed and maintenance requirements;
 - female ruminants were considered too weak for field work and were a sign of poverty;
- ruminants were sold as calves or when too old for draft work;
- there was no reporting of fattening of cattle for sale as pigs are now the major cash source; and
- festivities required either slaughter for entertaining guests and worshipping ancestors or sale of ruminants to finance these events.

As seen in table C.2, ruminants also have multiple functions in H'mong households with significant differences to the Black Thai villages due to ethnicity and remoteness. The relative importance of functions differed between surveyed villages but general findings were:

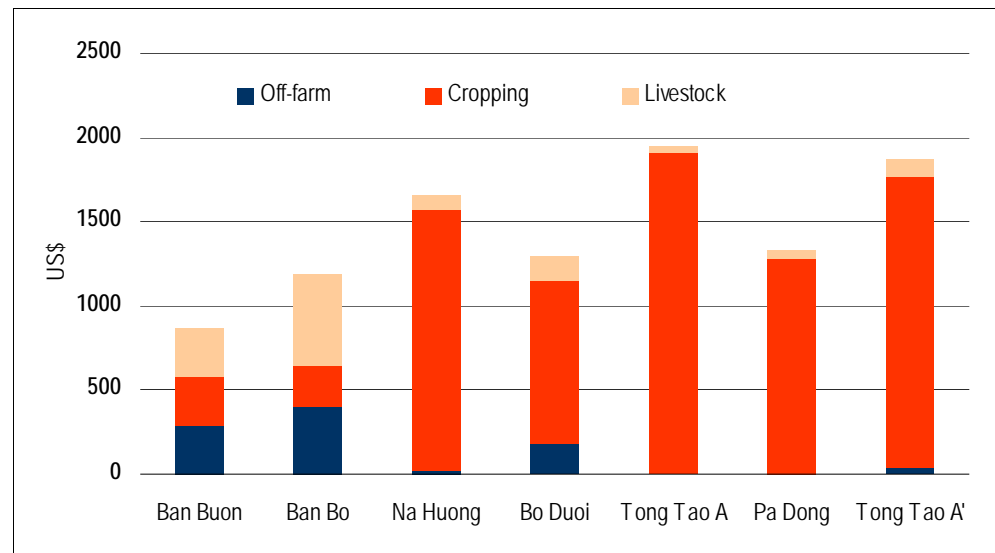
- ruminants were sold if large amounts of money were required, while pigs and chickens were sold to cope with smaller demands;
- manure was used by H'mong farmers as fertiliser, fish feed or for sale;
- buffaloes were required for funerals while offerings of a sacrificial animal is a custom of the H'mong people who invite a wizard to the house when there is disease or a newborn baby in the family;
- draught power was found of lesser importance for farmers with little land who could borrow draught animals from relatives; and
- most households had to supply ruminants with cut-and-carried roughage.

While cash income was an important function, at this stage of the survey, the use to which that cash was put was not well identified.

Economic analysis of ruminants

Chart C.3 summarises the contribution of livestock to average household income for the surveyed villages. Across all villages livestock contributed 12.4 per cent of total income — this being significantly higher for villages near town. While cropping remains a dominant source of income across all villages, off-farm employment was becoming significant for villages near to town.

C.3 Cash revenue from survey villages



Data source: Huyen et al 2006.

Chart C.4 shows the cost structure associated with keeping ruminants in each village.

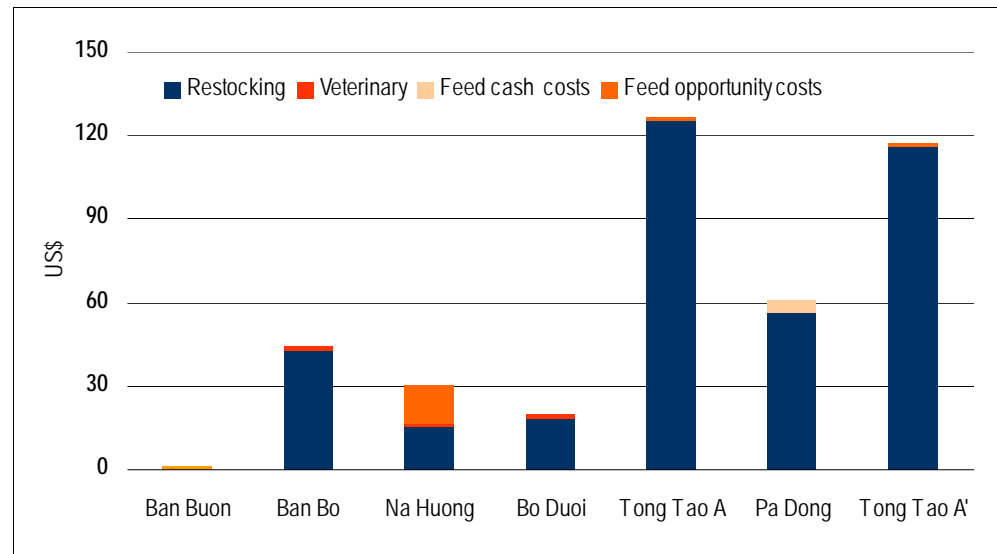
Variable costs are comprised of feed opportunity costs, feed cash costs, veterinary cash costs and restocking cash costs. Overall, the survey found that over 90 per cent of cash costs were from restocking. These costs were especially high in H'mong households.

The next step was to value each of the functions of ruminants across the villages. Chart C.5 summarises the contribution of each function to the total value of keeping ruminants. The value of stock provided the largest benefit accounting for 75 per cent of the total benefit. As noted in the study (Huyen et al 2006, p46):

This amount of money would be available for families, who are forced to sell ruminants to finance a festivity, cope with a shock like accident of a family member, or e.g. build a house.

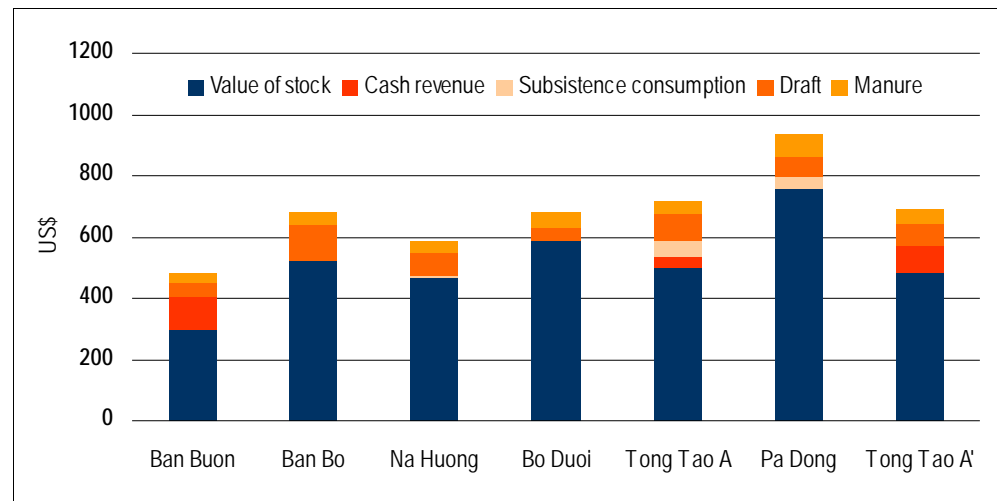
While this value was consistent between surveyed villages — the value of other functions varied significantly between villages.

C.4 Costs of keeping ruminants



Data source: Huyen et al 2006.

C.5 Value of ruminants

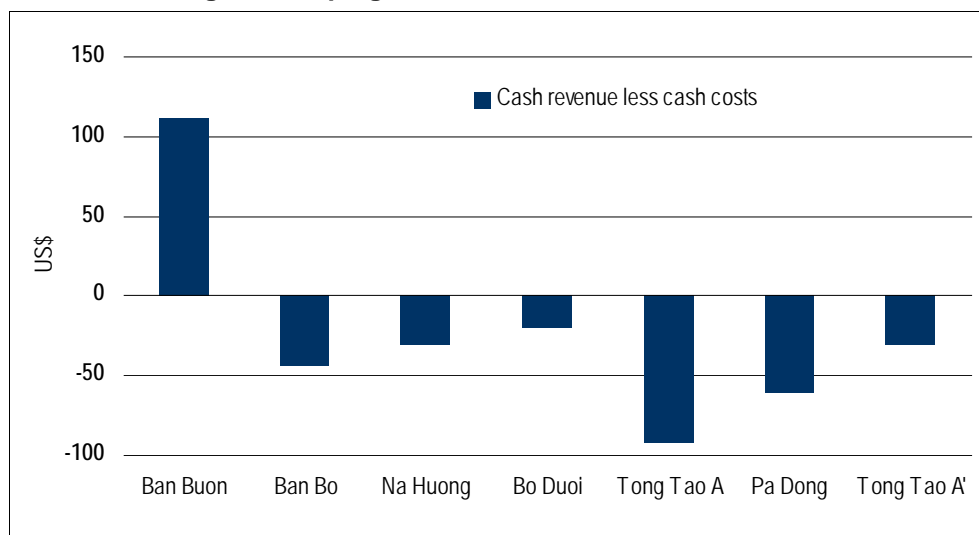


Data source: Huyen et al 2006.

Chart C.6 calculates the gross margin equal to revenue less costs of keeping ruminants. In only the village closest to town can the keeping of ruminants be considered to be a profit making enterprise. In many households, the sale and purchase of new animals happened on the same year reflecting the

fact that cattle and buffalo were being used to facilitate transactions and manage money.

C.6 Gross margin of keeping ruminants



Data source: Huyen et al 2006.

Caveats on this analysis

While this information is the best available for cattle and buffalo in the region, the reader should be cognisant of the major methodological problems in valuing many of these benefits. This is because most are unpriced because markets for them simply do not exist. This is especially true for the value of:

- manure and draught power; and
- insurance and financing functions.

D Donor and NGO projects

There is a significant amount of donor and non-government organisation (NGO) activity targeting agricultural and rural development in Cambodia and Laos. Some of these have components addressing animal health and productivity.

In value terms, the majority of these donor activities can be classified into two ways:

- specialist livestock projects that encompasses cattle and buffalo — usually including pigs and poultry; and
- integrated rural development projects.

The specialist livestock projects have an extension focus — and attempt to improve animal health and productivity by improving feeding regimes and also by the introduction of vaccines.

- In Laos, the ADB and the EU are the major players in the livestock sector. They are funding projects for cattle and buffalo in the Northern provinces.
- In Cambodia, the only dedicated livestock project at the moment is the EU small livestock production project, which is focused on pigs and poultry.

Rural development projects involve a range of activities from public health and education and construction of infrastructure through to improving agronomic practices for rice and cash crops. Some of these projects have a component supporting a livestock vaccination program — most often for cattle, buffalo and pigs.

These projects can be further classified by the type of expenditure:

- direct aid — donors funding activities that would be funded by government or would not otherwise happen (schools, roads, bridges); or
- extension and capacity building projects based on existing technology and information that also provide inputs such as vaccines.

Overall, the provision of aid is highly competitive, with a large number of funding agencies, such as the EU, ADB, AusAID, and UNDP. And under the current models, NGOs like Oxfam Australia and Veterinarians Sans Frontieres (VSF) are both donors and service providers — who contract to the large donors to deliver funding at ground level.

Donors have developed mechanisms to try to harmonise their activities between themselves and with government priorities and systems. (In Laos, for example, there is a steering committee at the national level for the ADB and EU livestock projects.) However, government planning and implementation systems in Laos and Cambodia are still quite limited and donors still tend to determine the aid agenda according to their own capabilities and interests.

Anecdotal evidence from the consultation suggested a degree of duplication at provincial and district level between the two livestock projects in Laos. There seemed to be a view that this is hard to avoid, and that smallholders could do with the extra help anyway.

One of the most obvious areas where the competition between donors and projects is evident is in the demand for local personnel and viable project areas. The VSF is currently undertaking a scoping process in Laos which will identify what other donors are doing and what in-country capacity is available to complete project work.

Relevant projects in Cambodia

Projects related to livestock in Cambodia are currently largely focused on pigs and poultry.

The European Union Smallholder Livestock Production Program is the most obvious example. It is operating in 4 provinces (Takeo, Kampong Speu, Kampong Chhnang and Pursat) and 18 districts. Its activities include:

- institutional capacity building for the Department of Animal and Production (DAPH);
- improved rural animal health services through training, certification, and expansion of Village Animal Health Workers (VAHWs);
- introduction and implementation of a national system of animal disease surveillance and monitoring;
- improved animal health through demonstration and extension services;
- improved livestock feed regimes;

- linking producers with local markets; and
- improved meat processing, storage and marketing.

Table D.1 summarises some donor projects with livestock components

D.1 Selected development projects in Cambodia

<i>Project</i>	<i>Funding organisation</i>	<i>Budget</i>	<i>Major objectives</i>
Rural Poverty Reduction Project in Prey Veng and Svay Rieng	IFAD and World Food Programme	US\$22.0 million	<ul style="list-style-type: none"> ▪ Increase poor household food production and incomes through intensified and diversified livestock production.
Community-based Rural Development Project in Kampong Thom and Kampot	IFAD,WFP, AusAID	\$US22.9 million	<ul style="list-style-type: none"> ▪ Sustain increased food production and improve incomes from intensified crop and livestock production.
Transboundary Animal Disease Control in the Greater Mekong Subregion	ADB/FAO	\$US2 million	<ul style="list-style-type: none"> ▪ Develop regional cooperation to control FMD, CSF and HPAI. ▪ Install regional and national disease identification systems ▪ Upgrade reference and diagnostic laboratories.
Livelihood and Livestock Systems Project	ADB/CIAT	?	<ul style="list-style-type: none"> ▪ Select improved forage species..... ▪ Assist farmers to adapt forage systems to own needs
Agricultural Productivity Improvement Program (completed)	World Bank/IFAD	US\$35.1 million	<p>Livestock component focus</p> <ul style="list-style-type: none"> ▪ Disease control and management ▪ Improving basic animal health services ▪ Promoting animal production
Cambodia-Australia Agricultural Extension Project	AusAID	\$A30 million	<ul style="list-style-type: none"> ▪ Develop sustainable district-oriented agricultural extension system
Agriculture Quality Improvement Project	AusAID	\$A20.7 million	<ul style="list-style-type: none"> ▪ Improve quality of rice production ▪ Build more robust village farming systems with improved fruit and vegetable marketing
Integrated Rural Development	AusAID	\$A7.7 million	<ul style="list-style-type: none"> ▪ Improve agricultural productivity and marketing
Cambodia Australia Program for Agriculture	AusAID	\$A30 million	<ul style="list-style-type: none"> ▪ Develop agricultural markets and agribusiness ▪ Promote research and extension services

Relevant projects in Laos

Donor funding plays an important role both in animal health and livestock extension programs in Laos.

The ADB has recently completed a design for a major Participatory Livestock Project in Laos. The project is aimed at reducing poverty through smallholder livestock development in the northern region of Laos. The project area comprises 18 districts in five Northern provinces (Bokeo, Houphanh, Luang Namtha, Luang Prabang and Xieng Khouang). It will target animal nutrition, animal health and fertility and animal management practices. Its budget is US\$18.4 million, comprising of a loan of US\$9.4 million and a US\$9 million grant. This project will initially focus on feed supply, HS vaccination, and de-worming including toxocara and then move on to animal management and husbandry.

The ADB project is scheduled to begin early next year. There is also another ADB capacity building project currently underway that attempts to build on previous forage project work undertaken by CIAT and the National Agriculture and Forestry Research Institute (NAFRI) (in particular the Forage and Livestock Systems Project (FLSP)¹ and provide a link into the new ADB project. It is focused on training extension workers.

The EU has begun to implement a follow up to the Lao-EU Livestock project, called the 'Livestock Farmer Support Project' which will operate in 6 Northern provinces (Luang Prabang, Oudomxai, Xieng Khouang, Luang Namtha, Kokeo, Xayabouri) and 33 districts. Its total budget is €5.3 million. The overall objective of the project is to 'improve rural livelihoods of poor households by increasing the value of their assets and their agricultural output' (EU 2006). To achieve this, the project will focus on improvements in four areas:

- livestock marketing system
- animal health services support
- animal nutrition
- animal husbandry.

There is significant overlap between the EU and ADB project, both in terms of content and geographical areas. Therefore it makes sense to have a high degree of collaboration and cooperation between the two projects. Significant collaboration and cooperation between donor agencies is not common, and hence there is often significant duplication and wasted effort — not just in Laos but in all countries that receive donor funding. Attempts have been made in the design of the EU and ADB projects to encourage cooperation. Firstly, the two projects share the same steering committee, which comprises national and provincial level stakeholders. Secondly, due

¹ See <http://www.ciat.cgiar.org/asia/forages.htm#flsp> for more information

to the overlap in district focus of the two projects, there is also district staff common to both projects. These moves are encouraging, but don't guarantee cooperation.

In addition to these projects, general development projects usually have a livestock component. The livestock component of these projects is usually extension focused. Table D.2 gives some examples of development and extension projects that include livestock components.

D.2 Selected development projects in Laos

<i>Project</i>	<i>Funding organisation</i>	<i>Budget</i>	<i>Major objectives</i>
Agriculture Development Project	World Bank	US\$12.21 million	<ul style="list-style-type: none"> ▪ Improving rural infrastructure ▪ Improving environmental management ▪ Improving agricultural services.
Poverty Alleviation in Remote Upland Areas	Swiss Agency for Development Cooperation (SDC)	US\$1 million approx	<ul style="list-style-type: none"> ▪ Improve the performance of agricultural livelihood systems ▪ Improve the ability of households to take advantage of market opportunities ▪ Improve access to water.
Small-Scale Agroenterprise Development in the Uplands	SDC	US\$3.3 million approx	<ul style="list-style-type: none"> ▪ Identifying and evaluating market opportunities for agrienterprise development ▪ Establishing a strategy and local capacity for promoting agrienterprises
Laos Extension for Agriculture Project	SDC	US\$5.8 million approx	<ul style="list-style-type: none"> ▪ Support the development sustainable agricultural extension system
Smallholder Development Project	ADB	US\$15.2 million approx	<ul style="list-style-type: none"> ▪ Promote small scale agriculture production to increase farming income and alleviate poverty
Special Program for Food Security and South-South Cooperation	Japanese Government	US\$3.6 million	<ul style="list-style-type: none"> ▪ Increase food production through diversification of production. ▪ Expand and develop livestock raising system. ▪ Improve agricultural product management. ▪ Build capacity for extension.
Forest Management and Community Support Project	Japan International Cooperation Agency (JICA)	N/A	<ul style="list-style-type: none"> ▪ Improve forest management, production and income generation activities, which contribute toward stabilization of shifting cultivation and poverty reduction
Xieng Khouang Agricultural Development Project Phase II	IFAD	US\$9.6 million	<ul style="list-style-type: none"> ▪ Reduce poverty, increase household food and income security and improve nutrition for the poor.

Source: <http://www.laoex.org/index.htm> accessed 16 October 2006.

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