

Methodology in Recording Data on Pig Health and Production in The Lao People's Democratic Republic

*- Experiences from a Surveillance Programme on Classical Swine Fever in
Lowland Villages in Bolikhamxay Province, Lao PDR*

Kristina Osbjer

**Supervisor: Prof. Ulf Magnusson
Department of Obstetrics and Gynaecology/Clinical Sciences**

**Assistant Supervisor: Dr. Peter Horne
Forage and Livestock Systems Project and Centro
Internacional de Agricultura Tropical, Lao PDR**

**Sveriges lantbruksuniversitet
Fakulteten för veterinärmedicin och
husdjursvetenskap
Veterinärprogrammet**

**Swedish University of Agricultural Sciences
Faculty of Veterinary Medicine and
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ABSTRACT

Improved animal health and alleviation of livestock diseases with high impact in developing countries have direct effects on poverty reduction as livestock has been estimated to account for 70% of the livelihoods of the world's poor. In Lao PDR 85% of the population lives in areas dependent on agriculture, and sale of livestock is estimated to account for their largest cash income. Smallholder farmers produce almost all of the livestock, and pigs are raised by 64% of the Lao households. In the low input-low output system used in Lao PDR losses due to disease are seen in pigs and Classical Swine Fever has in a recent study been pointed out as the most important disease.

During this study, four villages in the Bolikhamxay province in the central of Lao PDR were included into a surveillance programme on Classical Swine Fever set up by Australian Centre for International Agricultural Research (ACIAR). In the first part of the study, information on Lao farming systems was collected from literature and field visits. Thereafter the four villages to be included were visited with the aim to undertake a robust descriptive analysis of pig health and production and to make recommendations for future surveillance and data collection in the project. All fieldwork was done in cooperation with staff linked to the ACIAR project ASI/2003/001.

Information on pig management was collected with the help of a Baseline Questionnaire Form previously used in the ASI/2003/001 project and by village walks. The information was analysed together with data from six villages already included in the project. A qualitative analysis was conducted from the information and a quantitative analysis started using Epi Info version 2002.

The study showed major problems in pig management. A need for increased knowledge in disease prevention and action during disease outbreak was observed amongst the farmers and the animal health workers. Insufficient communication between farmers and the extension workers and difficult accessibility to the villages also showed great impact. Introduction of participatory research and extension approaches could contribute to the project and the study showed a demand for a more gender sensitive approach as pig husbandry is almost exclusively carried out by women.

Keywords

Classical Swine Fever, Lao PDR, Minor Field Study, pig husbandry, female farmers, gender, epidemiology.

SAMMANFATTNING

Förbättrad hälsa hos husdjur i utvecklingsländer har stor betydelse för att minska fattigdomen eftersom husdjur beräknas stå för 70% av fattiga människors leverbröd. I Laos bor ca 85% av befolkning i rena jordbrukssamhällen och handel med husdjur och produkter från dessa står för deras största inkomst. Nästan all boskap hålls av småbönder och 64% av hushållen i Laos föder upp grisar. Stora förluster i grisproduktionen orsakas av ohälsa och Klassisk svinpest blev i en nyligen publicerad studie utsedd till den viktigaste sjukdomen bland grisar i Laos.

Syftet med denna studie var att i några byar analysera hälsa och produktion i grishållningen samt att utarbeta rekommendationer för framtida övervakningsprogram och datainsamling i byar med låglandsjordbruk. Fyra byar kom att inkluderas i ett program för Klassisk svinpest startat av Australian Centre for International Agricultural Research (ACIAR) i Bolikhamxay-provinsen i centrala Laos. Första delen av studien utgjordes av insamling av information om djurhållning i låglandsjordbruk med hjälp av litteraturstudier och fältbesök. Därefter besöktes de fyra byarna och fakta om grisskötseln sammanställdes genom en rundvandring till de flesta av byns griskötselare och med hjälp av ett svarsformulär som tidigare använts i ACIAR programmet ASI/2003/001. Informationen analyserades sedan kvalitativt tillsammans med data från sex byar som sedan tidigare var inkluderade i programmet. En kvantitativ analys av informationen från de fyra nya byarna påbörjades också med hjälp av ett epidemiologiskt dataprogram.

Resultat från studien visade stora problem i grishållningen avseende inhysning, nutrition, avel och sjukdomar. Ett stort behov av ökade kunskaper vid sjukdomsutbrott men också för att förebygga sjukdomar observerades. Även kommunikationen till byarna och samarbetet mellan djurhälsoarbetarna och bönderna visade möjlighet till förbättring. Ett utvecklat samarbete med bönderna vid utformning av programmet skulle kunna tillföra mycket. Studien visade också ett behov av ökad genusmedvetenhet i programmet då grisskötseln framförallt bedrevs av kvinnor, men merparten av kommunikationen skedde utan deras medverkan.

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LIST OF ABBREVIATIONS

ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
BQF	Baseline Questionnaire Form
CIAT	Centro Internacional de Agricultura Tropical
CSF	Classical Swine Fever
CSIRO	The Australian Commissioned Organisation
DAFO	District Agriculture and Forages Office
DLF	Department of Livestock and Fisheries
DPO	District Project Officer
FLSP	Forage and Livestock Systems Project
FMD	Foot and Mouth Disease
GDP	Gross Domestic Product
HDI	Human Development Index
Lao PDR	The Lao People's Democratic Republic
MAF	Ministry of Agriculture and Forestry
NewV	The four new villages included in the ACIAR project
NAHC	National Animal Health Centre
PreV	The previous six villages with recorded data in the ACIAR project
PAFO	Provincial Agriculture and Forages Office
PPO	Province Project Officer
SARS	Severe Acute Respiratory Syndrome
SLU	Swedish University of Agricultural Science
UNDP	United Nations Development Programme
VPW	Veterinary Pig Worker
VVW	Village Veterinary Worker

INTRODUCTION

This report is the result of a study conducted in Lao PDR during October and November 2003. Professor Ulf Magnusson at Department of Obstetrics and Gynaecology/Clinical Sciences was my supervisor from the Swedish University of Agricultural Science (SLU). Supervisor in the field was Doctor Peter Horne, team leader at Forage and Livestock Systems Project (FLSP) and Centro Internacional de Agricultura Tropical (CIAT) in Lao PDR. The study was linked to a project funded by Australian Centre for International Agricultural Research (ACIAR) entitled “Improved Diagnostic and Control Methodologies for Major Livestock Diseases in Lao PDR” (AS1/2003/001).

Lao PDR is the only landlocked country in South East Asia and is sparsely populated with only 5.9 million inhabitants ([http:// www.cia.gov](http://www.cia.gov)). More than 85% of the population live in areas dependent on agriculture and around 64% of the population raise pigs (Stür *et al.*, 2002). The total number of pigs is approximately 1 million and 95% are produced by smallholder farmers in low intensive systems. Free range scavenging is the most common system and does in combination with poor management and animal healthcare lead to ineffective disease control. Classical Swine Fever (CSF) has been pointed out as the number one disease in pigs occurring annually with high morbidity and mortality (Gleeson, 2003).

Livestock has been estimated to account for 70% of the livelihoods of the world’s poor. Improvements in animal health and alleviation of livestock diseases with high impact in developing countries has been suggested to have direct effects on poverty reduction (Perry *et al.*, 2002). For smallholder farmers sale of livestock may be the only way to generate a considerable amount of cash and death of an individual animal can put the family in a difficult economical situation. Research for reduced animal disease is therefore of great importance in developing countries (Gleeson, 2003). This study has tried to monitor some of the major problems in pig health and production in lowland villages in central Lao PDR.

1.1 Objectives

The objectives of this study were to:

- *Undertake a simple descriptive analysis of pig health and production in four villages included into a surveillance programme on Classical Swine Fever in lowland villages in Lao PDR.*

- *Make recommendations for future surveillance and data collection in lowland farming systems.*

2 BACKGROUND

2.1 Poverty reduction

Poverty is generally considered as the greatest constraint to global harmony and well-being of the peoples of the world (Perry *et al.*, 2002). Different theories for how to reduce poverty have circulated during the last decades with the focus changing from improved national economies to measures targeted directly at the poor. The Human Development Index (HDI) presented by the United Nations Development Program (UNDP) includes life expectancy and educational attainment as well as Gross Domestic Product (GDP) per capita as a measurement of poverty (<http://www.undplao.org>). The World Bank recently recommended actions in three areas for fighting the poverty (Perry *et al.*, 2002):

- Promoting opportunity by expanding economic opportunities for poor people, building up their assets and increasing their return on these assets by market and non-market actions.
- Facilitating empowerment by making state institutions more accountable and responsive to poor people.
- Enhancing security by reducing poor people's vulnerability to ill health, economic shocks, crop failures etc.

2.1.1 Livestock and poverty

Livestock has been estimated to account for 70% of the livelihoods of the world's poor (Perry *et al.*, 2002). Milk and meat provide an important source of protein, micronutrients and vitamins and the annual demand for these products is predicted to grow in developing countries. Furthermore, the raising of livestock serves multiple roles in contribution to household assets: income through sale of their products, draught power and manure as soil fertiliser. Not only poor farmers but also traders, consumers and labourers throughout the developing world benefit from successful livestock farming.

Poor farmers usually have few animals and loss of an individual animal is of great significance as the farmers rely on them for income (Perry *et al.*, 2002). Improved animal health and alleviation of livestock diseases with high impact in developing countries would have direct effects on poverty reduction according to The World Bank criteria.

2.2 Livestock disease and public health

Livestock diseases are no longer only a national problem and the risk of spreading diseases internationally increases with global movement of humans and trade with animal products (Noordhuizen P, 2001). In some areas the animal population is so high that once a disease is introduced it spreads rapidly and affect an enormous amount of livestock even before the agent has been found. Some highly contagious infections such as Foot and Mouth Disease (FMD) in cattle and swine,

Newcastle Disease in poultry and Classical Swine Fever (CSF) in pigs occur endemic in developing countries with high economic impact but also with risk of being spread to the developed world causing serious epidemics.

The source of the FMD outbreak in Britain 2001 was most probably imported meat or meat products infected or contaminated with the virus and fed to pigs (<http://www.defra.gov.uk>). The FMD caused huge economic losses, but livestock diseases are also an issue in public health. A recent study suggest that human and livestock diseases, particularly in the developing world, are linked in three ways (Stür *et al.*, 2002):

- Zoonoses, diseases that can be transmitted between animals and humans.
- Poor livestock performance leading indirectly to poor human health e.g. caused by a diet low in animal protein.
- Increased public awareness of how diseases are caused and spread has effects on health both in humans and livestock.

It has been suggested that the severe acute respiratory syndrome (SARS) outbreak in 2003 was originating from domestic species (Weingartl *et al.*, 2004) and human influenza viruses are in many cases believed to have arisen from livestock. The avian influenza virus has since the outbreak in South East Asia 2004 had a highly virulent strain increasing the risk for human infection but also the opportunities for human and avian influenza viruses to exchange genes with person-to-person transmission as a possible outcome (<http://www.europa.eu.int>). Disease risk management and prevention is emphasized by many experts for future disease control in both humans and livestock (Noordhuizen P, 2001).

2.3 The country Lao PDR

2.3.1 General facts on Lao PDR

Lao PDR is the only landlocked country in South East Asia and has with 5.9 million inhabitants one of the lowest population densities in Asia (<http://www.cia.gov>). It is a cultural diverse country with 46 officially recognised ethnic groups that can be divided into three major groups, according to the elevation at which they live: *Lao Loum* (lowland), *Lao Theung* (lower mountain) and *Lao Soung* (higher mountain). About 68% of the population is Lao Loum, 22% Lao Theung and 9% Lao Soung. Each group has its own traditions in religion, linguistics and farming. Strong immigrant communities mainly from China and Vietnam (around 1%) also contribute to the ethnic diversity.

Lao PDR has a tropical monsoon climate with two seasons; rainy season May-November and dry season December-April (<http://www.cia.gov>). The Mekong river dominates the border between Lao PDR and Thailand providing fertile agricultural zones in the south. The north is mountainous and more remote with less development and poorer societies.



Figure 2.1: Map of Lao PDR (<http://www.cia.gov>).

2.3.2 Livestock production in Laos

Lao PDR has approximately one million animals each of buffalo, cattle and pigs, 11 million poultry and 200,000 goats (Stür *et al.*, 2002). Low input systems take advantage of natural resources and native breeds adapted to the environment. Approximately 20% of the beef production is exported and could be considerably increased in the north of Lao PDR. Expansion of pig and poultry production is limited by high production in neighbouring countries and with a small domestic market.

More than 85% of Lao PDR population is located in areas dependent on agriculture (Stür *et al.*, 2002). Rice cultivation is the dominating crop but more than 50% of cash income is generated from sale of livestock. Smallholder farmers produce over 95% of all livestock and only a few commercial enterprises operate. Sale of livestock is a safety net for many families when cash is needed and enable them to make long-term investments in farming and livelihood (Gleeson, 2003). A relative stability of prices and the possibility to walk animals to the market make livestock more competitive than cash crops, especially in remote areas. Farmers in rural areas throughout the country do however, according to a recent study by Asian Development Bank (ADB), consider livestock diseases as a major cause of poverty

2.3.4 Pig raising in Lao PDR

64% of families in Lao PDR raise pigs for home consumption or sale (Stür *et al.*, 2002). In the northern regions of Lao PDR pigs are more abundant than in the south, but great differences in number of pigs and their management can be seen between different ethnic groups. There are in total about 220 farms with intensive pig-raising in Lao PDR mainly situated near the big towns in the south and

central. These farms have however bad opportunities to compete with neighbouring countries' production as the concentrate feed needed is more expensive in Lao PDR. Research in improved pig management has therefore focused on small holding farming system rather than on intensive production.

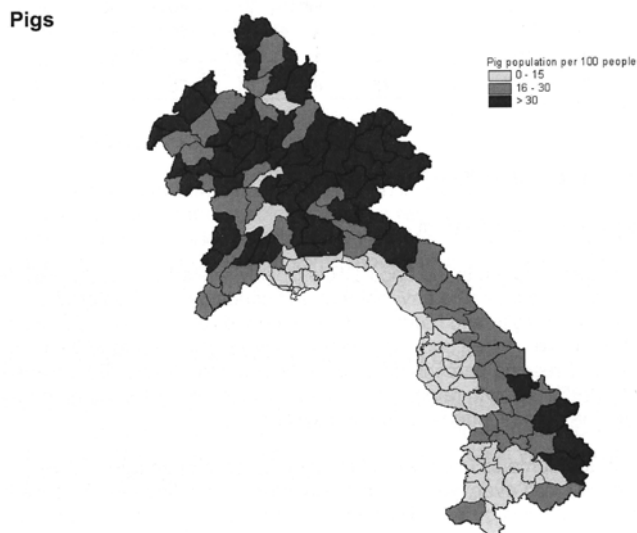


Figure 2.2: Pig population density per 100 people in 1998/1999 based on district data (Stür *et al.*, 2002).

Housing and Nutrition

Free range scavenging is the most common system for pig raising in Lao PDR, although penning is practised in some areas (Stür *et al.*, 2002). The free roaming system is very labour-intensive as supplementary feed is necessary. Women are almost invariably responsible for pig raising and may spend up to 2-3 hours per day for feed collection and preparation. The type of feed given differs between different regions, farming systems, natural vegetation and labour availability. Traditionally it includes rice bran, broken rice, alcohol-rice distilling residues, tree crops, vegetables (e.g. sweet potato, water hyacinth and wild taro), cassava, soya beans and maize.

See Appendix 2 for pictures on feed.

Breeds

Pigs used are mostly native Asian swaybacked breeds (Blacksell, 2001). Four groups of indigenous breeds have been described: *Moo Chid*, *Moo Laat*, *Moo Daeng* and *Moo Nonghaet*. They are slow growing high fat pigs with a mature body weight in sows of 60-90 kg except from the *Moo Chid* that is smaller. The litters are usually small with a farrowing interval of 1.5 litters per year (Blacksell, 2001). This can be compared to Swedish breeds with a rate of 2.2 litters per year in 2004 (<http://www.qgenetics.com>). The native breeds are hardy, well adapted to

a free-ranging system and can survive in hot climate on low quality feed with a high resistance to diseases (Blacksell, 2001). A small number of farmers use exotic breeds or crossbreeds, but compared to local breeds they are less resistant in small holding farming conditions and do not perform as well.



Figure 2.3: *Moo Laat* pig.

Diseases in general

Insufficient control of animal movements and trade make transmission of disease difficult to prevent in Lao PDR (Stür *et al.*, 2002). Checkpoints for official export and import of livestock are found in 18 locations in Lao PDR and all animals crossing are supposed to be inspected but training of the checkpoint staff is basic and papers more likely to be checked than animals. Illegal trade is common, but movement of livestock between districts, villages and households is probably more significant to the epidemiology of disease. The governmental Department of Livestock and Fisheries (DLF) presented in 2000 regulations regarding animal raising and management in Lao PDR (No.0036/DLF). It includes detailed regulations for trade of livestock, feed and veterinary supply as well as for CSF vaccination and destruction of infected animals. The regulation is however ignored and most villagers do probably not even know that it exist. It has also suggested that it would hamper national livestock production if it was enforced.

Facts on Classical Swine Fever

In a recent study CSF was found to be the most important disease in Lao pigs occurring annually (endemic) with high mortality and morbidity (Khounsy, personal communications). This study is linked to a surveillance program for CSF that was started in 2003.

Classical Swine Fever; also known as hog cholera, is caused by a RNA virus belonging to the genus pestivirus (Taylor, 1995). It can replicate in ruminants, but only produce clinical signs in pigs. The virus is resistant surviving an acid environment (pH 5), 65° C for 90 minutes and at least for 1500 days in frozen meat. It infects the animal through the upper respiratory tract or the upper

digestive tract causing viraemia after 24 hours. The disease is highly contagious and four different forms can be seen: hyperacute, acute, chronic and low virulent. It has an incubation period of 5-10 days with clinical signs such as high fever, diarrhoea, nervous signs, blotching of the skin and sudden death. The virus may cross the placenta resulting in abortion, mummified or persistent infected piglets.

Virus is present in all body secretions and can survive up to 2 days in urine and faeces (Taylor, 1995). Normal ways of infection are:

- Purchase of infected pigs.
- Direct contact between infected and non infected pigs e.g. at markets.
- Feeding of improperly boiled household scraps including meat infected by CSF.
- Purchase of infected pregnant sows giving birth to persistent infected piglets.
- Indirect transfer from contaminated vaccines, sera and semen.
- Spread from wild boars.

Diagnosis is confirmed by clinical signs, post mortem findings, clinical pathology, demonstration of virus, serology or animal transmission (Taylor, 1995). As no treatment exists, disease must be prevented with improved management, disinfection or vaccination.

2.3 Developing livestock management in Lao PDR

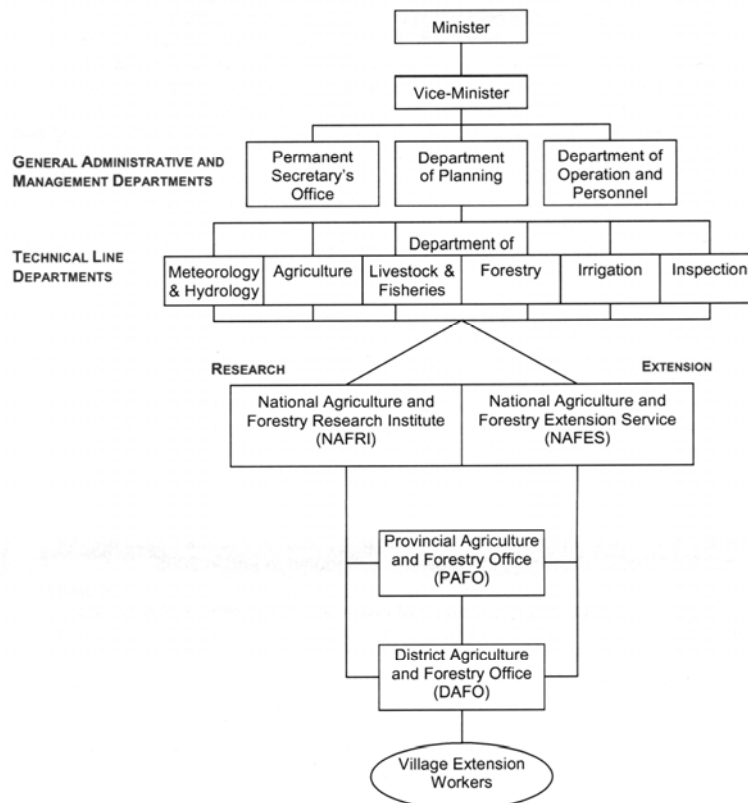


Figure 2.4: National structure of agriculture (Stür et al., 2002).

2.4.1 National structure of agriculture development

The Government of Lao PDR supports livestock production at a national, provincial and district level (Stür *et al.*, 2002). The structure is evolving but in June 2002 the organisation was as above.

NAFRI and NAFES are responsible for all agricultural research and extension except the veterinary one sorting under DLF through PAFO and DAFO. Among the Village Extension Workers are Village Veterinary Workers (VW). These are villagers trained by different projects such as the Lao-EU Livestock project (see below). They provide basic veterinary services and are responsible for animal health issues in their village as Lao PDR has very few trained veterinarians. The VW is usually selected by the village chief who is the head of the village, chosen by the villagers according to local traditions. A change of village chief usually means a change of the VW to a non trained person suggesting that more support and follow up training of the VWs would be necessary to provide sufficient animal health care in rural villages.

2.4.2 Projects for livestock improvement

There were in 2003 three major ongoing livestock research and extension projects in Lao PDR (Stür *et al.*, 2002):

- A *Lao-EU Livestock Project* “Strengthening of Livestock Service and Extension Activities”.
- A *Forage and Livestock Systems Project (FLSP)*. A farmers participatory project for developed feed, forage and animal health technologies.
- A project by *Australian Centre for International Agricultural Research (ACIAR)* with the title “Improved Diagnostic and Control Methodologies for Major Livestock Diseases in Lao PDR”.

In 2001 FLSP and ACIAR performed a disease survey in 12 upland villages to select the most important livestock diseases in Lao PDR (Khounsy, personal communications). Classical Swine Fever in pigs, *Toxocara vitulorum* infection in Buffalo calves and *Pasturella multocida* infection in chickens and ducks were identified as the three most important diseases in terms that cause substantially large animal losses (ACIAR project ASI/1994/038). In pigs parasitism, bacterial diseases (mainly *Salmonella* and *Erysipelothrix*) and severe diarrhoea were also reported a problem but little is known about their impact.

See Appendix 3 for more facts on the projects.

2.5 Livestock improvement through Australian Centre for International Agricultural Research

Results from the ACIAR/FLSP project ASI/1994/038 were used as the basis of a second ACIAR project “Improved Diagnostic and Control Methodologies for Major Livestock Diseases in Lao PDR” (AS1/2003/001) with improved husbandry and disease control as an entry point to conduct research on the implementation and impact of CSF vaccination in village pig production (Gleeson, 2003). Local capacity in laboratory diagnosis (e.g. for FMD, Rabies and CSF) has been set up at the National Animal Health Centre (NAHC) in Vientiane (sorting under Department of Livestock and Fisheries (DLF)) with support from the Lao-EU livestock project. The Australian Commissioned Organisation (CSIRO) Australian Animal Health Laboratory is a laboratory collaborator (as in the ASI/1994/038 project) and the FLSP key partners in the fieldwork. Forage and Livestock Systems Project experiences from linking provincial and district extension workers with local farmers in participatory research will provide a useful tool for introduction of vaccination and disease control.

The ongoing ACIAR project on livestock diseases was started up in March 2002 in the Bolikhamxay province in the central of Lao PDR (Khounsy, personal communications). Eight villages in two districts, Bolikhan and Pakading, were selected for fieldwork and an active surveillance of the villages based on their normal pig raising practice started. The programme begun with a meeting in the villages to inform farmers about the project and to collect baseline data. A Baseline Questionnaire Form (BQF) was conducted for extensive information on village conditions and demographics, animal management practices, the role of pigs in village livelihoods and general animal health and production. Every month for one year changes in the village pig production was recorded by the Veterinary Village Worker (VW), Province Project Coordinator (PPC) and District Project Coordinator (DPC) in collaboration with the farmers. The plan is to analyse the data and implement changes in the production such as vaccination against CSF.

See Appendix 4 for the Baseline Questionnaire Form.

3 METHODOLOGY

3.1 Preparations

With knowledge from the first eight villages included in the ACIAR project on livestock diseases the study was designed. Prior to the fieldwork villages in the Bolikhamxay and Luang Phabang province were visited to get an overview of how small holding pig husbandry was performed in Lao PDR. The villages visited were part of either an ACIAR or a FLSP project in agricultural development. Together with literature studies and personal communications an opinion was formed of the difficulties farmers faced in pig management and disease control and became the base on which the field part of the study was conducted. The objectives for the fieldwork were to include four new villages into the surveillance

programme on CSF for the ACIAR project and to undertake a basal descriptive analysis of pig health and production in the four new villages.

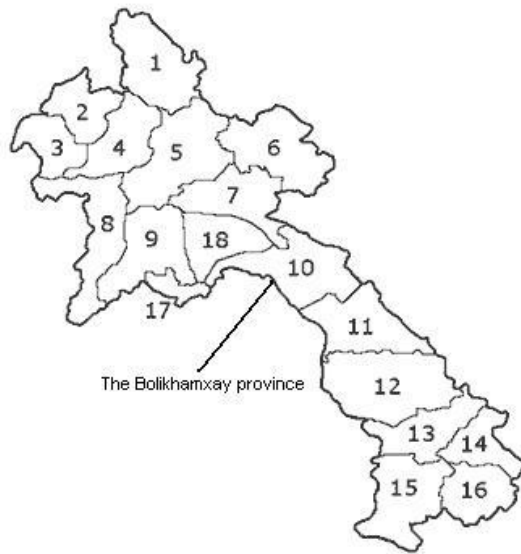


Figure 2.5: Map of the Bolikhamxay province (www.zendig.org/landen/laos/laos.htm#geografie).

3.1.1 Recruitment of villages

Four villages in Bolikan district, Bolikhamxay province were selected for the fieldwork by staff at the Provincial Agriculture and Fisheries Office (PAFO) according to the following selection criteria decided by ACIAR:

- The village should have pigs.
- The village should not be located close to the main roads (as animal movements should be possible to control).
- Access to the village should be possible by vehicle all year around (so that data could be continuously collected).
- The villages should not be close to each other and not already involved in a livestock programme.

3.1.2 The team

The villages were informed about our arrival by staff sorting under the District Agriculture and Fisheries Office (DAFO). To enable my communication with the farmers English-Lao translation was carried out by Mr Amphonephet Sisavong from Department of Livestock and Fisheries (DLF), The team also included Mr Phoungem (PPC) and Mr Seangsamai (DPC).

Time Schedule

06/11-2003 Songkhonemai Village
11/11-2003 Thaopho Village
12/11-2003 Naou Village
13/11-2003 Phothong Village



Figure 3.1: Photograph of the team.

3.2 The fieldwork

Transportation to the villages was made by motorbike and each village was visited for approximately four hours. An information meeting was held before the farmers were divided into small groups and facts on the livestock was taken with the help of the Baseline Questionnaire Form (BQF) previously used by the ACIAR project. To fill in some of the gaps in the BQF, a village walk was made at the end of the visit. Time for evaluation of the fieldwork was held between the first and the second village.



Figure 3.2: Photograph from the meeting in Thaopho Village.

3.2.1 Introduction meeting

The meetings were held in the mornings in an appropriate building (usually the village temple). Apart from the farmers the village chief and the VVW attended. The PPC started by introducing the team and the objectives of the project. Afterwards the farmers were informed about the time schedule of the day and the project time schedule, future benefits to the farmers and how they could contribute. To increase the interest and limit the linguistic and cultural barriers, drawings were made (some copied) illustrating the information given. Two pictures emphasised the importance of farmers reporting animal diseases to the VVW who would pass it on to the DPC and PPC. One drawing showed a calendar and a pile of paper illustrating the amount of time until the farmers can see results from the project.

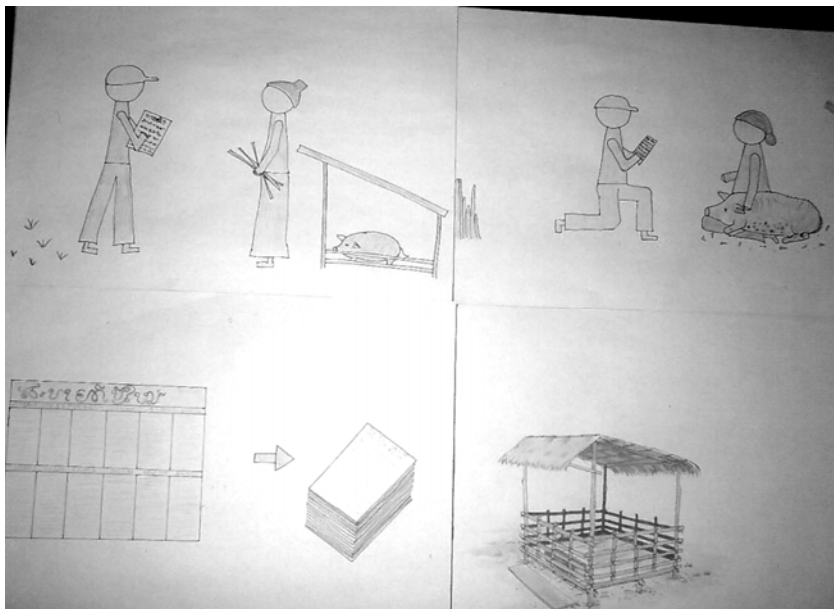


Figure 3.3: Example of the drawings 1.

A few drawings showing different housing opportunities and the importance of preventing piglets from escaping was discussed from a disease preventing point of view. Protection from rain and hot sun was emphasised in construction of roof systems and the use of wooden slatted floors encouraged. A drawing of the faecal-oral transmission route was made to show the advantage of clean pens. Regular cleaning of troughs and drinkers and good quality feed and water was illustrated as well as the importance of boiling household scraps when fed. Finally problems associated with breeding were discussed with a drawing of a sow and her piglets.

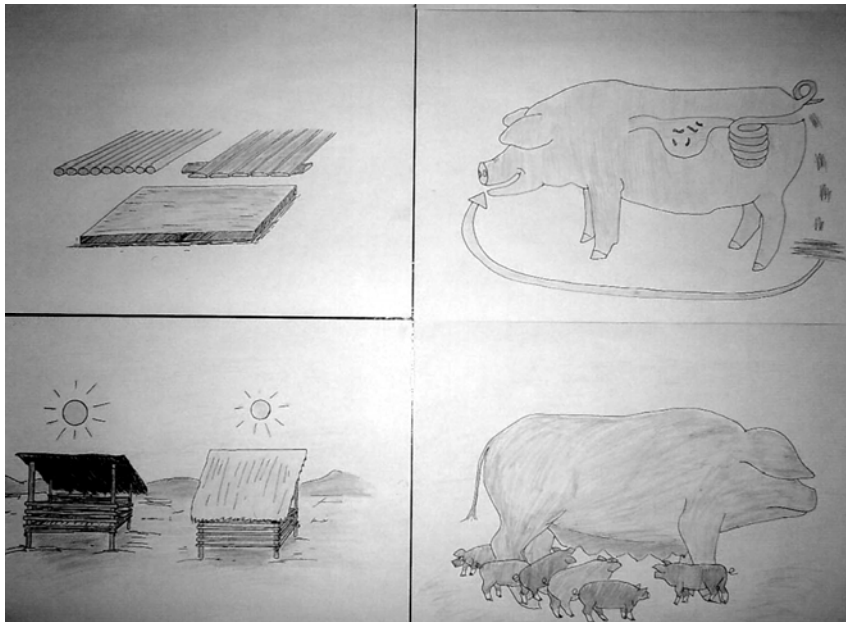


Figure 3.4: Example of the drawings 2.

After the meeting around ten pig farmers were asked to stay for the following group activities. In three out of the four villages visited more than ten farmers wanted to stay so two groups with about ten farmers in each were formed. If possible the farmers responsible for looking after the pigs were chosen. Mr Phoungum and Mr Seangsamai worked with one group and Mr Amphonephet and me with the other one. The activities started off by asking the group to draw a paper map of the village with the important physical features e.g. households, roads, water supplies and surrounding fields. The purpose of the map drawing was to encourage all farmers to participate and to get an idea of where livestock diseases were most likely to enter and spread in the village. The BQF was then discussed with the farmers and filled in by the team (Appendix 4). Two forms were completed in three of the four villages as two groups of farmers were formed in the last three villages visited.

After the group activities the VVW was interviewed about his experience and training (Appendix 5) and the VVW and village chief would take the team for a village walk to show the pig farming system.

3.3 Data recording

The data collected in the BQF in the four new villages was entered into a computer record for analysis. A text document was made using the same format as previously used in the ACIAR project on livestock diseases. Out of the eight villages already involved in the programme only BQF data from six had been recorded into a text document and could be used for analysis. Altogether data from ten villages, six previously involved villages (PreV) and four new ones (NewV), was used in the analysis,

3.4 Data analysis

3.4.1 Methodology for qualitative analysis

A qualitative analysis was made by comparing data in the BQF from the ten villages. Pig management includes pig health and production and can be split into four major groups: housing, nutrition, breeding and disease issues. This structure has been used in a simple analysis of BQF data from the ten villages and village walks in the four NewV. In one of the NewV and one of the PreV only one group of farmers was formed and altogether 18 BQFs were filled in from ten villages.

3.4.2 Methodology for quantitative analysis

An attempt was made to transform most of the data from the four new villages into figures and enter into Epi Info, version 2002. The ACIAR project plan is to transform and enter data from the PreV as well but qualified training in data coding will be necessary before to minimise bias when the data is to be analysed. Epi Info is: “a computer programme for public health professionals in conducting outbreak investigations, managing databases for public health surveillance and other tasks, and general database and statistics applications ... epidemiologists ... can rapidly develop a questionnaire or form, customise the data entry process, and enter and analyse data” (<http://www.epiinfo.se>).

A detailed guide of how every question in the BQF from NewV was transformed into figures was conducted and can be used for future data coding. In general the data was transformed as follows:

- Numbers answered were entered and means of the numbers were used when different answers were given in the two BQF from the same village
- Yes and no questions were entered as 1 for yes, 2 for no and 3 for different answers in the two BQF from the same village
- Season questions were entered as 1 for wet season (May-October), 2 for dry season (November-April) and 3 for no specific season (or different answers in the BQF from the same village)
- Answers to multiple choices questions were either grouped and numbered (different strategies) or left out

4 RESULTS AND DISCUSSION

4.1. Qualitative analysis

Pig management was divided into four major groups for this analysis namely housing, nutrition, breeding and disease issues. In addition to data from the BQF observations from the village walks in the NewV has been included. The analysis showed a need for improved management to reduce livestock disease and to make pig husbandry more profitable. Improper fencing, low nutritional status in the pigs

and lack of breeding programmes were abundant. The farmers had little knowledge of animal health and disease. Minor improvement in management and increased knowledge by the farmers would enable them to make informed choices, which as a second step could increase the productivity.

A description as well as a discussion about pig management in the ten villages included in the study is followed by a synthesis of the methodology used.



Figure 4.1: Dr. Syseng Khounsy in front of a traditional pen.

4.1.1 Housing

The NewV had most of their pigs penned but free running pigs were seen in all four villages during the village walk. Fencing that allows piglets to escape was widely used and a range of roof systems, mostly grass thatched roofs protecting the pigs more or less from hot sun and rain, was seen. A majority of pens had mud grounds and the farmers reported on constantly muddy flooded pens in the wet season whilst the village walk showed dusty pens (dry season). Floor quality and space covered differed between the floored pens. The wooden slatted floors seen had in some cases rusty nails or decimetre wide spaces between the logs and raised slatted floors were only used by one farmer. Daily cleaning of the pens removing faeces did not occur.

It is likely that diseases are spread by the free roaming pigs, especially piglets that are particularly vulnerable to infection. Therefore penning could be a first step in disease prevention. It is cheap and relatively low in labour input once it has been built.

High exposure to rain and hot sun resulting in bad health and low productivity could be limited with proper roof systems. Single or even sloping grass thatched roofs provide good protection and ventilation and have the advantage of being cheap and easy to build (Oosterwijk *et al.*, 2003). Oosterwijk *et al* also suggest floors that are safe for the pigs and keep the pens dry, free of dust and easy to clean. Raised wooden slatted floors with 1 cm between the logs are recommended.

Daily cleaning and manure collection is also suggested as it limits the faecal oral transmission of diseases as well as provide cheap fertilisation for the fields.

4.1.2 Nutrition

Water availability during dry season was reported as a problem only in one of ten villages, but few pens in the NewV had water during the village walks despite hot weather. Water sources were wells, rivers or natural reservoirs and water was provided with feed in all ten villages. Rice by-products, household scraps, foraging and alcohol production by-products were the most common feed sources and only in 22 % of the BQFs supplementary factory feed was said to be used. Troughs made of wood, old tyres or metal bowls were used for feeding and not reported ever to be cleaned. Malnutrition, especially in the sows, seemed abundant according to their body constitution.

If good quality water and sufficient water supply were stressed pig health could be improved. Thirst can reduce the daily feed intake making the pigs more vulnerable to diseases and reduce growth rate (Oosterwijk *et al.*, 2003). In lactating sows an insufficient water supply may also reduce the milkyield resulting in undernourished piglets. Oosterwijk *et al* stresses that household scraps should be properly boiled before fed to avoid spreading diseases and that troughs should be cleaned on a regular basis.

Malnutrition in pigs in Lao PDR is most commonly caused by protein deficiency (Gleeson, personal communications). Foraging and increased knowledge on nutrition could increased protein in feed and reduce mineral deficiency, abundant even in free ranging pigs. Low protein feed can result in sows not gaining enough weight before mating with low breeding results as an outcome but also more undernourished sows for every litter. Low protein feed also limits the possibility to use higher performing crossbreeds.

4.1.3 Breeding

In all BQFs the predominant pig breeds used were of indigenous origin, but a few farmers kept Large White breeds (Yorkshire) or crossbreeds with Large White. In 50% of the BQFs the farmers answered that they did not have enough boars, some villages none. Reasons given were that the boars had died in disease, that they were slaughtered or sold. Most villages lacking boars would borrow one from a neighbouring village to mate the sows. No selective breeding was reported and boars were sometimes kept with the sows all year around. Sows and boars from the same litter were not always separated before puberty and no planning to avoid inbreeding was reported. The age of which piglets were weaned differed between 2 and 14 weeks.

If the VVW together with the village farmers planned and recorded all breeding, genetic diversity could be improved. By keeping a record of sows and boars in the village and promoting purchase of new boars every few years selective breeding could be started. Breeding results could also be improved if castration of boars not

selected for breeding was encouraged before weaning and if pigs from the same litter were kept separate after weaning if not castrated. In order to avoid bringing disease into the village a limitation of boars borrowed from nearby villages could be started. A minimum age for weaning is recommended as piglet mortality before weaning is high. In commercial western pig farming weaning is usually done at the age of three to five weeks but sometimes earlier (Gordon, 1997). In a low intensive system weaning at a higher age is advisable for improved piglet survival after weaning.



Figure 4.2: pregnant sow of indigenous origin.

4.1.4 Health and Disease

Severe disease was reported to occur at least every 2-3 years in all villages and in 56% of the BQFs more often than once a year. No tests were reported to be used to confirm diagnoses during disease outbreak. In all but one village sick pigs were said to be sold in case of disease. A middleman was in all ten villages the most common trading practice for sale. For purchase, however, all the pigs would come from the same village or a village nearby. Medical treatment used during disease outbreak in 5 of the villages was mainly oxytetracycline, but in one village the farmers gave paracetamol and vitamins as treatments. The effect of the medication was not discussed. Other action during disease outbreak in the own stock was to slaughter the pigs, to sell them or to separate the sick pigs from healthy ones. When other farmers in the village had sick pigs, 57% reported that they would sell their own pigs. In some villages a few different answers were given to the questions on action during disease outbreak and percentage is made from the total of answers given. No consideration was made to different diseases (see below). The number of sick pigs was increased in two thirds of the villages when new animals were introduced. Slaughter of feral pigs was carried out in 80 % of the villages. One to five pigs were slaughtered annually, except in one village where more than 20 pigs were captured every year. No village used any routine treatments in all age-groups of animals. The farmers considered diseases as the main problems in the village pigs, but nutrition and housing was also mentioned.

Question Nr. 3.22 “What do you usually do when you have sick pigs?”

Separate sick pigs from healthy ones	Slaughter sick animals	Sell sick piglets or sick and healthy ones	Vaccinate sick and healthy animals	Treat sick animals with antibiotics
15%	15%	46%	0%	23%

(n=26)

Question Nr. 3.23 “What do you usually do with you own pigs if other farmers in the village have sick pigs?”

Restrict movement of pigs in village	Sell piglets	Vaccinate stock	Treat with antibiotics	Nothing
13%	57%	4%	17%	9%

(n=24)

It is recommended that every village have a quarantine area outside the village to keep purchased pigs in before introducing them into the village. One or two village pigs could be kept with the new ones for a more reliable disease detection. Separation of sick pigs from healthy ones and movement restrictions for animals and humans could be tried, but would be unlikely to work in the rural villages as it would interfere with normal movement and social behaviour. Middlemen are spreading diseases and should if possible never be allowed to enter the village with animals. Generally during a disease outbreak the farmers do not know what to do, and therefore sell their pigs to ensure not to lose all money invested in case the pigs die. The developed world model to slaughter pigs affected by viral diseases such as CSF would be unlikely to work in Lao PDR because of poverty and lack of economical coverage to the farmers. Understanding of why sale with sick pigs should be avoided could limit disease outbreaks. Increased knowledge that persistent infected animals can function as carriers of disease could also change the widespread beliefs among farmers that all animals surviving diseases are strong and should be used for breeding.

A working vaccination routine could be an option to prevent CSF but would require easy access to good quality vaccines and village people responsible for keeping a record on them (Khounsy, personal communications). To keep the cold-chain and a good vaccine quality would be difficult in the region. Therefore vaccinations have sometimes been given twice to ensure vaccination resulting in extra cost. In today’s low input small holding farming system the most successful entry point for a reduced number of unhealthy pigs would probably be to improve management rather than to vaccinate. A heat stable vaccine for CSF to be used in the field has however been developed and could be an option to prevent CSF (Khounsy, personal communications). Vaccination does however only give a partial protection but is sometimes believed by the farmers to be the optimal solution (Engel *et al.*, 1999). During an eradication programme for Audjeskys Disease Engel *et al* experienced that effort to eradicate a virus by other measures

declined if vaccination was practiced and could in the worst case lead to an increased number of sick animals instead of the opposite.



Figure 4.3: Vaccination of a village pig.

4.1.5 Training of Veterinary Village Workers

Interviews with the VVW in the four NewV showed that they had very different experiences ranging from time as VVW from 1 month to 9 years. They had been given different amount of training from no training at all, to 17 days of training at the most. All training was provided by the DPO or the PPO. None of them had had any training in sample collection, post mortem examinations or use of anthelmintic drugs in livestock.

4.1.6 Methodology aspects on the qualitative analysis

The BQF is in many aspects limited as every answer has to fit into one or a few of the listed options for answers. The short questions sometimes give room for misunderstandings and it is not always specified exactly what is requested. The BQF does however make it easier to compare villages and to analyse data than an open question interview would do.

In all villages women were answered to be responsible for pig farming sometimes with the children helping out. Farmers responsible for looking after the pigs were asked to stay and fill in the BQF, but in all villages at least one third of the farmers that stayed were men. If the BQF was filled in with the help of other farmers than the ones in charge of the pigs, data collected may not be reliable.

Different answers given in the two BQFs from the same village were abundant. Only two questions showed exactly the same answer in the BQF from the same village. On questions with multiple choices divergences were big as expected, but

also in questions with only two options such as yes/no questions and season questions, different answers were common. In question number 3.4 (see below) different answers were observed in 50% of the villages and most questions would show different answers in at least one of the villages.

During the simple analysis some general differences between the four newly recruited villages (NewV) and the previous six ones (PreV) were found. Daily time spent looking after the pigs were in all of PreV more than one hour per day and in NewV few spent more than two hours daily. Season for most labour time was in most of PreV rainy season but in NewV it was 50/50. Feral pigs were slaughtered in wet season in all but one of PreV but different seasons were answered in NewV.

Question Nr. 3.3 “Daily time spent looking after the pigs?”

Villages	< 1 hour	1-2 hours	> 2 hours
New	43%	43%	14%
Previous	0%	73%	27%

Question Nr. 3.4 “Time of the year when greatest labour input is required?”

Villages	Wet season	Dry season
New	50%	50%
Previous	82%	18%

Question Nr. 5.4 “Season for slaughter of feral pigs?”

Villages	Wet season	Dry season
New	60%	40%
Previous	83%	16%

Differences between NewV and PreV may not be actual divergences. It could be a result of different methodology used. Suggested reasons are that the data was collected in May (rainy season) in PreV and in November (dry season) in NewV, that different teams collected the data and that no introduction meeting was held prior to data collection in PreV. In the BQF some of the questions required answers on pig production (even numbers) a few years back. Depending on who, when, where and how it is asked different aspects will be remembered by the farmers and exact information can not be expected (Mikkelsen, 1998). A risk of misunderstandings and entering of wrong answers in the questionnaire is also abundant. Mikkelsen even suggest that the analyser play an important role in the qualitative analysis as previous cultural experiences and values will have an effect on the results.

The planned data collection by VVW, PPC and DPC once a month for one year will give more reliable data. If the farmers also could be provided with forms to

keep their own records on animal events during the time between visits data quality could be improved. Important is however that the record keeping is done in a way the farmers can master and that educational training in record keeping is done prior it is introduced (Kim Jong et al., 2001).

4.2 Quantitative analysis

Most of the information in the BQF has not been analysed in Epi Info as information from four villages is not sufficient for a summary. A future analysis when data from more villages has been entered to the data set will hopefully give some valuable information. The piglet mortality part of the BQF has been analysed. In total 58 farmers in NewV answered the questions on piglet mortality. The farmers were asked to give average numbers on: how many piglets a sow would normally have, how many piglets she would normally wean, how many piglets from a litter that were normally sold and how many piglets from a litter that normally die from diseases after weaning.

4.2.1 Analysis of piglet mortality

Information from NewV in the BQF piglet mortality table was entered into Epi Info:

	<u>Means ± standard error (range)</u>
Number of born piglets	7.6 ± 3.9 (4-15)
Number of weaned piglets	6.1 ± 5.1 (0-10)
Number of sold piglets	4.9 ± 6.6 (0-9)

Forward

Born	Frequency	Percent	Cum Percent	
4	1	1.7%	1.7%	
5	6	10.3%	12.1%	
6	10	17.2%	29.3%	
7	12	20.7%	50.0%	
8	16	27.6%	77.6%	
9	7	12.1%	89.7%	
10	1	1.7%	91.4%	
11	2	3.4%	94.8%	
12	2	3.4%	98.3%	
15	1	1.7%	100.0%	
Total	58	100.0%	100.0%	

Figure 4.4: Number of born piglets analysed in Epi Info version 2002.

Weaned	Frequency	Percent	Cum Percent	
0	3	5.2%	5.2%	
2	2	3.4%	8.6%	
3	3	5.2%	13.8%	
4	2	3.4%	17.2%	
5	6	10.3%	27.6%	
6	12	20.7%	48.3%	
7	16	27.6%	75.9%	
8	8	13.8%	89.7%	
9	5	8.6%	98.3%	
10	1	1.7%	100.0%	
Total	58	100.0%	100.0%	

Figure 4.4: Number of weaned piglets analysed in Epi Info version 2002.

The death post-weaning column was excluded as the numbers were apparently wrong, since it had not been correctly understood that only the post weaning deaths were supposed to be counted. The number of born piglets reached from four to fifteen with a majority of answers between five and nine. The number of weaned piglets showed greater differences ranging from zero to all of the piglets born and can explain a variance of 5.1. The number of sold piglets varied between zero and all of the piglets born.

The average number of surviving piglets until weaning were 80% and must be considered a high number of survivals. Average number of survivals until after weaning in commercial Swedish pig farming in 2004 were 83% (www.qgenetics.com). The number of born piglets were considerable lower than in western commercial pig farming. Figures in Sweden 2004 were 11.7 alive piglets born for gilts and sows and slightly higher for only sows.

Litter size in pigs is influenced by many factors in the mother such as: age, parity, season, previous lactation length, previous weaning-to-conception interval (Gordon, 1997). Other important factors are the boar, husbandry practices, feeding, disease, stress, environment (daylength, humidity and temperature). The small litters reported by the Lao farmers are probably due to a lot of factors but undernourished sows and low quality in the breeding material is suggested to be among the most important reasons. But it could also be due to that the data is based on a high proportion of primiparous sows, that on average give birth to smaller litters. An average number of piglets born and weaned by indigenous breeds in an optimal environment would have been interesting as a comparison.

4.2.2 Methodology aspects on the quantitative analysis

The risk of collecting biased data with the method used has been discussed in 4.1.6 and can be applied also in the quantitative analysis. It might even be more difficult for the farmers to remember numbers than qualitative aspects. The farmers were asked to communicate average numbers and a suggestion is that the information would have been more usable if they had been asked on numbers in

their last litter. Data collected monthly over the year would give a better quality data and enable a comparison with the information given in the BQF, offering some indication on how reliable data is collected at one occasion.

Quantitative indicators can be misleading giving an impression of greater objectivity than qualitative indicators (Mikkelsen, 1998). To minimise bias a combination of qualitative and quantitative methods is preferred. A methodological pluralism with flexibility in the choice during the project is suggested by Mikkelsen for more reliable results.

5 GENERAL CONCLUSION AND RECOMMENDATIONS

5.1 Research for improvements

5.1.1 General comments on research for rural development

Small improvements in livestock management and low cost investments could make a big difference for Lao small holder farmers and thereby improve their livelihoods. Further research in livestock health, aimed at the management is necessary. Research prioritised by the farmers and full co-operation of farmers and the village head is likely efficient (Ørskov, 1993). An understanding of interactions between the different elements such as external forces (markets), inter household relations, intra household relations, the normal life cycle and to apply a farmers household approach to evaluate their relevance will enable robust results (Valdivia, 2001).

The pig farmers in the villages visited were concerned about major disease outbreaks causing big losses and were very keen on starting vaccination against CSF. It should be noted though that other health issues such as parasite- and bacterial infections causing slow growth might have as much impact but is not as obvious and sudden and does not cause instant economical problems. More research on diseases other than CSF would be valuable for a wider understanding of pig health in the lowland villages.

In one of the four NewV, farmers complained that disease in chickens was a bigger problem than unhealthy pigs and asked for help in poultry management. Involvement of farmers in project design is discussed in the ACIAR project as participatory research and extension approach is planned to be introduced by FLSP. In participatory research the farmers are supposed to be involved in the selection, design, planning and implementation of the project (Mikkelsen, 1998). Feedback to the farmers should be given continuously integrated with the development activities.

5.1.2 Pig management in lowland villages

The most pressing needs in the villages seemed to be:

- Knowledge amongst the farmers on successful management, disease prevention and action during disease outbreak.
- Training of VVW on general pig management as well as disease prevention, treatment and diagnoses.
- Increased communication between farmers, VVW, DPC, PPC and National Project Coordinators.
- Accessibility to villages enabling quick transport of diagnostic samples and people.
- Money to invest in management improvements.

The critical shortage of qualified veterinarians in Lao PDR (approximate 30 veterinarians today) and the fact that few students are being trained will be likely to cause problems in livestock health, but can be limited if field staff is provided with good local knowledge and understanding. Follow up training of VVW, DPC and PPC in tropical livestock management influenced by local knowledge will most likely be important in future projects.

5.1.3 Entry points, feedback and information pass on as a short time working foreigner

My overall experience from the field work is that it worked well. It was very valuable to evaluate the meeting from the first village before continuing with the other three. As a foreigner I had an obvious disadvantage not speaking the language, which has had effects on the information flow between me and the villagers. Important to emphasise though is that the farmers were interested in what I had to say partly because I was foreign.

I found the drawings to be a good tool in the information to the farmers and would strongly recommend it for future village meetings. The map drawing was a good starting point of the group discussions as it encouraged all attending farmers to take part. I found them to be more active in the fill in of Baseline Questionnaire Form if they felt as an important part of the group in the beginning. To achieve more participation they were asked individually on piglet mortality after the first page of the form was filled in and were also asked to draw their house in the village map. It worked very well.

5.1.4 Two forms and farmers memory

It is advisable to fill in two separate Baseline Questionnaire Forms in each village as the information given by the two groups in the current study was different in many parts. It gives you an idea of what information in the form you can trust. It is not possible to get detailed information as the farmers do not record exact data on their pigs. The farmers who attended the meeting or talked, may not be representative of the village in terms of wealth, gender, geography etc which must be taken into consideration. The detailed description on housing/penning conditions (question number 3.28 in BQF) was filled in after the village walk. I

would advise a village walk in all new villages as it gives a good idea of the pig raising systems and shows that you have an interest in the village farming.

5.2 Women and farming

5.2.1 General discussion on gender issues

Gender equality and women's empowerment has shown strong linkage to other sustainable development goals in developing countries such as poverty reduction, environmental sustainability, democratic governance and realization of human rights (Woodford-Berger, 2000). A number of general recommendations for development project have been set up to increase gender issues. Some of them are:

- Training of Donors and Partners to remedy lack of gender-awareness.
- Incorporate gender issues better into project planning, evaluation, data collection and analysis.
- Inform Donors and Partners on the linkage between women's empowerment and other development goals.
- Identification and use of sex-disaggregated data and gender-aware performance indicators.

Farming systems all over the world have gender-specific agricultural tasks but women have sometimes been excluded from training programmes because experts have assumed a pattern of responsibility for agriculture similar to that of their own societies (Momsen, 1996). In European history women were cut out of farming as the state encouraged men to play a key role in agricultural technology (Shorthall, 1999). A gender analysis during project planning and for evaluation of the project can minimise gender related bias (Mikkelsen, 1998).

5.2.2 Gender considerations in the fieldwork

In the villages visited during this study village chiefs and VVWs were all men. In Phothong village only two farmers out of eighteen that helped to fill in the Baseline Questionnaire Form were women even though pig farming was answered as women's responsibility in the BQF. The DPCs and PPCs attending were exclusively men. As pig farming is mainly women's work in Lao PDR, it is important with gender sensitive experts in project planning and in the fieldwork. It does however not necessarily mean that more female experts must be involved in the project. Several reports emphasise that gender competence coupled with socio-cultural expertise is a lot more important than the sex of the team members (Woodford-Berger, 2000). A social-economic impact assessment report was conducted by Lao Women's Union in the ACIAR project on livestock diseases in 2005.

5.2.3 Women in development projects

Lack of participation of women in meetings for development have been reported a problem in many projects (Kiralyi, 1998). Some key issues have been pointed out in order to ensure women's participation namely the venue, time of the year as well as time of the day and duration of the meetings. During my introduction weeks I joined a meeting in one of the PreV. Only a few farmers were present during the meeting and the ones that showed up were upset that the meeting was held midday during the intense rice harvest. No consideration to when the farmers were busy had been taken when planning the meeting.

An activity calendar could be used when scheduling meetings so that all farmers affected have a chance to participate (Kiralyi, 1998). Other needs to ensure women's participation and information exchange are the use of visual aids in communities of low literacy and training programmes for labour-saving technologies. Improvements in infrastructure and transport will enable a better marketing system for pigs. In Ethiopia a successful women's group association was tried by female goat farmers. A credit and saving system at village level was managed by the cooperation and helped the farmers to advance from a limited low scale production to a better yielding business. A similar women's group formation of lowland pig farmers would be an interesting contribution in the ACIAR project on livestock diseases.

After I had left Lao PDR it was decided to introduce Veterinary Pig Workers (VPW) in all villages included in the ACIAR project. The VPW had to be female pig farmers and was thought to be responsible for keeping a record on pig health and to join the discussions for future development. Introduction of women as key persons in the project could increase the chance for the project to succeed. Improved pig health may even be a contribution to a changed situation for women in Lao lowland villages as it may give them a secure income and enable them to gain social empowerment and a greater responsibility.

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8 LIST OF APPENDICIES




Appendix 1: Facts on Lao PDR

Appendix 2: Example of feed

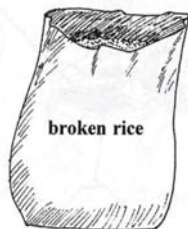
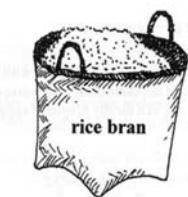
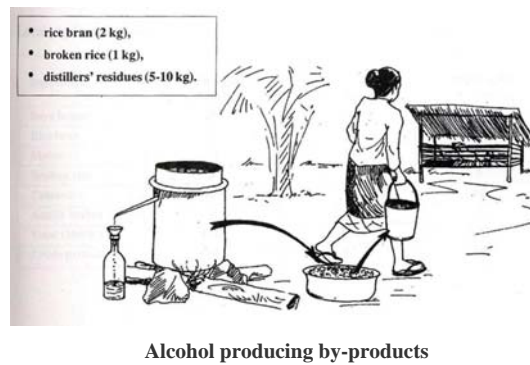
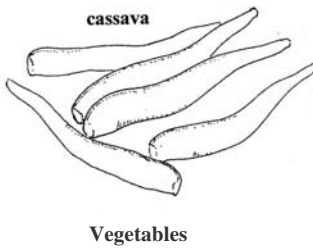
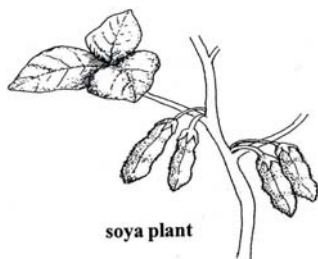
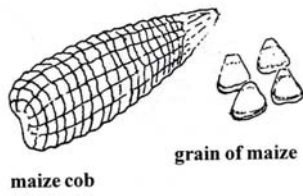
Appendix 3: Facts on livestock projects

Appendix 4: The baseline Questionnaire Form

APPENDIX 1: Facts on Lao PDR
(<http://www.cia.gov>)

The World Factbook	
 	Laos 
Location:	Southeastern Asia, northeast of Thailand, west of Vietnam
Geographic coordinates:	18 00 N, 105 00 E
Area:	<i>total:</i> 236,800 sq km
Climate:	tropical monsoon; rainy season (May to November); dry season (December to April)
Geography - note:	landlocked; most of the country is mountainous and thickly forested; the Mekong River forms a large part of the western boundary with Thailand
Population:	6,217,141 (July 2005 est.)
Life expectancy at birth:	<i>total population:</i> 55.08 years <i>male:</i> 53.07 years <i>female:</i> 57.17 years (2005 est.)
Religions:	Buddhist 60%, animist and other 40% (including various Christian denominations 1.5%)
Languages:	Lao (official), French, English, and various ethnic languages
Literacy:	<i>total population:</i> 66.4% (2002)
Government type:	Communist state
Capital:	Vientiane

APPENDIX 2: Examples of feed



Rice by-products

APPENDIX 3: Facts on livestock projects

Strengthening of Livestock Service and Extension Activities	
Executing agency:	Department of Livestock and Fisheries, Ministry of Agriculture and Forestry.
Funded by:	European Union.
Duration:	1 Feb 1998 to 31 Jan 2004.
Objectives:	(i) Institutional strengthening of animal health service and disease control at national, provincial and district level. (ii) Improvement of animal production at village level.
Components:	Training of Village Veterinary Workers, veterinary legislation, information systems, laboratory and vaccine production support, extension (farmer training and provision of credit).
Implementation:	Training of VVW is a major activity of the project. Broad range of support for national and provincial institutions on animal health.
Regional focus:	National focus except for on-farm activities which are limited to northern Lao, particularly Louang Prabang and Louang Namtha provinces.
Size of grant:	Euro 5.7 million.
Forage and Livestock Systems Project (FLSP)	
Executing agency:	Department of Livestock and Fisheries, NAFRI and NAFES, Ministry of Agriculture and Forestry, and PAFO and DAFO in Louang Prabang and Xieng Khouang.
Funded by:	Australian Government (AusAID).
Duration:	July 2000 – June 2005.
Objectives:	Integration of forage and improvements in animal management practices in upland farming systems.
Components:	Institutional and human capacity building, development of options for farmers to improve small and large animal production.
Implementation:	The project implements a participatory extension approach. Building capacity of DAFO and PAFO to do this is a major part of the project. Technical components target improvements in feeding and animal health practices.
Regional focus:	Louang Prabang and Xieng Khouang Provinces.
Size of grant:	AUD 3 million.
Improved Diagnostic and Control Methodologies for two Major Livestock Diseases in the Lao PDR and Yunnan Province, P.R. China	
Executing agency:	Department of Livestock and Fisheries, Ministry of Agriculture and Forestry and the CSIRO - Australian Animal Health Laboratory
Funded by:	Australian Center for International Agricultural Research (ACIAR)
Duration:	1997 – 2002
Objectives:	Improve the diagnostic and disease surveillance capability of staff and laboratory of the Animal Disease Laboratory, particularly in Classical Swine Fever and Foot-and-Mouth Diseases
Components:	Development of diagnostic methods and fieldwork to determine the epidemiological significance of major animal diseases.
Regional focus:	National
Size of grant:	AUD 0.9 million

APPENDIX 4: The Baseline Questionnaire Form
 (The Lao script has been taken out of the form).

ACIAR Project 9438

Pig Health and Production Baseline Questionnaire 2002 - 03

(Date today): _____

1. Village Name and Location Descriptors

(Village Name):	(District):	(Province):
(GPS coordinates):		(Village code):
(Distance to nearest market):	(Primary school location):	(Secondary school location):
(Describe road access to village):		

2. Village Demographics

(Total HH in village):	(Ethnicity):	
(Adult male population):	(Adult female population):	(Children):
(HH with pigs):	(HH with cattle/buffalo):	(HH with chickens/ducks):

3. Animal Management Practices

3.1 What is the predominant pig breed/type in this village?

- Moo lath/Moo dum (Local Lao breeds)
- Large white or durock
- Lao breed pig X large white or durock
- Other, specify.....

3.2 Are there enough boars to meet the breeding demands of this village?

- Yes
- No

3.3 Approximately, how much time do you spend looking after your pigs each day? (This includes cutting & collecting feed, collecting water, cleaning pens etc)

- < 1 hour
- 1 - 2 hours
- 2 - 4 hours
- > 4 hours

3.4 What time of the year is the greatest labour input required (time and energy) and why?

.....

3.5 Which member/s of the household assume the responsibility of looking after the pigs?

- Women
- Men
- Children
- Combination, specify.....

3.6 What are the sources of feed for pigs in this village?

- Rice by-products
- Cut & Carry grasses
- Maize
- Household scraps
- Restaurant leftovers/scraps
- Lao-Lao/Lao-Khao production by-products
- Foraging
- Other, specify.....

3.7 Is there any supplementary feeding for the breeder pigs?

- Yes
- No

If yes, specify

3.8 Is there any supplementary feeding for the grower pigs (post-weaning)?

- Yes
- No

If yes, specify.....

3.9 Is there any supplementary feeding for the piglets (pre-weaning)?

- Yes
- No

If yes, specify.....

3.10 How do you provide water for your pigs and what quantity do you provide?

- With feed
- Water available to pigs all day
- Other, specify.....

Quantity.....

3.11 What is the source of water you use for your pigs?

- Well
- Nearby river or stream
- Other, specify.....

3.12 Do you have a problem with water availability in the dry season?

- Yes
- No

3.13 Is there any routine animal health treatments (such as, use of vaccines or antehelminthic's) for:

3.13.1 Breeding stock No

Yes, what & when.....

3.13.2 Growers No

Yes, what & when.....

3.13.3 Piglets No

Yes, what & when.....

3.14 How often are there episodes of severe disease in pigs in this village causing high mortality?

- At least once a year
- Once every 2 -3 years
- Every 5 years
- Other, specify.....

3.15 What age groups are most often affected?

- Breeding stock (mature adult pigs)
- Piglets 0 - 3 months of age
- Piglets 3 - 6 months of age
- Piglets 6 - 9 months of age
- Piglets 9 - 12 months of age
- Not age specific

3.16 What season, if any, do outbreaks of disease in pigs usually occur?

.....

3.17 Do you notice an increase in the incidence of disease after 'new' stock is introduced into the village?

- Yes
- No

3.18 What age are piglets normally weaned?

- 1 - 2 weeks
- 2 - 4 weeks
- 4 - 6 weeks
- 6 - 8 weeks
- > 8 weeks
- Other, specify.....

3.19 Describe the circumstances that most often cause deaths of piglets before weaning?

.....

3.20 Describe the circumstances that most often cause deaths of piglets after weaning?

.....

.....

3.21

Piglet mortality table

	Farmer Name	How many piglets does a sow normally have?	How many piglets does a sow normally wean? (% of born piglets)	On average, how many piglets from a litter are normally sold? (% of born piglets)	On average, how many piglets from a litter die from disease after weaning?
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

3.22 What do you usually do when you have sick pigs?

- Separate sick from healthy animals
- Slaughter sick animals
- Sell sick and healthy piglets
- Sell sick pigs only
- Vaccinate sick and healthy animals

Specify vaccine.....

- Treat sick animals with antibiotics

Specify antibiotics.....

- Nothing
- Other, specify.....

3.23 What do you usually do if other farmers in the village have sick pigs?

- Restrict movement of pigs in village
- Sell piglets
- Vaccinate stock

Specify vaccine.....

- Treat pigs with antibiotics

Specify antibiotics.....

- Nothing
- Other, specify.....

3.24 What are vaccines used for/what do they do?

.....

.....

.....

3.25 What percentage of farmers in the village use vaccines?

.....
.....
.....

3.26 What vaccines are used in this village? (Cattle, buffalo, pig or chicken vaccines)

.....
.....
.....

3.27 Is pig theft a problem?

- Yes
- No

3.28 Provide a detailed description of the housing / penning conditions (also include a description of the feeding area and birthing areas) and general in-village movement of pigs.

.....
.....
.....

4. Role of Pigs in Village Livelihoods

4.1 What are village pigs usually raised for?

- Sale
- Family consumption
- To be kept for sale in an emergency
- Breeding
- Other, specify.....

4.2 At what age are piglets normally sold?

- < 6 months old
- 6 - 9 months old
- 9 - 12 months old
- > 12 months old

4.3 What is the most common trading practice when pigs are sold?

- Pigs are taken directly to slaughter-house
- Pigs are taken to local market
- Pigs are sold to farmers in nearby villages
- Pigs are sold to farmers in this villages
- Pigs are sold to middleman
- Other, specify.....

4.4 What is the most common trading practice when pigs are purchased?

- Purchased from local market, specify name.....
- Pigs are purchased from a middleman
- Pigs are purchased from farmers in this village
- Pigs are purchased from farmers in nearby villages
- Government or private pig farm
- Other, specify.....

4.5 If a middleman is used for sale or purchase, where does he/she come from?

- Nearby village
- Nearby town
- In this village
- District centre
- Provincial centre
- Other, specify.....

4.6 What are the usual prices for pigs sold (kip per head or kip per kilogram)?

Breeder pigs.....

Young pigs (post-weaning).....

Piglets (pre-weaning).....

4.7 On average, how many pigs are sold from this village each year?

.....

5. General Animal Health and Production

5.1 Do people in the village capture and slaughter feral pigs for local consumption?

- Yes
- No

5.2 If yes to Q 5.1, do you:

Slaughter feral pigs in the forest and bring the meat back to the village,
or

- Bring live feral pigs back to village for slaughter

5.3 If yes to Q 5.1, how many feral pigs are captured each year on average?

- 1 - 5
- 6 - 10
- 11 - 15
- More than 15

5.4 Is there a particular season (time of year) when feral pigs are captured?

- Yes, please specify.....
- No

5.5 What do you think are the biggest problems with pig production in this village?

.....
.....

5.6 What intervention strategies have you personally implemented to try and counteract the problems you face?

.....
.....

5.7 How successful have these strategies been?

.....
.....
.....

5.8 If the input to benefit ratios in village pig production were to increase, would an increase in production be a viable option?

- Yes
- No
- Mixed response

5.9 What areas do you think would need to be improved before village pig production could be increased?

.....
.....
.....

5.10 Would you be willing to invest more time and money to increase pig production?

- Yes
- No
- Mixed response

5.11 What are the risks of investing more in pig production?

.....
.....

5.12 How do you think you may over-come these risks?

.....
.....
.....
.....