



Smallholder Pig Rearing Systems in Northern Lao PDR*

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ABSTRACT : This paper describes the results of a survey aimed at characterizing smallholder pig production systems in northern Lao PDR. A total of 341 households from five Northern provinces were interviewed in the survey. Village meetings and individual interviews, using a semi-structured questionnaire, were used to collect information. Three main pig rearing systems, free-scavenging, semi-scavenging and confinement (enclosures and pens), were found in the survey areas. These systems were practiced differently by smallholders depending on the level of intensity of crop production, ethnicity and purpose of keeping pigs. The confinement system was mainly practiced by Lao-Tai and Tibeto-Burman groups, who mainly bought piglets and fattened these pigs for sale. In contrast, the Mon-Khmer and Hmong-Mien reared pigs in free-scavenging and semi-scavenging systems, and usually keep sows for piglet production. The main factors that affected the changes in rearing systems were found to be level of intensity of crop production, local regulations and outbreaks of disease. The main constraints found in smallholder systems were outbreaks of disease, high mortality of piglets and the slow growth rate of fattening pigs. (**Key Words :** Rearing System, Ethnic Group, Disease Outbreak, Intensity of Crop Production)

INTRODUCTION

Smallholder agricultural systems in Lao PDR are mixed farming systems including staple and cash crops as well as livestock production. In this context, pig production plays an important role in smallholder farming systems, as a source of income and capital accumulation for use at critical times (rice shortage, medical treatment or marriage). In 2008, there were about 2,460,000 pigs in Lao PDR (DLF, 2008), and approximately 85% of these were kept in smallholder systems, mainly in the mountainous regions (Thorne, 2005). In 2006, Phengsavanh and Stür (2006)

concluded from their survey in three districts in two Northern provinces that there were three main production systems, namely free scavenging, confinement in a small area with simple shelter provided, and penning. Recently there have been reports of rapid change in cropping and livestock systems in the Northern part of Lao PDR (Government report, 2009) which have attributed to improved road accessibility to many of the remote villages, in addition to government policies of reducing shifting cultivation and increasing market-oriented agricultural production. Improved accessibility of villages brings many benefits, but also increases the risks of bringing pig disease to these previously “sheltered” villages. It was hypothesized that crop intensification may have led to incompatibilities with traditional extensive pig production systems and, together with an increased incidence of pig diseases, have become important factors driving farmers to change their extensive pig production systems into more confined systems. Before interventions to assist smallholder farmers in improving their production systems can be designed, a better understanding of the current systems and the key factors that motivate farmers to change their production systems is needed.

This study to characterize smallholder pig production systems in Northern Lao PDR was carried out with the aim of better understanding the prevailing production systems

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and the factors that influence their development.

MATERIAL AND METHODS

Study area

The study was carried out in 32 villages in five districts in five provinces in Northern provinces of Lao PDR: Phongsaly, Oudomxay, Luangphabang, Xayaboury and Xiengkhuang. The provinces and districts were selected on the basis of having the highest pig population among all provinces and districts. Within the selected districts, villages were allocated to one of three groups according to market access as indicated by distance to the district capital (less than 1 h, 1 to 3 h, and more than 3 h by car). Within each of these market access groups, villages were chosen randomly for the study. Within each selected village, 10 households, or a minimum of 10% of pig rearing farmers in village were randomly selected for group meetings and individual interviews. A total of 341 households were interviewed in the survey. A more detailed description of the selection process can be found in Phengsavanh et al. (2010).

Methods used for the survey

Two methods were used to collect primary information: i) farmers' focus group meetings and ii) household interview surveys using a semi-structured questionnaire.

The focus group meetings were designed to obtain general information about the main agriculture and livestock activities, detailed information about the pig production systems practiced by farmers in the village, and to discuss issues associated with these pig production systems. The information from focus group meetings was used to complement and corroborate farmers' responses in the individual interviews.

The individual farmer interviews were used to collect details on management, productivity, problems and benefits of raising pigs. This information, gathered through face to face interviews using a semi-structured questionnaire, was followed by probing questions to gain a deeper understanding of the issues. The details of these methods have been described in Phengsavanh et al. (2010).

The issues covered in the questionnaire included questions on experience in pig production (When and why

did you start raising pigs?), rearing and management systems (How do you keep and manage your pigs? Have you changed the way you raise pigs and why?), feed and feeding system used, production and reproductive performance, and problems and benefits of raising pigs. The average growth rate was calculated from farmers' estimates of the time taken to grow individual pigs from the start of fattening them for sale until sold for slaughter and the weight difference of pigs at the start of fattening and the weight when the animals were sold. Based on this information, the approximate daily growth rate was calculated. Data on reproductive performance was collected based on information about individual sows that the farmers owned at the time of the interview.

Data analysis

The data was entered into a spreadsheet and analyzed using PASW Statistics 18 (2009) for descriptive analysis of means, medians and ranges, frequency of distribution and variation.

RESULTS

General household information

Average household size ($n = 341$) in the survey area was 6.4 people (median 6.0; range 2.0-17.0) and was similar among all main ethnic groups, ranging from 5 to 7 people, consisting of mainly parents and children (75%), and grandparents. Almost all households (99%) owned land for cultivation. The mean agricultural land area per household was 3 ha (median 2.0; range 0.3-7.1) and each household had on average of 3 parcels of land (median 3.0; range 1.0-9.0) which they used to cultivate crops, including rice, maize, cassava, annual cash crops, and plantation trees.

Farmers kept five major types of livestock, namely: pigs, cattle, buffaloes, poultry (mainly chickens and ducks) and goats (Table 1). Approximately 1/3 of interviewed households raised cattle and buffaloes. The survey also found that households who had rice paddy fields in lowland and flat areas kept buffaloes more often than household living in other areas, as they needed them as a source of draught power for land preparation. Cattle were found to be kept by farmers in all the study areas, but more often by the

Table 1. Livestock ownership*

Animal type	Household with livestock (%)	Number of animals raised by households		
		Mean	Median	Range
Pigs	100	5.3	4.0	1-32
Cattle	33.7	3.5	3.0	0-25
Buffalo	36.0	3.0	3.0	0-12
Poultry	83.0	30.0	20.0	0-300
Goats	10.0	4.7	4.0	0-15

* $n = 341$.

Table 2. Size and structure of pig herd for different production purpose (n = 341)

Production purpose	Sow	Boar	Piglets	Fatteners
Piglet production (n = 130)				
Frequency (%)	100	15	77	-
Mean	2.3	1.0	4.4	-
Median	1	1	4	-
Range	1-4	1	0-17	-
Fattening pig production (n = 84)				
Frequency (%)	-	-	-	100
Mean	-	-	-	3.8
Median	-	-	-	3
Range	-	-	-	1-32
Mixed (Piglet production and fattening) (n = 127)				
Frequency (%)	100	14.4	66.6	100
Mean	1.5	1.0	4.3	2.3
Median	1	1	4	2
Range	1-3	1	0-17	1-3

better-off households in the village as assets to generate cash in case of needs.

All of the interviewed households raised pigs and, on average, kept 5.3 pigs per household (Table 1). Based on the purpose of pig production (Table 2), households could be divided into three groups: those that i) produce piglets for sale (38%), ii) fatten pigs for sale (25%), and iii) produce both piglets and fatten pigs for sale (37%). The number of pigs raised and herd structure differed according to the purpose of production (Table 2).

Within the mixed production group, 71% of households raised pigs primarily for piglet production but also fattened a small number of pigs mainly for use in traditional ceremonies and festivals. These animals were usually the ones left from the previous litter, either because the farmer was unable to sell them or because he wanted to fatten them for their own use. The remaining 29% of households primarily fattened pigs for sale but also produced piglets for their own use and for sale within village.

The purpose of pig production differed among ethnic groups, although in all ethnic groups there were a significant percentage of farmers who engaged in mixed production systems (Table 3). The Lao-Tai tended to raised pigs primarily for fattening for sale, while the Mon-Khmer and Hmong-Mien were engaged more in piglet production.

The Tibeto-Burman was engaged in both fattening and piglet production.

The survey found that around 90% of households raised indigenous native pigs and that only 10% of households raised exotic breeds, crossbreeds, or both crossbred and exotic pigs. Households raising exotic and crossbred pigs were mainly from the Lao-Tai group living close to the large towns, and were engaged in more market-oriented production systems. Two main indigenous breeds (or types) were found in study area: the Moo Lat and Moo Hmong pigs. Both breeds are characterized by being either completely dark grey or dark grey with some white spots. The mature weight of Moo Lat and Moo Hmong pigs ranges from 80-100 kg and 100-120 kg, respectively.

Pig rearing systems

The study found that farmers raised pigs using in three main production systems (Table 4). The details of these are as follows:

Free-scavenging system: In this system, pigs were allowed to scavenge freely for feed all the year round. Farmers gave only small amount of additional feedstuff to scavenging pigs. In some villages, farmers feed their pigs only when they were not working in the upland rice fields. Farmers practicing the free-scavenging system kept pigs

Table 3. Purpose of production of different ethnic groups

Ethnic group	Total number of respondents	Frequency (%)		
		Piglet production	Fattening pigs	Mixed production (Piglet and fattening)
Lao-Tai	110	10.0	53.6	36.4
Mon-Khmer	113	58.5	8.8	32.7
Hmong-Mien	78	56.4	2.6	41.0
Tibeto-Burman	40	25.0	40.0	35.0

Table 4. Type of production system used by farmers with different accessibility to markets (distance in hours by car from nearest town) and used by different ethnic groups

Item	Total(n)	Frequency (%)			
		Free-scavenging	Semi-scavenging	Year-round confinement	
				Enclosure	Pen
Distance from nearest town*					
≤1 h	112	6.3	14.3	8.0	71.4
>1- <3 h	119	5.9	13.4	30.3	50.4
>3 h	110	39.0	30.0	12.7	17.3
Ethnic group					
Lao-Tai	110	1.0	9.0	0.0	90.0
Mon-Khmer	113	15.9	35.5	31.0	18.6
Hmong-Mien	78	35.9	19.2	38.5	6.6
Tibeto-Burman	40	25.0	5.0	20.0	50.0

* hours by car.

mostly for piglet production, and had 2-4 sows plus piglets. They fattened pigs only for special purposes, such as traditional festivals, wedding and other cultural ceremonies. In most villages pigs were kept in simple shelters, but in some villages pigs simply stayed under dwellings, under rice storage sheds or under trees.

Free-scavenging, was typical for more remote, less accessible areas (often inaccessible in the rainy season and travel in the dry season took more than three hours to get to the district center by car). The agricultural systems, especially crop production, were extensive. In these remote areas, 39% of interviewed households raised pigs in free-scavenging systems, compared to only 6% in the areas close to the towns. This system was practiced by three main ethnic groups, Hmong-Mien, Tibeto-Burman and Mon-Khmer (Table 4). The system was not common for the Lao-Tai ethnic group, as there were only 1% of households of this group practiced free-scavenging.

Semi-scavenging system: The semi-scavenging system was used for both piglet production and fattening. In this system, pigs were allowed to scavenge freely only after the main crops had been harvested. In the free scavenging time, farmers provided small amounts of feed each day and pigs had to find the rest of their feed by themselves. During the planting and crop growing seasons, pigs were confined either in pens or enclosures, built near to the villages or close to the crop production areas. At this time, pigs only received feed from their owners. The main feeds provided were rice bran, maize, cassava and green leaves which were available in the forest, on fallow areas, or along stream banks.

This system was practiced in all areas, but was more common in the most remote areas (Table 4), and was practiced more by the Mon-Khmer and Hmong-Mien people. The semi-scavenging system was not commonly practiced by the Lao-Tai and Tibeto-Burman ethnic groups.

Year-round confinement system: Villages with confinement systems were found mainly in the areas closer to the district centers (Table 4). Two different types of confinement were found in the survey area: pens and enclosures, and pigs were normally kept in pens or enclosures throughout the year.

The penning system was found to be the most common pig production system practiced by the Lao-Tai and Tibeto-Burman ethnic groups, who fatten pigs for sale (Table 4). The percentage of surveyed households from each ethnic group practicing this system was 90% for the Lao-Tai and 50% for the Tibeto-Burman ethnic groups, compared to 19 and 7% respectively for the Mon-Khmer and Hmong-Mien groups. During the interviews, farmers mentioned that bringing in piglets from other villages could introduce disease problems. For this reason, some farmers had started to produce piglets in their own villages. Pig production in this penning system was usually more intensive than in other systems, and around 36% of interviewed farmers in this system had started to use exotic and crossbreed breeds and feed concentrate to both/either piglets and to growers. Farmers vaccinated pigs on a regular basis and sometimes also de-wormed their pigs. The Mon-Khmer, Hmong-Mien and Tibeto-Burman ethnic groups used enclosure systems for raising pigs, whereas this was not common practice for the Lao-Tai group (Table 4). The aim of putting pigs in an enclosure was not to intensify the system, but rather to keep pigs away from crops and improve village sanitation. Pigs in enclosures were fed traditional feeds, such as rice bran, maize, cassava and green plant materials.

Drivers of change in production systems

Farmers were asked to describe the type of production system they practiced 5 years ago, what they practice now and what they expect their system to look like in the future. Their replies showed that within the last 5 years, many

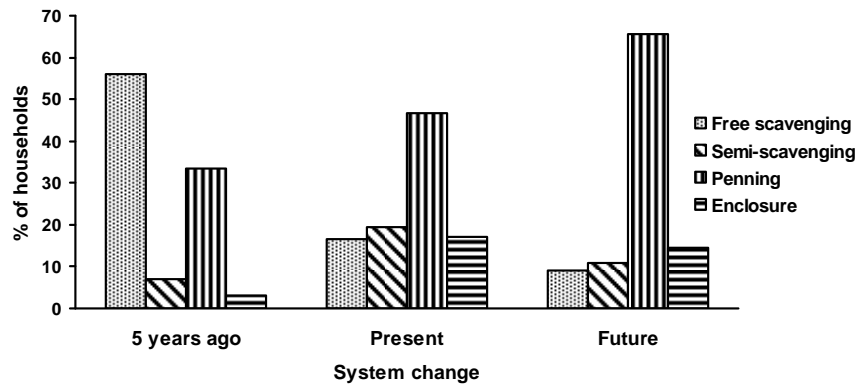


Figure 1. Changes in pig production in smallholder systems.

farmers had moved from free-scavenging systems towards confined systems (Figure 1). Farmers were also asked to list the main factors that influenced their decision to confine their pigs. The three most frequently listed factors driving the system change were: more intensive crop production (or expansion of crop production), village regulations limiting free-scavenging (or making the pig owner responsible for crop damage) and more frequent outbreaks of disease. In addition to these factors, the ease of provision of better management in confinement systems and improved village sanitation were also mentioned by some farmers. However, the village sanitation and outbreaks of disease were more concerned and important in communities closer to markets than those in more remote areas.

Main problems in smallholder pig production

The main problems identified by farmers during the survey were outbreaks of disease, slow growth rates, difficulty in finding feed and high mortality of piglets (Table 5). In addition to these, several other problems such as insufficient funds to expand pig production, lack of labour to properly manage pigs and the high cost of

commercial feed were mentioned.

Figure 2 indicates that the relative importance of problems differed among ethnic groups. While the outbreak of disease was ranked as the most serious problem by all ethnic groups, other problems were ranked differently. In relation to diseases, farmers reported that an outbreak of disease usually occurred twice per year, coinciding with changing seasons. Around 65% of respondents, who mainly rear pigs in free-scavenging and semi-scavenging production systems, reported that losses usually ranged from 40 to 80% of the head, but in some cases mortality was as high as 100%. Most farmers had no explanation for these outbreaks, but 13% of interviewed households identified bringing pigs from other areas as a main cause of outbreak of disease. Farmers had little knowledge of how to prevent disease epidemics and only 4% of interviewed households vaccinated their pigs against classical swine fever (CSF). About half of farmers (53%) said that they preferred treating pigs only when they are sick. Other producers said that when their pigs got sick they sold them, slaughtered them for food or moved them to secluded areas. The mortality rate of piglets was as high as 50%. The most

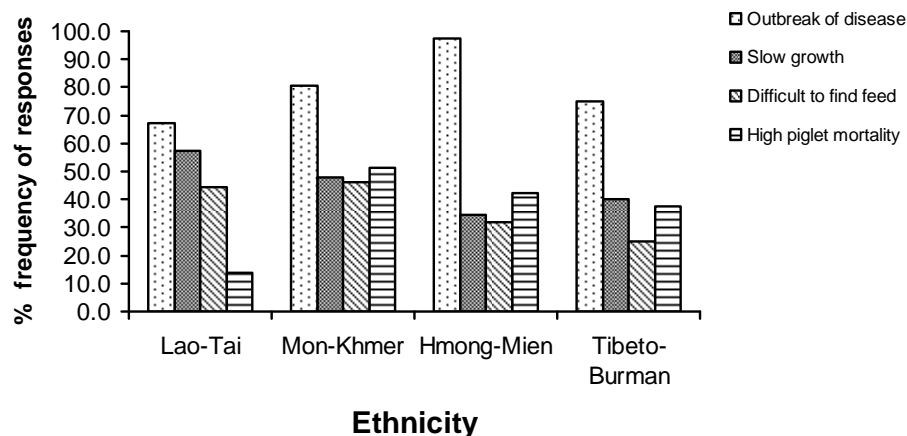


Figure 2. Constraints in smallholder pig production as identified by different ethnic group.

Table 5. Relative importance of pig production constraints as identified by respondents

Problem	Ranking of pig production constraint				Number of respondents	% ^a
	First	Second	Third	Fourth		
Outbreak of disease	197	50	24	0	271	79.5
Slow growth of pigs	59	56	44	1	160	46.9
Difficult to find feed	28	66	44	0	136	39.9
High mortality of piglets	40	70	9	2	121	35.5
Insufficient funds	2	12	8	1	23	6.7
Low price of pigs	1	6	6	2	15	4.4
Lack of labour	1	2	2	1	6	1.8
High cost of concentrate	5	0	0	0	5	1.5
Theft of pigs	0	0	2	1	3	0.9

^a Total of observations is more than 100% due to multiple responses.

common causes of death reported by farmers, who experienced pig mortality during the last 12 months, were disease outbreak (86%) and diarrhea (44%).

DISCUSSION

Pig production systems in Lao PDR are mixed, multipurpose agricultural systems, which include pig production only as one of several livelihood options. Pigs, however, play an important role in income generation with relatively low input in traditional systems. If further intensified, they have potential to bring good revenues and help to secure income security for smallholders and food security for the region.

The average number of pigs being raised by farmers in this study was 5.3 animals, which was clearly higher than the average of 3.4 pigs per family reported previously for farmers in the Northern Lao PRD (Vongthilath and Blacksell, 1999). This may have been related to the purposeful selection of areas with a high pig population for this survey. Our survey indicates a relationship between the number of pigs per family and the production purpose. Household producing piglets had on average 7.7 pigs, those fattening pigs had 3.8 pigs and those producing both piglets and fattening pigs had 8.9 pigs.

The production purpose was also related to ethnicity. Traditionally, Mon-Khmer and Hmong-Mien farmers are the main producers of piglets to sell to other farmers, either for breeding or for fattening. The Lao-Tai and Tibeto-Burman farmers produce mainly fattened pigs for sale, and traditionally buy piglets for fattening from Mon-Khmer and Hmong-Mien farmers rather than producing piglets themselves. However, this situation is changing and some farmers of the Lao-Tai ethnic group had started to produce piglets themselves. The reason for this is that purchasing piglets from markets and other villages has brought diseases into their village which killed many pigs in their village, so farmers now produced their own piglets in order to prevent

this from happening again.

Two native pigs, Moo Lat and Moo Hmong, were the most commonly kept pig breeds in the study areas. These two native pig types could be different "breeds" but so far no genetic studies have been undertaken to confirm breeds status of native pigs in Lao PDR (Wilson, 2007). Native pigs are important for farmers employing free-scavenging systems, as native pigs are well able to satisfy some of their nutritional needs in free-range conditions (Kennard et al., 1996). These local pigs are similar to other local pig breeds in neighboring countries such as China, Vietnam and Thailand, which are often characterized by yielding more fat than meat. As pig fat often is the only available source of cooking oil in remote villages, farmers often prefer to raise native pigs rather than exotic breeds. However, for some Lao-Tai villages located near to the town centre, the situation is different as there is a market demand for lean meat. The Lao-Tai farmers have started to keep crossbred or pure exotic breeds, as they have higher growth rates when fed well, and produce carcasses with lower fat content (Phengsavanh and Stür, 2006).

The types of pig production systems employed by farmers in Northern Lao PDR are related to the production purposes, intensity of cropping and ethnic traditions. Similar results have been found by Keoboulaphet and Miklet (2003) and Phengsavanh and Stür (2006).

The free scavenging system was practiced mostly in remote areas, where agricultural production is still very extensive. Pravongviengkham (1998) described this system and stated that pigs were always allowed to roam freely around the houses to scavenge for their feed. However, we also found that there were different practices in feeding and management from site to site. In some villages, pigs were allowed to roam freely in the village and surrounding forests, while in other villages, farmers built fences around their houses. In other areas, pigs were allowed to roam freely only outside the village and a fence was built around the village to improve sanitary conditions within the village.

The feeding systems were also found to vary depending on the seasons. In the crop planting and growing season, most farmers feed their pigs only once a day, and in some areas farmers feed their pigs only when they were not working at rice cultivation. In the dry season, farmers fed their pigs twice a day, as when crop harvesting had been completed there is always more feed available, especially that coming from agricultural by-products, and farmers also had more time to devote to feeding their animals at this period.

Semi-scavenging was practiced in the areas where cropping was slightly more intensive. In these areas, in addition to the main crops such as rice, maize and cassava, farmers also planted cash crops such as sesame, beans, cucumbers and vegetables to supply markets in nearby towns. To protect these crops, pigs were confined in the planting season, but were free to scavenge in the dry season. Management differences were found among farmers in this system in the study area. Most confine pigs close to the house (under rice storage and shed areas), where they could feed them before going out to work in the rice fields in the morning, and on returning home in the evening. Other farmers, whose rice and cropping fields were a long distance from the village, usually stayed near the fields in which they were working during the planting season in order to minimize travelling time. They brought their pigs with them and confined them nearby, making it easy to manage and feed the pigs while they manage the crops. After crop harvesting, these farmers brought their pigs back to their home village.

Total confinement in enclosures or pens was practiced because farmers have to prevent pigs damaging their cash crops, which was an important source of income for the family. Another reason was that the roads, which lead to improved market access also increased the probability of exposure to epidemic diseases, through animal movement generally, and visits from animal and meat traders. Confinement allowed a better risk management. Finally, sanitation in the village was another major reason for keeping pigs in confinement, particularly it was more concern for people living near to the town and less in remote areas.

These reasons given by farmers were found to be also the main drivers for a change towards more confined systems in general. More intensive cropping, more frequent outbreaks of disease epidemics and village regulations as consequence of these factors can be seen as the most dominant drivers. New village regulations to address conflicts between pig and crop producers, where cash crop production became more intensive (and more profitable than pig production), made farmers accountable for damage to crops by free-scavenging pigs and forced them to rely on better controlled systems to avoid high payments

(Phengsavanh and Stür, 2007). Solution took place on village level by either building solid fences around cropping areas or pig producers had to confine their pigs. Building and maintaining fences around the cropping areas was expensive in terms of materials and labour. Therefore, village committee often had no choice then to ban free scavenging, forcing farmers to confine pigs in enclosures and pens. In addition to this, the confinement was used to manage the high losses from epidemic diseases such as classical swine fever (CSF). When these diseases appeared in the village, they spread rapidly through the free-scavenging pig population.

But the employment of a specific pig raising systems often depends also on ethnic traditions and experiences. The Lao-Tai and Tibeto-Burman groups traditionally raise pigs in confinement, particularly in the penning systems and in general were more engaged in fattening pigs for sale. While the Mon-Khmer and Hmong-Mien groups raise pigs in free-scavenging and semi-scavenging systems. A possible explanation might be that these ethnic groups in general lived in areas where agricultural production systems were extensive and farmers took these traditional rearing and management practices with them when they resettle in more intensive cropping areas.

Apart from disease, high mortality of piglets and slow growth rate were major constraints for pig production. Slow growth rate was primarily the result of poor quality and small quantity of local feeds provided to pigs. However, the most severe problems for farmers were those caused by epidemic diseases. Outbreaks were generally more severe in accessible villages than in remote villages which had limited contact with other villages and little or no influx of pigs from outside, and were therefore less prone to disease epidemics. As soon as villages in these remote areas had become more accessible, however, the risk of accidental introduction of diseases increases drastically, through the visits of people as meat and livestock traders. CSF, and most probably many other viral diseases, account for a large proportion of pig deaths in all pig rearing systems (Vongthilath and Blacksell, 1999). In a recent report by FAO (2010), several measures were suggested to address disease outbreaks in smallholder pig production systems. These measures mostly focused on the segregation of animals, including quarantining and controlling pig movement.

Disease outbreak and diarrhea were the main causes of high losses in piglets. The problem of diarrhea in piglets was common in many smallholder pig production system and caused considerable economic loss to pig farmers (Tuyen et al., 2005). Disease and diarrhea occurrence in smallholder pig production may have been related to the observed poor hygiene, and lack of disease preventive measures as well as poor nutrition of sow during gestation

and lactation (Phengsavanh et al., 2010). This latter observation was in accordance with Hong et al. (2006) who reported that the poor quality of feed and nutrient supply may have been a contributory factor to the high incidence of diarrhea in piglets. The authors suggested that good management could have played an important role in reducing diarrhea in piglets, particular in the pre-weaning period.

CONCLUSION

Smallholder pig rearing systems in Northern Lao PDR are influenced by the purpose of raising pigs, intensity of cash crop production and ethnic traditions. The intensity of cash crop production, outbreaks of disease and resulting local regulations were the main drivers of changes in pig rearing systems of the surveyed areas. The major constraints in smallholder pig production systems here were slow growth rate of pigs, outbreaks of disease, and high mortality of piglets. The latter two problems result in high economic losses for smallholders in northern Lao PDR. Education in proper pig management and improved rearing conditions including appropriate feeding, provision of water, housing as well as raising awareness of disease prevention and vaccination could improve this situation drastically.

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