Farmer-led research in village pig production in Lao PDR

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Abstract

Pigs are a very important component of smallholder farm households in the uplands of Lao PDR. About 60–80% of households in upland areas raise pigs and smallholder pig production accounts for more than 80% of the total pig population in the country. Pigs are commonly kept in three production systems: Free scavenging (seasonally or year-round), confined in enclosures and penning. The main constraints in pig production are disease epidemics and low animal productivity due to lack of feed, both quality and quantity.

Farmers are always looking for ways to improve their crop and livestock production systems. Recently, an opportunity for improving feed supply for pigs was identified by farmers in northern Laos. The legume *Stylosanthes guianensis* CIAT 184 (Stylo) had been introduced as a feed for ruminants but farmers also evaluated its use as a feed for pigs. They found that stylo was liked by pigs. They used stylo to replace naturally-occurring green feeds which took a long time to collect from fallow fields and forest margins. Women had been spending, on average, 3 hours per day collecting and cooking feed for pigs. With stylo, this time was reduced to 90 minutes per day, a saving of 1.5 hours per day. As farmers started to feed more stylo, they found that their pigs grew much better, increasing the average daily weight gain from approximately 100 to 200g. This better growth halved the time needed to grow pigs to marketable weight. These benefits prompted other farmers in surrounding villages also to grow and use stylo as feed for their pigs.

Creating an environment in which farmers were able to freely evaluate and adapt forage technologies to their own situation was a critical element in the evolution of this innovation. Participatory approaches were employed to ensure that farmers were involved actively in every stage of technology development. This generated unexpected outcomes such as the feeding of forage legumes to pigs, and it opened new research opportunities.

Animal productivity improved with better feeding, making pig production a more profitable farm enterprise. This stimulated farmers to make other improvements in their pig production systems and to look at pig production as an income-generating opportunity. Interest in stylo for

pigs occurred once participating farmers started to get, and report, the large benefits of feeding stylo. Impact was clearly the most important driver of adoption of this simple technology.

Smallholder pig systems

Pig is one of the most important animals for smallholders in the uplands of Lao PDR. In remote upland areas, particularly in areas where shifting cultivation is practiced, households face a high risk of crop failure or low rice yields, resulting in too little food for their households. Pigs are part of the household insurance system, and can be sold when cash is needed for buying rice and other food, for paying school fees or if a household member is sick and needs medical attention. In 2005, the pig population in Laos was approximately 1,820,000 pigs (FAO 2005) and more than 80% of these were raised by smallholders (Thorne 2005). Per capita pig density is highest (>0.3 pigs per person) in the northern provinces (Stür et al. 2002) and is particularly high among some ethnic minority groups, such as the Hmong and Khmu people (Thorne 2005). In most households and villages, pig raising is the responsibility of women.

There are many ways of classify pig production systems. A recent survey by a joint team of researchers from the National Agriculture and Forestry Research Institute (NAFRI) and the International Center for Tropical Agriculture (CIAT) on pig production in the northern Laos suggested three main pig production systems:

- Seasonal or year-round free range scavenging. This is practiced only in relatively remote upland areas and mainly for sow-piglet production. Pigs scavenge for feed either during the day, and kept in enclosures at night time, or are left to roam free all the time. In this system, small amounts of supplementary feed, such as left-over human food, cassava, maize and rice bran, are often provided.
- Year-round or seasonal confinement in an enclosure. Pigs are kept in enclosures either all year, or only during the crop growing season; in the latter case, pigs are free to scavenge during the dry season after crops have been harvested. This system is practiced in semi-intensive upland cropping areas.
- Penning. Fattening pigs are kept in pens for the whole fattening cycle. Farmers usually buy weaned pigs, weighing around 14–15 kg, and raise them until they reach a market weight of 60–70 kg.

Many farmers and villages in northern Laos have specialized in either raising sows to produce piglets for sale, or growing and fattening pigs for slaughter (Phengsavanh and Stür 2006). Piglet production is practiced mainly by farmers in the more remote upland areas (often Hmong and Khmu ethnic groups) who sell these piglets to farmers in other villages for fattening. Often, villages located in lowland areas concentrate on fattening pigs, utilizing rice bran, which is a by-product of paddy rice production, as the main feed.

The main constraints of village pig production are disease epidemics, high piglet mortality, poor growth rates and high labour demand (Stür et al. 2002). Disease epidemics cause huge losses for smallholders, and in some areas up to 90% of pigs in a village die in a single outbreak of classical swine fever. The high labour demand and the poor growth rates are related to feeding. Many women spend up to three hours a day collecting and preparing feed for pigs.

Using stylo for feeding pigs—A farmer innovation

Over a ten-year period, the Forages for Smallholders Project and its successor the Forage and Livestock Systems Project, both funded by AusAID, introduced a range of broadly adapted forage varieties to farmers in the uplands of Lao PDR, with the aim of assisting farmers to overcome feed shortages in ruminant production. While working with these forages, farmers learnt that the legume *'Stylosanthes guianensis CIAT 184'* can be fed not only to ruminants but also to pigs. A survey by Phengsavanh (unpublished), during which farmers were interviewed and asked about the impact of growing and using stylo for pigs, showed that the main impacts of using stylo were improved animal growth rates and the saving of time for collecting and preparing feed.

Labour is a very limited resource for upland farmers, particularly in areas where upland rice is produced in shifting cultivation systems. In these systems, weed invasion is a big problem, and farmers have to spend a lot of time weeding. Labour requirements for weeding one hectare of upland rice have been estimated at 140–190 person days per ha for one crop (Horne 1998). Reducing labour requirements for pig production frees up labour, which is then available for other activities.

Reducing labour requirements was an excellent entry point for working with pig farmers in upland areas of Laos. If farmers had plenty of stylo 184, the time needed to feed pigs could be reduced from more than 3 hours to 1.5 hours (Table 1). Farmers feeding only rice bran and stylo were able to reduce the time needed for feeding to 40 minutes a day, as they no longer needed to cook feed. Even farmers with small areas of stylo saved almost one hour per day.

The improved growth rates of the pigs fed stylo 184 is significant, as daily weight gain increased from 107 grams per day in traditional feeding system to 207 grams per day for pigs being supplemented with stylo 184 (Table 2). The low productivity in the traditional feeding system may be explained by (i) overall lack of feed, (ii) diets that are high in energy but deficient in protein, and (iii) seasonal availability of pig feeds, such as maize, rice bran and cassava, resulting in poorly balanced diets (e.g. farmers feeding mainly cassava root which is severely protein deficient and so effects pig growth). Also, naturally-occurring green feeds, which are a source of protein and minerals for pigs in traditional diets, are not available year-round, and when they are, the high labour requirement for collecting them may result in the collection of insufficient quantities.

Table 1. *Time needed to feed village pigs before and after adoption of stylo*

Items	Before		Now (with stylo)			
	Time spent (min)	Who does the work?	Small stylo area (not enough to feed daily)	Large area of stylo (enough to feed daily)		Who does the work?
				Mixed feed + stylo	Rice bran + stylo	
Collecting feed	125	W/M*	55	0	0	W/M
Cook	50	W	50	50	0	W
Feeding	20	W	20	20	20	W
Collecting stylo	–	–	20	20	20	M
Total	195		145	90	40	

*W = women, M = men.
Source: Phengsavanh and Stür (2006).

Table 2. *Productivity of growing pigs supplemented with traditional green feeds or stylo 184*

	Traditional green feeds (no stylo)	Supplemented with fresh stylo	SE
Duration of production cycle, months	18.0	8.7	0.95
Initial weight, kg	14.0	15.0	0.4
Final weight, kg	65.3	65.1	3.2
Calculated ADG, g/day	107	207	12.2

Source: Phengsavanh and Stür (2006).

Drivers of system change

There are many factors that either encourage or allow farmers to change the way they raise and manage pigs. These include disease epidemics, scarcity of local feed resources, damage to food crops by free-range pigs and market demand for leaner meat.

Disease epidemics

In remote areas in Laos, where agricultural production systems are extensive, many villages use free-range scavenging pig production systems to raise pigs. Traditionally, feed availability was high in these remote areas and the risk of introduction of disease epidemics low. Contact with other villages was limited and livestock production systems were 'disease-free, closed systems' where no or very few animals were added to the village pig population from external sources. However, as soon as villages in these remote areas became more accessible, the risk of accidental introduction of diseases to the villages by visitors (e.g. meat and livestock traders; pigs purchased from markets etc.) increased and, once they were introduced, diseases such as classical swine fever spread rapidly through the free-roaming pig population. When this happened, many if not all, pigs in these villages died.

This new production risk forces farmers and villages to find ways to reduce disease risk. One of the first strategies is a change from free-range to confined production systems. This increases the level of management (e.g. farmers see their animals several times a day) and also means that farmers have to provide all of the nutritional needs of pigs.

Scarcity of local feed resources

Local feed resources, especially the natural green leaves and herbs needed to supplement basal feeds (such as rice bran, maize and cassava) used to be abundant. These have become scarcer through overuse. Farmers (predominantly the women) have to spend several hours a day collecting sufficient material for their pigs. Time is a very valuable commodity on smallholder farms and having to spend a lot of time feeding pigs makes pig production a less attractive livelihood activity with poor returns to labour. On the other hand, households have little choice but to continue to raise pigs, as these are needed as part of the family reserves. The introduction of stylo has reduced the time needed to feed pigs significantly, thus making pig production a more attractive farm activity.

Feeding stylo also resulted in significant improvements in pig productivity (probably because farmers fed their pigs more green material so the pigs received more feed, particularly more protein and minerals). The improvement in pig productivity meant that pig production became much more attractive and farmers started to improve other parts of the production system (e.g. housing and more confinement). Farmers also started to have more animals at any one time and, because of higher daily gains, were able to turn off animals faster and fatten more animals per year.

These improvements happen because the right entry point was identified. In this case, the entry point was the inordinate amount of labour needed for collecting natural green feeds, which was overcome with the introduction of the forage legume.

Damage to food crops by free-range pigs

In the areas where crop production has become more intensive (and more profitable than pig production), the amount of crop damage caused by free-range scavenging pigs has become a village issue. Building pig-proof fences is expensive, both in terms of materials and in terms of labour needed to build and maintain these fences. As the number of conflicts increased, the village committee (or district government) saw no alternative but to issue a regulation banning free scavenging, either during the crop growing period or for the whole year. This has forced many households to start confining pigs in enclosures and pens.

Market demand for leaner meat

The main pig breeds raised in Laos are high fat, black, swaybacked Asian breeds. Pig fat is the main fat used for cooking in remote areas and the local pigs provide plenty of fat for this purpose. Clearly, local breeds have many positive attributes such as being hardy and able to survive on relatively poor feed resources. However, meat yield of local pigs is low. With demand for lean meat growing in urban areas, exotic breeds that produce more meat and less fat are becoming popular among farmers located near urban centres. These tend to be farmers who keep pigs in relatively intensive production systems in pens (no free-range scavenging). At this stage, crosses are mainly between exotic pig breeds such as 'large white × duroc' rather than 'local × exotic breed' crosses. Farmers producing these exotic breeds report higher feed conversion rates than for local breeds, which may be explained by the lower nutrient requirement for producing meat as compared with producing fat.

Conclusion

The introduction of stylo was conducted in a participatory way that encouraged farmers to experiment with forages and the feeding of forages to livestock. This resulted in farmers using stylo for pigs which had not been anticipated by the researchers involved. Thus, the participatory approach that encouraged farmer innovations was a key ingredient in this story.

The entry point for system's change was the enormous labour demand for feeding pigs in the traditional management system. Planting stylo freed up labour but soon farmers also noticed better growth of pigs resulting in much higher returns to labour from pig production. The new feed resource enabled farmers to change the way they managed their pigs, with some farmers moving towards more intensively managed production systems designed to produce regular income.

Adoption of stylo for pigs by neighbouring villages began only once the participating farmers started to experience and report significant benefits from the feeding of stylo. This could only occur once farmers had production size stylo plots (100–200 m^2 per pig) as smaller areas provided less or only intermittent benefits.

Improved feeding quickly led to demand by farmers for other pig production system improvements such as improved housing, de-worming and vaccination. Working closely with farmers has opened new research opportunities such as the search for other forage legumes as a protein source for smallholder pig production.

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