

# Improving pig feeding systems in Vietnam

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Raising pigs is a common income-generating activity in Vietnam. Many farmers in the north of the country use fresh sweet potato as the main pig feed. This makes good use of a crop which does not sell so well, and the pigs provide manure for the farm. This integrated system is very important to rural household economies, and it was widely acknowledged that improvements in the system could have extensive impact.

Scientists from the International Potato Center (CIP), together with Vietnamese collaborators from various institutions and disciplines, began working together in 1997 to improve these sweet potato based pig-feeding systems in northern and central Vietnam. Three main improvements were tried through the Participatory Technology Development approach: selecting sweet potato varieties which were most suited for pig feed; processing sweet potato roots and vines to improve nutritional value; and improved pig-feeding methods and management to enhance growth efficiency. An overview of project activities is provided in Table 1.

## Assessing the current situation

A situation analysis was carried out between 1997 and 1999. This included a survey of pig production techniques, which was conducted through exploratory studies and observations in a few towns; a series of formal studies using a survey, based on the results from the preliminary studies; and continuous reconfirmation and verification of the survey results in the field with informal discussions with farmers.

The results of this situation analysis showed that the scale of pig production, as well as feeding methods, was more commercial in the south than in the north. Small farmers in the north use fresh sweet potato roots and vines, dry cassava chips, rice, rice bran, maize, and various forms of vegetables/grasses as the main sources of pig feed. Such feeds are not commonly used in southern Vietnam. There, pigs are mainly produced on a large-scale and fed on commercial feed. Based on this data, the project team focused its efforts on improvements for small pig producers in the northern and north-central provinces of Vietnam.

## Participatory Technology Development (PTD)

Various PTD activities were carried out during the six years of the project, including technical options described here: selecting sweet potato varieties specifically for pig feed; sweet potato processing for use as pig feed; and pig-feeding trials to examine the methods of increasing pig growth efficiency. As the project

evolved, the use of other important feed sources such as cassava and peanut stems was also included as new research activities.

All trials with farmers were done in the Red River Delta area, near Hanoi. Farmers here generally have only 2 to 4 pigs per production cycle, and only two cycles a year. They practice intensive crop rotation all year round with some irrigation from the Red River or other smaller rivers. The crops commonly grown here are rice, sweet potato, cassava, and many vegetables. Chemical fertilizer, animal manure or compost are applied to the crops as the production system is quite intensive and there is very little opportunity for fallowing the land. Relatively inexpensive chemical fertilizers are available in the market from China, and the farmers make compost by mixing pig manure and crop residues. The combination of such fertilizers with access to irrigation makes it possible to carry on with such an intensive production system.

Trial farmers were selected based on their willingness to participate and on other criteria such as having the amount of piglets needed for the trial, meeting some minimum requirements for the pig pens (to minimise environmental variation), and their ability to follow simple instructions on weighing and recording feed rations. A farmer who participated in all the trials throughout the years was selected for daily follow-up and advising newly participating farmers. Different participants were selected each time a new trial began, in order to give as many farmers as possible an opportunity to learn from participating in the trials. This also meant that as many farmers as possible were exposed to the new ideas. Participating farmers were always offered an informal training on the different treatments, the fermentation process, methods of mixing the various feedstuffs, and on how to weigh and record the feed given to the pigs.

## Selection of varieties

On-farm sweet potato varietal selection trials were conducted in various locations and during different seasons. Two types of varieties were used in the trials: dual-purpose varieties, where both vines/leaves and roots are used as pig feed, and forage varieties, where vines/leaves are complemented by cassava roots or maize in the diet. Dual-purpose varieties are planted after a rice crop in paddy fields of northern and central Vietnam as a winter-spring crop, as this is the best season for root production. In 1999, after three years of selection, a couple of sweet potato clones emerged as high-yielding and with wide adaptability. They were released through the formal government channels as sweet potato varieties. More clones are being developed, but in the meantime many farmers have adopted the new varieties and are satisfied with them. Although there is also potential for

Table 1. Project activities conducted between 1997 and 2002

Process	Activities	1997	1998	1999	2000	2001	2002
Situation analysis	Pig production assessment	●	●	●			
	Supply-market chain identification			●			
Participatory Technology Development	Sweet potato varietal selection	●	●	●	●	●	●
	Sweet potato root and vine processing		●	●	●	●	●
	Pig feeding trials with silage		●	●	●	●	●
	Sweet potato and cassava combination feeding				●	●	●
	Sweet potato and peanuts fermentation						●
Scaling up	Farmer-to-farmer training						●
Monitoring and evaluation	Impact study						●



Photo: Dai Peters

**The farmer-trainer demonstrates how to use a hand cutter to shred sweet potato vines.**

improving the total protein content in sweet potato vines, selection for this purpose was of less interest to the farmers.

#### *Processing for use as feed*

Farmers face three constraints after harvesting sweet potatoes: storage, high labour demand for daily processing of sweet potato roots and/or vines, and the need to cook the sweet potato roots before feeding them to the pigs. Without adequate storage facilities, farmers are often forced to feed large quantities of sweet potato to their pigs immediately after the harvest. The fresh roots contain high levels of a trypsin inhibitor, a substance which makes it difficult for the pigs to digest and get enough protein, unless it is cooked first. They are therefore unable to get the most benefit from the feed, and cannot grow so well.

Trials were conducted by farmers to find simple and low-input methods of turning feed into silage (known as ensiling) to conserve roots and vines. If this could be done, farmers could process what they harvest and then use the resulting silage during the busy field season or when other feeds are scarce. In ensiling trials, farmers experimented with a wide range of fermentation methods to increase the nutritional value, extend the storage life, and reduce the labour requirement for daily processing of pig feed. Twelve different ways of ensiling sweet potato vines with various proportions of different additives were tested. The vine trial was later replicated for root silage. The results of these trials showed that ensiled roots and vines can be stored for up to five months, and there was no significant difference in nutritional value of the feeds between 14, 30, 60, and 90 days after silage. Ensiling is a simple process that requires little investment. The only equipment needed is a set of scales for weighing the ingredients, and bags for storing the silage. Thus, farmers can easily adopt this silage method to improve pig growth and increase profit. Most importantly, the silage process eliminates the need to cook the feed, as it breaks down the substance which made the feed difficult to digest. This saves two to three hours of labour per day, as well as the fuel necessary for cooking the pig feed.

#### *Pig feeding trials*

Feeding trials were conducted following the silage trials, to examine the effects of feeding root or vine silage to pigs. The most important finding was that uncooked sweet potato root silage was as good for pig growth as cooked sweet potato roots, though with much lower costs in labour time and fuel. Farmers who only kept between two and four pigs at a time when the project activities started, are now raising more than 20 pigs at a time. Cooking the feed was a major limitation to increasing the

herd size, and without this constraint they now keep many more pigs for fattening as well as sows to produce their own piglets.

When the idea of using fermented feed was introduced, and it was not known what effect this feed could have on the pigs, the project paid all costs in order to minimise the risk for participating farmers. After a couple of these trials, when the results showed only positive effects, the project no longer paid for costs of the trials, but this had no effect on overall participation. It must be mentioned though that the project supported the participating farmers in the control of diseases in order to minimise variation. The project veterinarian kept the pigs in good health through vaccination, medicine (e.g., for de-worming the animals), and advice to farmers on best practices. A long running relationship was built up with the farmers, and meetings were organised between the project nutritionist, veterinarian, and root crop specialists nearly every week.

#### **Training of farmer-trainers**

After five years of research and development work, more and more farmers began adopting some or all of the new technologies to improve their pig production system. A limited number of farmers were involved in the PTD phase, so the farmer-to-farmer training approach was decided on for scaling up the project. Three farmers (one from a local women's union, one from a veterans' association, and one from a farmers' association) from each of seven different communes were invited for four days of farmer-trainer training. The project's long-term collaborators, including two sweet potato breeders, one veterinarian, and one pig nutritionist from various national research institutions and agricultural universities, provided the training.

These 21 farmer-trainers have since conducted training on various subjects, depending on the season and its relevant issues (such as training on sweet potato cultivation at planting season and training on producing and feeding silage during the harvest season), with limited assistance from staff of government institutions. A second farmer-trainer training session was held for other districts, involving the first group of farmer-trainers, with the aim to disseminate the pig production innovations to more farmers. These new training events provided the first farmer-trainers with an occasion to present the results of their training activities and share their experiences with the new trainers, and an opportunity to provide comments and feedback on the curriculum and training methods.

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