Strategies for Scaling Up: Technology Innovation and Agro-enterprise Development

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Abstract

Upland farming systems in the Lao PDR are complex and diverse. For promising agricultural technologies to be successful, they must be accompanied by new approaches to (a) integrate the technologies into the existing farming systems and (b) make markets accessible.

To address the first of these issues, the Lao Ministry of Agriculture and Forestry (MAF) and the International Centre for Tropical Agriculture (CIAT) have developed participatory extension approaches to introduce forages to upland farmers. These methods encourage farmers to take the 'raw technologies' (well adapted and productive forage varieties), and innovate ways to fit them into their production system. This has led to increased livestock productivity and reductions in areas of shifting cultivation, which in turn has released time, allowing farmers to further diversify their livelihood systems.

Market issues are being addressed through the introduction of an agro-enterprise development approach, examining the whole supply-chain from producer to consumer, and involving all actors along the chain to identify 'critical points'. Solutions to bottlenecks can lie not in increasing productivity, but rather in gaining efficiencies further down the chain, such as quality improvement or 'value adding'. Business development services then need to be developed, to continue to serve the chain and ensure it remains responsive in the long term.

Introduction

Considerable research has been carried out on the production systems and issues affecting the uplands. The diversity and complexity of upland production systems make research a challenging task. Even when promising technologies have been identified, this complexity and diversity has continued to inhibit them from improving livelihoods or reducing shifting cultivation (Connell 2001). It appears that in addition to identifying promising technologies, additional issues need to be addressed if impacts are to emerge:

- **Technology development and adaptation**: Improved technologies derived from research require some degree of adaptation and innovation. If they are to be integrated into local farming systems. Indeed, new production systems seem to be needed before technologies can affect livelihoods.

- **Linking farmers to markets**: Highland areas have advantages for many products (e.g. fruit, NTFPs), but rural communities are not well-linked to markets and not able to respond to market demands.

These are two areas that MAF, together with CIAT, have been addressing. While they are two quite different issues, they have been grouped together for discussion in this
paper as they both have significant roles to play in helping to realise the opportunities promised by new technologies in the generation of improved upland livelihoods.

**Technology development and adaptation: the case of forages**

The significant role of market-oriented livestock systems in providing options for farmers to diversify their farming systems away from shifting cultivation is described by Phengsavanh *et al.* (these proceedings). A key factor enabling farmers to develop these livestock systems is the availability of a managed feed resource. This allows farmers to pen their animals closer to home and to provide a greater intensity of management and health inputs. Without such a feed resource, none of these other inputs are possible (Hansen 1998; Horne 1998; Pravongvienkham 1998).

The use of forages as a managed feed resource for livestock (cattle, buffalo, pigs, fish and poultry), has long held the promise of increasing productivity, generating income, and so replacing shifting cultivation. Various projects over the years have attempted to introduce forages into the Lao PDR and other countries in southeast Asia, but have been frustrated by the complexity of the system and ultimately failed to leave behind any significant impacts (Horne *et al.* 2004).

Recently however, using participatory research approaches, MAF and CIAT have been able to identify a small range of broadly adapted and robust forage varieties that are well suited to the environmental and farming systems of the Lao uplands\(^1\). These are described in more detail in Phengsavanh *et al.* in these proceedings. These varieties could be considered ‘raw technologies’, which when applied in the right way in the right place, have delivered significant livelihood and environmental impacts to smallholder farmers in the uplands, including:

- Allowing increases in herd size (e.g. from 2-5 cattle to 10 or more).
- Enabling fattening of cattle and buffalo for regular sale (e.g. selling one every 2-3 months).
- Reducing time needed to raise pigs to saleable age (e.g. from 12 months to 5-6 months).
- Increasing the rate of twins born and survival of goats.

With such improved productivity, farmers have begun to realise that raising livestock can become a reliable source of income, not just of livelihood security. This is a significant shift in attitudes. With this new income from livestock, some have been able to reduce their area of shifting cultivation (e.g. from two hectares to half a hectare or less). The reduction in shifting cultivation has further released time, which farmers have then used to diversify into other activities, thus broadening their livelihood base. The use of forages has therefore provided these farmers with a pathway out of shifting cultivation and out of poverty.

Consider the following case, one of many emerging in the Lao uplands, from Kieuw Talun Nyai village, Xieng Ngeun district, Luangprabang:

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\(^1\) Much of the work referred to in this paper has been conducted as part of the AusAID-funded “Forages and Livestock Systems Project”, managed by NAFRI and CIAT.
To escape from shifting cultivation, Mr. Jong Gor Her bought a cow and two calves. Each year when the cow was calving, it was kept by the house and had to be fed by hand. Jong had time to collect only one basket of local grasses each day. The cow lost weight on this poor diet and the calves were born weak. In the first four years, two calves died out of the four that were born.

After he had planted forages close to his house, Jong was able to feed the cattle twice as much, with only a few minutes needed to collect the forages. Within five years his herd had increased to five adult cattle and ten calves. In the last two years he has been able to sell off 1-2 calves to buy rice and other comforts for the home. With this income his family has reduced their shifting cultivation area from 2 to <0.5 ha. With the time saved in this way, his wife now does embroidery, and Jong is preparing to grow cucumbers as a cash crop.

This is not an isolated or exceptional example. Nor are Jong and his wife ‘model farmers’ who have enjoyed special support. While the overall numbers of farmers with these benefits are still limited, they represent a real trend, which is expected to increase rapidly over the next year.

**From raw technologies to impact-yielding systems**

*Providing a framework for innovation: extension of raw technologies*

These impacts have been gained from new systems for raising livestock, where forages are the main feed source, and the animals are managed close to the home for most of the year. While such new systems for raising livestock in the uplands have long been envisioned, MAF and CIAT did not begin by trying to define or introduce the improved systems to farmers, but rather focused on trying to solve the ‘immediate problems’ that farmers had with feed. It was then the farmers themselves who innovated new ‘impact-yielding systems’ based on forages.

How did all this come about? Starting in 2001, the following process was applied to introduce forages to farmers:

**Site selection**

The project initially selected villages where farmers already spent time collecting native grasses to feed their livestock for some period of the year. Thus ‘cut and carrying’ of feed was already part of the system, and forages simply reduced the time and labour for this, without any systems change being required. In other words, sites where forages were expected to have a role were pre-selected.

**Identifying the immediate problems**

Tools commonly used in Participatory Rural Appraisal (PRA) were borrowed for problem diagnosis, to help farmers to identify the root causes of poor performance in their livestock production. While death from disease was a factor, constraints due to lack of feed were the most common and recurrent problem².

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² As local grasses disappeared they had to spend longer time collecting feed, gradually reducing the amount they collected and in some cases reducing the number of animals they could maintain.
Testing options

Forages planted in small plots were presented as solution to the immediate problem of time constraints in collecting feed. A range of eight forage species were provided for farmers to assess which performed best under local conditions, and to then select those most suitable for feeding their animals⁴.

Follow-up and expansion

District staff visited the farmers regularly to check the establishment of the plots and their initial use as feed. Discussions were held within a focus group of farmers to share lessons learnt. Later this group related their experiences back to the whole village, encouraging expansion of the use of forages within the villages.

The initial expansion of forages was based on farmers' ability to solve the immediate problem of lack of time to collect feed. Most farmers were satisfied with the convenience of having feed nearby and the time this saved. A few farmers, however, thought beyond the immediate problems. They noticed a range of other benefits such as improvements in the condition of their livestock, more rapid weight gain, clearer skin, reduced thirst and higher milk production for suckling. They then sought ways to gain more consistently through expanding the area of forage grown, and keeping the livestock closer to their house so that they could be fed on forages more regularly. Thus new ‘impact-yielding systems’ emerged. It is important to recognise that the impacts gained were often quite different from simply resolving the original immediate problem, as the following case from Xang village, Pek district, Xiengkhuang illustrates;

Mr. Neng cultivated a small area of paddy as well as upland rice, but because of limited feed resources he was not able to keep a draught buffalo all year. Each year he purchased a draught buffalo and resold it at the end of the ploughing season. During this period of peak labour he had to spend two to three hours each day collecting feed. Even this was not enough and with the hard work, the buffalo usually lost condition and was sold at a loss.

After using forages to feed his buffalo, he found that not only had he saved time, but the buffalo had improved in condition. So in addition to ploughing his fields, he also made a profit! The following year he increased the area of forages, and was able to sell the next buffalo at a profit. Then, instead of waiting to buy a buffalo for ploughing the next season, he immediately purchased another animal and fattened it during the dry season. By the end of 2003 he had converted all of his upland fields to forages and was regularly fattening buffalo for sale.

It is also important to realise there is more than one impact-yielding system for fattening. For instance, within Xang village, seven other households have begun to follow Mr. Neng's example. Some choose to fatten cattle and others buffalo; some buy thin animals and others rotate animals from their upland pastures. Almost 70% of the farmers in the village now grow forages for their own animals or for sale. The type of forage grass farmers use also varies, depending on the soil and moisture conditions.

Across the 50 villages where these forages have been trialled, a wide range of new impact-yielding systems are now emerging for cattle, buffalo, pigs and goats.

⁴ Six to eight species, with sufficient seed to grow plots of 10x10 m. Usually five to eight farmers were involved.
**Initiating a problem solving attitude**

To a large degree the innovation that farmers have made has been to find ways to integrate the raw technologies of half a dozen forage species into their livestock system. This is by no means a simple matter, or something that can be taken for granted. During the earlier small-plot testing phase, many farmers grew and used forages to some extent, yet their use did not persist or expand. The ‘raw’ technologies do not automatically suggest a result: it is only once a few innovative farmers have adjusted their system based on the raw technologies, and gained impacts, that the potential is revealed. Without this step being taken, the raw technologies remain dormant.

This process may appear to be unpredictable, in that it is not possible to know which farmers will be active in innovation or what new systems they will develop. A few simple mechanisms were used to initiate a problem-solving attitude with farmers. These were:

**Problem diagnosis**

PRA type tools were used for problem diagnosis, which enabled farmers to define and then focus on resolving their immediate problems. Thus the technical interventions, such as forages, were seen not as ‘recommendations’ to be followed, but rather as potential solutions to be assessed.

**Technology options**

Providing a range of forage varieties immediately placed the farmers in the position of evaluation. Limiting the initial introduction of forages to a small number of farmers, and small areas, also reinforced the sense of a trial to be learnt from.

Together these two basic mechanisms engaged farmers in a problem-solving process, which led a few farmers to go beyond resolving their immediate problem to thinking about what further benefits could be gained from the technologies. These mechanisms are neither novel nor difficult and are in fact already applied by many projects and development organisations.

**‘Creative follow-up’ to consolidate and disseminate innovation**

In the first year, farmers had a number of technical problems with establishing their forage plots. Follow-up provided by the DAFO staff was timely and technically competent. They used problems in the field as learning opportunities with the farmers. The reasons for poorly-established plots were quickly understood, enabling the farmers to feel confident they could correct these in the following seasons. This ‘technical follow-up’ was essential at this early stage and meant that farmers were able to properly establish their plots and so grow some forages to begin feeding their livestock. While the plots were small, generally providing insufficient forage to generate impacts among the cattle, the time and labour saved in collecting native grass feed was sufficient to interest most farmers and to drive expansion in the use of forages in the second year.

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4 Farmers have also innovated new technologies. The first of these is to expand their area of forages by growing from cuttings, and the second is to produce leaf meal from *Stylo*, one of the leguminous forage species, so that it can be available as a supplement during the dry season.

5 These were mainly associated with the small size of forage grasses, i.e. seeding too densely, too deep or too shallow; removal of seed by ants; seeding too early; washout by heavy rains etc. These problems were greatly diminished in the second year, and by the use of cuttings instead of seed to expand plots.
During the first year, a few farmers did note an improvement in the condition of their animals and began to innovate new systems that would lead to impacts. Thus in addition to carrying out ‘technical follow-up’, DAFO staff also carried out ‘creative follow-up’ to the support and capture innovations. DAFO staff actively observed how farmers were using the forages, and were sensitive to any special benefits or impacts that were emerging. When these were observed, staff would first support the farmer, so that the effects and impacts were recognised and noted. Staff then used a number of ‘farmer to farmer’ approaches to consolidate the impacts and disseminate them to other farmers. These approaches were applied in a phased manner as the different needs and opportunities required.

**Focus group meetings within villages**

The small group of farmers who had grown forages on trial formed a focus group. At key times staff brought them together to discuss their experiences. In this way they all became aware of ways to solve problems, and of the benefits emerging from forages.

**Cross-visits**

As impacts emerged with a few farmers in a few villages, selected farmers were taken on cross-visits to these villages. More important than any technical understanding that they gained was the chance to witness forages being grown extensively and see the benefits of using them as a regular feed source.

**Village planning and interest groups**

Planning at village level did not play a large role until impact-yielding systems became available. When these were then introduced, the farmers could focus and objective shifted from how much they wanted to expand their forage plots, to how raise their livestock according to the new impact-yielding systems. Such planning implicitly contributed to consolidation of interest groups with common goals (small or large animals).

Focus group meetings, cross-visits and village planning were together critical in reinforcing the new systems and their impacts with the few farmers who had independently begun to explore and establish them. Disseminating and exchanging these with other farmers helped to stimulate further refinement and innovation within the broader population of farmers using forages. Without this consolidation and dissemination, isolated occasions of new impact-yielding systems might have been missed.

Various activities such as focus group meetings etc. are commonly applied when introducing technologies to farmers. If they also aim to support innovation by farmers, staff must be prepared to: (a) be familiar with how technologies are applied and be sensitive to any innovation by farmers, and then (b) use farmer–to-farmer approaches to consolidate the innovations, and in turn stimulate further innovation across sites.

‘Technical follow-up’ is not yet a regular practice among DAFO staff, and this ‘creative follow-up’ was a new and more challenging role to require of them. To help DAFO staff to be sensitive to emerging innovations, they received on-the-job training, which included them writing a case study of selected ‘champion farmers’ (those farmers who

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6 The focus group was the small group who made the initial forage usage trials. They can be considered to be a sub-group of the large ‘interest group’ of farmers who were interested in raising livestock.
were doing better than others). The case studies focused on (a) factors that had previously limited the farmer's livestock production; (b) the benefits they had noticed from forage use, and (c) their plans for improving livestock raising in the future. The studies were then discussed within each province through peer review, to encourage staff to be more analytical and more aware of issues affecting farmers' decisions, and to ensure that staff were aware of the whole range of innovations and impacts that was emerging. The cases were then used as the basis for selecting sites for cross visits.

**Accelerating impacts**

It took three years to move from identifying immediate problems, to identifying new impact-yielding systems through farmers' innovation. With these systems maturing, it should now be possible to short-cut the process and directly introduce the new impact-yielding systems to farmers at new sites. With the confidence inspired by the impacts already gained, more farmers might begin to apply forages, and apply them in a substantial way to gain impacts more quickly.

Forages are a simple technology. The learning curve for planting a plot of forage grasses or cutting it to feed to livestock is low compared to, for instance, that of learning the procedures for livestock vaccination. While the technology barrier is low, the livestock production systems and opportunities are diverse (Pravongviengkham 1988), so farmers may still need to innovate to gain impacts. As the potential opportunities from forages become more evident, there will be a strong urge to disseminate them as widely as possible. It will be important to understand: (a) how quickly the use of forages can be scaled-up to new areas, and (b) how much support will be needed within a site to allow its effective establishment. The key issues appear to be the following:

**Issue 1 Maintaining farmer innovation**

Maintaining farmer innovation is likely to remain important in the uplands for two reasons:

(a) The highland environment is diverse. If presented with ready made impact-yielding systems, new farmers will still need to adjust and tailor systems to fit their particular conditions.

(b) In existing forage villages, farmers will soon begin to face a set of ‘second generation’ problems, including: managing soil fertility to maintain forage yields, dealing with animal health interventions as livestock become more concentrated, and dealing with community issues when extra stock place burdens on local resources, such as water supplies.

These second-generation problems are not unexpected and a range of options already exists for overcoming them, but farmers will need to be innovative in how they apply these ‘solutions’ to fit their own situations.

**Issue 2 Levels of support required**

District staff have provided high inputs of time for follow-up to support the development of these impact-yielding systems. With these new systems now proven, it should be possible to reduce this level of follow-up. Some assessment is needed of the degree of follow-up that will be required, and for how long, to ensure that forages are still well established.
**Issue 3 Management of extension**

Extension has previously been conducted in the Lao PDR on a limited scale. Widespread introduction of forages will require effective strategies to manage extension, including staff capacity building, and planning and monitoring of complex activities.

These issues are being researched by a new project, Accelerating Impacts from Participatory Research, funded by the Australian Centre for International Agricultural Research, or ACIAR (Millar et al. 2003). The project will examine the use of different extension approaches to introduce impact-yielding systems to farmers and how farmers then apply forage technologies, including whether they continue to innovate, and what level of support is still needed. The project will also examine the administrative and human resource requirements that are needed to conduct extension in the uplands.

In the lowlands, extension usually aims to introduce new 'component technologies' such as a new variety of rice, or a new cash crop, within an existing production system. In the uplands it appears that such component changes are not sufficient, and that systems changes are needed before farmers will gain significant impacts. Thus in the broader context of the challenges facing extension in upland areas, the project will be examining the issues of scaling-up the use of new systems (in this case 'livestock production based on forages') in a complex environment.

**Linking farmers to markets**

The uplands have often been regarded as a disadvantaged area, but many of the environmental conditions in the uplands can be seen as an opportunity for particular livelihood activities (such as crops suited to cooler areas and livestock production). A common problem limiting the achievement of this potential is the lack of access to markets. In many cases the solution to this has been to search for a market which will be willing to purchase the product for an acceptable price. This fails to address the issue of the underdeveloped market structure in the Lao PDR, including the poor flow of market information, the absence of checks and balances to ensure quality, and a lack of services to support the development of enterprises (GoL 1999). Unless these underlying issues are addressed, then solving marketing problems, product by product, will at best be a piecemeal approach.

This is a new area of research for NAFRI and CIAT, which have begun to examine these issues through a new project in Xieng Khouang and Luangprabang. The Small-scale Agro-enterprise Development for the Uplands (SADU) project commenced in 2003. The project has two underlying principles:

- That farmers must respond to market requirements, and should not expect that the market necessarily accepts what they want to produce.
- That assessment of market opportunities and constraints should be a participatory process which involves all actors.

This project has two core approaches (Lundy et al. 2004):
A territorial focus

This means that the project focuses on a geographical area, and aims to enable the farmers in that area to identify products for development as enterprises, and to learn how to access markets. Thus the focus is on enabling farmers, rather than improving the performance of a commodity or a sub-sector. At later stages of development, the territorial focus also means that the different resources and actors in the same area can be better coordinated to work in an integrated manner.

Supply chain focus

A market chain consists of the producers, local collectors, traders, processors, retailers and consumers who are interdependent. It is possible that by influencing the activity of traders or wholesalers, through interventions such as improved processing and packaging, farmers’ products are better able to compete in the market place.

The agro-enterprise development approach being taken is quite simple:

- **Livelihood and production assessment**: this enables villagers to assess which products they believe they have the capacity to develop commercially.

- **Market opportunity identification**: with the farmers’ participation, these potential products are then assessed at the market place for their demand in terms of quantity, quality, prices and trends. Villagers will then be able to make an informed decision on which products they want to focus on.

- **Supply chain analysis**: all stages in the market chain are surveyed and then analysed with all the actors involved to identify critical points which need to be resolved. This participatory analysis allows all actors to understand their interdependence, and also generates a greater degree of cooperation.

- **Action plan**: activities to resolve critical points are identified and implemented.

This is a straightforward approach, but its strength lies firstly in that it works across the whole supply chain and is not confined to any individual part, such as the suppliers. Secondly, the joint analysis of constraints and identification of critical points by all actors together generates a sense of cooperation towards a common goal for all. Development projects are very familiar with working alongside villagers to improve the supply of products, but for many products the critical points which impede development exist at other points in the chain. One example can illustrate this:

*Vegetables can be grown in Xiengkhuang cheaply with good flavour and without use of chemicals. Despite these advantages, they are difficult to sell on the large Vientiane market due to damage during transport. If Xiengkhuang traders could improve their methods of packing, vegetables would arrive on the market with a better appearance and so take advantage of their better flavour. Another opportunity that has not yet been exploited would be to conduct a campaign to convince consumers in Vientiane of the benefits of chemical-free vegetables.*

Both these points of action are downstream from the field production of vegetables. Yet working to resolve these critical points would result in demand being transferred back up the chain and so stimulate increased production in Xiengkhuang.
Working on the production end of the chain does play an important role in improving regularity of supply and quality of products. However, it is important to recognise the equal importance of working with traders, wholesalers and processors to resolve the constraints that exist there.

There are many products and each product will have a market chain with its own particular issues. While working on specific chains to generate real benefits, NAFRI and CIAT will also work at two other levels:

(a) Supporting the development of business development services.

This can include input suppliers, processing for added value, market information brokers and sources of credit. These 'service providers' are often lacking in the Lao market environment. They are small businesses in themselves and so once they do emerge, they will be able to stimulate and support expansion along the chain. Indeed, it will be in their own interest to do so.

(b) Institutionalisation of agro-enterprise development concepts.

This can be gained firstly through working with other agencies interested in applying agro-enterprise development, such as projects and NGOs. It is expected that as local authorities become aware of this approach, when faced with problems of specific commodities they will also be able to examine all factors that affect the operation along a market chain. Institutionalisation might also help regulate the enabling factors for more efficient market structures, such as improved tax collection and better logistics.

Conclusions

Technology Development and Adaptation

Working with complex systems in a diverse environment such as the uplands of the Lao PDR is challenging, yet real gains are being demonstrated in forage and livestock systems. Farmers are beginning to gain real impacts and as a result are finding new livelihoods not based on shifting cultivation. This is a significant outcome, and it is worthwhile reviewing the key elements that have made it possible.

The raw forage technologies, while continuing to prove robust and broadly-adapted, required another stage of development where innovative, new impact-yielding systems were developed. In a complex and diverse environment, this is an almost impossible task to address within a conventional research structure. In the case of the forage and livestock systems, it was addressed through introducing the raw technologies to farmers in the context of a participatory extension approach. The technologies were introduced in ways that engaged farmers in a problem-solving rather than a conventional adoption approach based on ‘finished technologies’. The mechanisms to do this were not complex:

Problem solving is stimulated through:

- Conducting problem diagnosis to help farmers identify ‘immediate problems’.
- Providing a range of technologies for farmers to assess.
This was maintained and consolidated through a number of farmer-to-farmer approaches:

- Focus group meetings within villages.
- Cross-visits between villages as impacts emerged.
- Village planning to consolidate interest groups within villages.

The outcomes of this farmer innovation could not have been predicted, either in terms of the systems themselves or in terms of the fact that farmers would emerge as the innovators. Staff had to take on a new role during follow-up, to identify innovations as they occurred and then to quickly communicate these within their own extension group, so that they could be then be used across various sites.

The complex systems and diverse environments are challenges that will apply to most farming systems in the uplands, not just livestock. Research produces the initial ‘raw’ technologies, but these need to go through a further process, to be integrated into new impact-systems, before they can be widely applied by farmers. Rather than attempting to do this within the research sector, it seems that it can be achieved more efficiently by working through extension, which will provide the opportunity for unstructured innovation by a broad population of farmers. This innovation then needs to be ‘harvested’ and further disseminated.

It is useful to reflect on the structural arrangements that have allowed this to take place with forages:

**Stage 1 Identifying the raw technologies**

NAFRI staff worked directly with farmers to carry out participatory research. This resulted in identifying a range of core forage varieties (the ‘raw’ technologies), which were broadly adapted to the environment in the Lao PDR.

**Stage 2 Identifying impact systems**

DAFO staff are using participatory extension approaches (described above) with a broad population of farmers. This is stimulating innovation amongst farmers, who are in turn developing a range of impact-yielding systems. While it is DAFO staff who are implementing this at the field level, the work must still be considered an extended phase of research, and so is led by NAFRI, with support from NAFES.

**Stage 3 Expanding and stabilising the use of systems**

Once new impact-yielding systems have matured, they can be disseminated widely through the extension service. At the same time, second generation problems will emerge and require further technical support and innovation. This implies the need for: (a) participatory extension approaches that continue to be applied to stimulate innovation amongst farmers, and (b) mechanisms to link extension and research, to ensure ongoing technical support for this new round of innovation.

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7 During the Forages for Smallholders Project (1995 - 1999)
8 Currently being carried out under the Forages and Livestock Systems Project (2000 - 2005)
These experiences and structural arrangements could provide ideas for complementary roles between research and extension in the Lao PDR for the longer term. Identifying mechanisms for on-going interaction between research and extension, to deal with new technical issues in the field and include new farmer innovation in research, is something that has yet to be addressed but will certainly be needed as Lao research and extension institutions mature.

**Linking farmers to markets**

This is perhaps an even greater challenge. Finding models for interaction between research and extension has been difficult. The issue of linking farmers to markets cuts across sectors (such as agriculture, transport and commerce) and geographically spans districts and provinces.

Perhaps one of the first steps is accepting these difficulties and being prepared to work across boundaries, even though there is no single agency with authority over all these sectors. This will be a challenge not just for national agencies and institutions, but also for projects and NGOs, who must be willing to engage constructively with traders, merchants, processors and retailers all the way down the market chain.

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