ADOPTION AND SCALING OUT - STRATEGIES AND EXPERIENCES OF THE FORAGES FOR SMALLHOLDERS PROJECT[1]

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INTRODUCTION

The Forages for Smallholders Project (FSP), convened by the International Centre for Tropical Agriculture (CIAT), started in 1995 to move research on tropical forages from the experiment stations to farmers' fields, which created scope for evaluating the potential of improved forages in smallholder farming systems in Asia. The target farming systems were those in upland areas. The FSP now operates in six countries in Southeast Asia through national partners, namely: China, Indonesia, Lao PDR, the Philippines, Thailand and Vietnam.

The strategy has been to concentrate farmer participatory research activities in one or two sites in each country, which subsequently have been used as focus sites for dissemination of forage systems developed at these sites. This case study describes the methods that the project developed and how they evolved, the meaning of adoption of forage technologies, how adoption was achieved, and how dissemination took place in new areas, and includes an example of impact on farmers' livelihoods at these focus sites in Indonesia.

The term 'forages' is used here for crops that are specifically cultivated to provide feed for animals. This is different from the broader definition often used for forages as 'any plants or parts of plants used for animal feed, including agro-industrial by-products'.

DEVELOPING TECHNOLOGIES WITH FARMERS, AND ADOPTION

The project aims to work with resource-poor upland farmers. However, it can be argued that livestock keepers are not the poorest farmers, because keeping livestock means having some wealth. On the other hand, upland livestock keepers in S.E. Asia do not have large herds, and it is uncommon to find smallholder livestock keepers with large pasture or fodder banks. This is likely to remain so even if numbers of livestock per household or production levels increase. A common scenario is to find forage crops planted within a complex pattern of other food and cash crops, utilising farm space and labour in a multiple and optimal way. After many years of working with these farming communities, we now see the integration of a range of some 25 introduced grass and legume species: in lines along contours on farm land; as cover or green manure crops in fruit trees, coffee and tea; as live fences for demarcation of external and internal boundaries; and as pastures and fodder banks in backyards or under young oil palm or coconut plantations.

The main difficulty with forage research is that it is complex. Unlike food crops, forage crops need to pass through an animal for an end benefit to be obtained. Inevitably, forages are often of secondary importance to poor farmers, as food security is their main concern. The interest of farmers in participating in evaluation of forages is influenced by

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[1] In: C. Conroy (ed.) Participatory Livestock Research: A Guide. ITDG, Warwickshire, UK. pp. 225-236.

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these and other factors. The decision whether to work with new communities and farmers in forage technology development is guided by five questions:

1.
Is there a genuine problem? Very often, when we meet farmers for the first time and we are strangers to them, they will say, "Yes, we have a problem" because they would like to work with us. Sometimes forages are just an entry point for them as they expect to receive free fertilisers or animals.

2. Are there committed local individuals who can work with farmers to solve this problem? There are few staff employed by the FSP project and we do not have field workers. At the field level, we depend on availability of staff from the district agricultural services. We look for persons who are motivated and will not go into an area where such people are not available to help us.

3. Do farmers think that this problem is important enough? During the dry season, farmers' cattle often do not have enough feed. At the same time, their children might not have enough food to eat or they are malnourished. Farmers may have a higher priority than providing for animal feed needs, e.g. engaging in on-farm or off-farm activities that will bring in immediate cash to buy food.

4. Are there many other farmers with the same problem in a region? In order to ensure efficient use of resources we only work in locations where there is a minimum number of farmers interested in collaborating with us.

5. Do we have potential solutions for substantial benefits? There might be a problem of shortage of feeds but in certain circumstances we do not have options to offer. If the system, for instance, is irrigated rice, every square meter is cultivated and there is very little land to plant forages for the buffaloes that plough the fields.

Role of participatory research

A major contributor to farmer adoption of forage technologies has been the process of farmer participatory research, that is where farmers are involved in planning and carrying out the evaluation of new species and in adapting the management of them to their farming system.

In practice, when scientists first begin to work with farmers in new projects, the degree of participation may be small. For example, it may be necessary to plant a demonstration in a village to enable farmers to become aware of various options. As farmers gain interest and confidence, so they naturally show more initiative and take on more responsibility.

FSP's research and development strategy

A research and development strategy using participatory approaches has been developed following many years of experience of working with farmers (Figure 1). The normal sequence of events is from 1 to 10 but there is no fixed formula. The first step is to gather secondary information and to carry out a rapid rural appraisal. Secondary information, from reports and key local informants, gives us an indication of the nature of the farming systems, livestock densities and farm problems. From this information, we can assess whether there is a need and opportunity for working in the area. If there is a need, we train extension workers from several districts in forage agronomy, participatory research and gender analysis.

The training lasts for two weeks and may involve 20 participants. During this training, the more active and motivated extension workers, who can effectively lead work in the project, are identified.

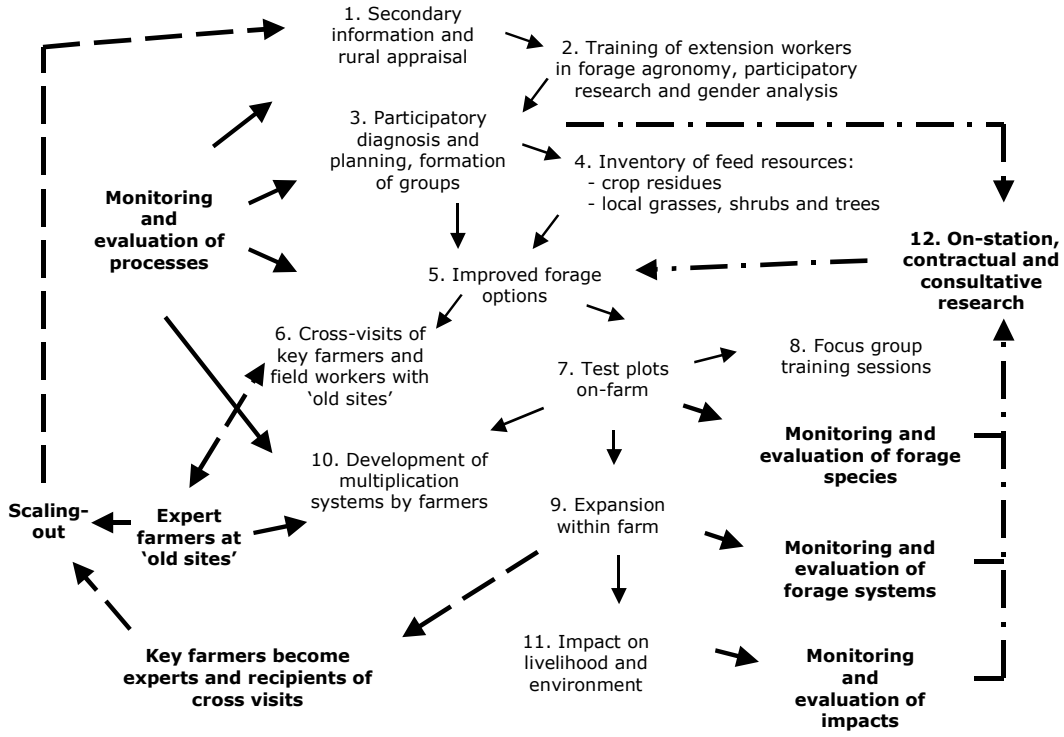

Figure 1: Participatory research and development processes

After we have selected motivated extension workers, we conduct participatory diagnoses and planning in selected villages where the initial appraisal has shown there is a need and opportunity. This process normally takes 1-2.5 days. Problems are identified by the village community using participatory tools, such as mapping, calendars and flow diagramming. The problem diagnosis is followed by planning research and development activities to evaluate solutions to specific problems that might be solved using the farmers' own resources supplemented by seed and technical inputs from the project. Farmer groups may already exist. If not, we work with those farmers who have identified them selves during the diagnosis as being
willing to invest their time and resources in testing new technologies. Regular farmer meetings are facilitated by field workers, and often stable groups develop from these meetings.

Research issues identified at step 3 often lead to the evaluation of improved forage species, for biomass production, drought resistance, and quality, under farm conditions. Researchers and experienced field workers are able to provide forage species, and suggest forage systems that have been screened, modified and developed by other farmers in the region, that will meet the specific needs of the new group of farmers. The project initially evaluated some 500 species and accessions of forage grasses and legumes. Out of those, 25-40 were well adapted to climate, soils and diseases, and are now widely adopted; they are the species options recommended for evaluation by new farmers.

The choice of introduced forage varieties to offer to farmers depends on the seasonal availability of existing feed resources. Sometimes the quality and availability of existing feed resources cannot be easily assessed during the participatory diagnosis phase. If local trees

and shrubs form an important part of animals' diet, their quantity, availability and nutritive quality are often unknown. A high availability of good quality local tree fodder would reduce the need for research on exotic fodder trees. The inventory of feed resources, Step 4, can be made a researchable issue if little is known about this. Nutritive value of local vegetation can be determined through participatory studies with key informants, and through laboratory analysis (Roothaert and Phengsavanh, 2001).

Where feasible, key farmers from new villages are selected by the community and the field workers, and are taken on cross-visits to other farmers who have been working with the project for several years (step 6). Farmers with extensive forage experience are the best advocates to show how forages can make an impact on livelihoods, the livestock and the environment. Farmers learn a lot from other farmers. During these cross-visits, new farmers receive planting materials from the old farmers, and take them home to plant on their own farms. New farmers are encouraged to try more species than only the ones that grow well on the farms that they have visited. The new farmers plant test plots or strips, which are evaluated regularly by both farmers and field staff (step 7). In every new community, new champion farmers emerge, whose enthusiasm and experience is harnessed by the project. They in turn will become expert farmers able to receive other farmers from new areas, to show them their experience in forage evaluation and utilisation.

Some key farmers receive training on certain topics that interest them and that complement their on-farm research (step 8). Such topics have included training in animal nutrition, nursery techniques for forage trees, and seed production. Farmers that have evaluated new forage germplasm in small plots or strips expand the area planted with those species or accessions that show good growth (step 9). There are also other factors that determine whether or not a farmer expands, such as palatability of the forage, ease of harvest, ease of propagation, and low weediness potential. Later on, we find farmers take other factors into consideration, e.g. whether the introduced forages can play a role in improving soil fertility, whether they compete with crops, and usefulness in soil and water conservation. Concurrently with the expansion activities, an interest in multiplication systems is developed (step 10). Often, the original test plots become multiplication plots to produce vegetative planting materials. Seed production is often low, especially in humid climates. If there is a strong market demand for seeds, such as improved accessions of *Leucaena leucocephala* or *Centrosema pubescens*, some individual farmers may choose to develop seed production systems.

Availability of planting material or seed can be a bottleneck for developing and expanding forage systems if it is not addressed systematically, and is essential for sustainability of forage development. Seeds of improved forages are rarely found in markets in rural areas. In the areas where FSP has been operating for 5 years, there is now a lively trade in vegetative planting materials and some legume seeds among farmers. Sale of planting materials also contributes to farmers' incomes.

Monitoring and evaluation are used to provide feedback to farmers and project implementers. It is relatively easy to monitor and evaluate forage technologies in terms of test plots on-farm, expansion within farm, and impacts on people, livestock and the environment. What is more difficult to monitor and evaluate are the effectiveness of the processes, such as collecting secondary information, conducting rural appraisal, participatory diagnosis, and cross-visits. How do we quantify the success of these elements? These processes are probably more appropriately evaluated by qualitative case studies than quantitative assessments.

Farmers' experience with growing improved forages often generates the need for new research. The results of such research are fed back as new options for farmers to evaluate.

The adoption process

Farmers' evaluation is a prerequisite for adoption. When a farmer has experimented with a species or a forage technology, and subsequently expands his cultivated area with the technology using his own resources, then we can talk of meaningful adoption or an adoptable forage system. Farmer evaluation does not always result in adoption. About 25% have dropped out of evaluating or using improved forages after one to three years for various reasons, although this is highly variable between sites. Some farmers never reach the stage of expanding from test plots to larger areas, due to labour constraints. Sometimes the forage plots cannot be properly protected, resulting in grazing by stray animals. Some had planted improved forages with the aim of qualifying for receiving animals from government loan schemes, but when the animals were not dispersed, they abandoned the plots.

What is a typical adoption process? First, the farmer tests grass and legume varieties and accessions in small plots and observes such things as yield and whether the grass stays green in the dry season or not. The second step is to evaluate the species by incorporating and/or adapting it in a forage system (Figure 2). The forage system includes the forage variety or species, the way it fits in with other crops, the cutting management, the contribution to soil fertility or degradation, the type of animals it can be fed to, and the effect on the animals.

Some unique systems have been developed, such as feeding cut fodder to Carp (*Ctenopharyngodon idella*) instead of cattle, because farmers discovered this was more profitable. When such forage systems are tested and developed on-farm, and they are appreciated, more land is allocated to grow forages and expansion within the farm occurs. Expansion usually happens after every planting season, and can take place over many years.

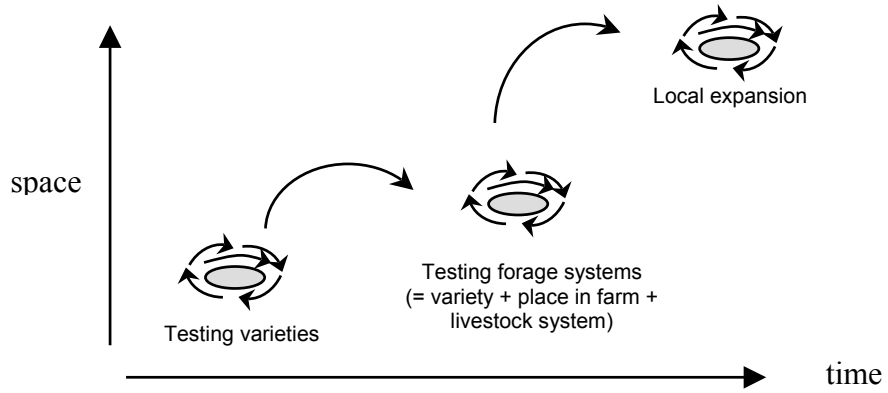

Figure 2. Adoption: from on-farm test plots to on-farm expansion.

SOME FSP RESEARCH HIGHLIGHTS

A publication 'Developing forage technologies with smallholder farmers' (Horne and Stür, 1999) was the outcome of screening of some 500 accessions of forage germplasm, on experimental stations in Indonesia and the Philippines, and ending with about 40 varieties that are now widely adopted by farmers in more than 6 countries. The booklet is meant for field workers and gives practical information about the most popular forage species and varieties. The way the forages can be grown and utilised, their adaptation to climates and soils, and their comparative advantages are all explained. The publication is also available in Chinese, Indonesian, Lao, Thai, and Vietnamese.

The relationship between natural feed resources, improved forages, and adoption of forage technologies is shown in Figure 3. Traditionally, farmers in S.E. Asia have been using natural grasses and crop residues to feed their cattle, goats and sheep. 'Adoption' of this system is 100 %, but ruminant productivity is only 25-35 % of its potential. In terms of animal nutrition, the limiting factor for productivity is energy intake and year round feed supply. The first forage innovation that farmers usually adopt is the cultivation of new grass species. The new grasses establish easily and show impressive growth and biomass production. Most grasses are readily accepted by cattle. Adoption rates for improved grass accessions are high; about half of the farmers with livestock within the community that we work with start growing them within a year of introduction. Livestock productivity improves because of higher dry matter intake, more available energy, and good quality feed in the dry season. Maximum ruminant productivity, however, is still not obtained, due to limitations of available rumen nitrogen and shortage of by-pass protein. It is only in the very intensive systems, such as the dairy cattle and dairy buffalo systems in Mindanao, Philippines, that farmers realise the protein limitation. In those systems, there is a demand for herbaceous and tree legume species that, when fed, cause a remarkable and immediate increase in milk production or milk fat content. Young stock fed on a mixture of grass and legumes get all the nutrients they need and can attain potential growth rates. The challenge of the project is to have more farmers experimenting with the optimal feed regimes, and to overcome constraints of initial slow establishment of legumes, seed availability, and misconceptions of cattle and buffaloes not being able to eat herbaceous- or tree-legumes.

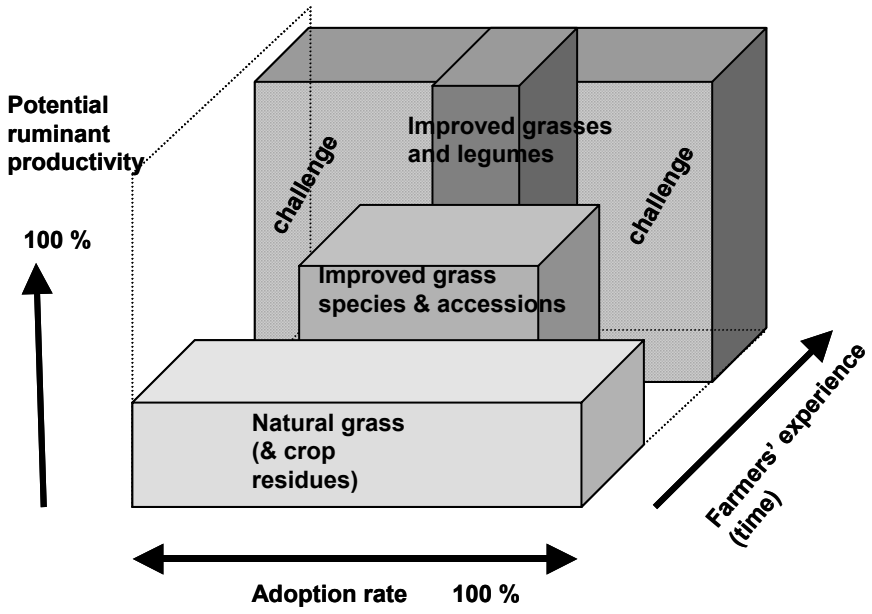

Figure 3. Relation between adoption rate of forage technologies, potential ruminant productivity, and time.

SCALING-UP

If all stakeholders, that is the farmers and government staff, are happy with the results of the forage evaluation and adoption, the next challenge is to allow more farmers to benefit. Replicating a forage system on new farmers' fields would seem ideal, but experience has taught us that this does not work. No two smallholder farms are the same, and farmers need to experiment with and develop their own forage systems. In addition, farmers need to learn to manage new systems. Identifying new areas where there is a need is another challenge. The FSP therefore uses the same strategy as described in Figure 1 when it comes to scaling-up, proceeding through all ten steps. However, the process can be speeded up by using farmer-to-farmer visitation and ensuring there is ample planting material or seed.

Skilled and motivated local staff are essential for scaling-up. New staff need training about forage accessions, agronomy, systems, and participatory approaches. They must be equipped with good listening and facilitating skills, and they need to be able to analyse data and write reports. During the training courses, field staff with potential can be selected. Apart from skills, attitudes are also an important selection criterion for staff. Only those staff that are willing to accept change and learn new principles can learn about participatory approaches. Even then, it often requires a big mental change to be prepared to learn from farmers, listen and respect them.

In very remote areas, extension workers can be scarce. Another option that has worked well in the FSP is the use of experienced farmers as extension workers. In East Kalimantan, Indonesia, this is now a common practice. These farmers have detailed agronomic knowledge about the forage accessions and can provide useful tips that they have learned by experience. Cross visits being facilitated by these leading farmers are lively and very convincing to new farmers. In every village key farmers can be found and used for extension purposes, if a modest remuneration for their service is provided.

Other lessons we have learnt are that it is important that focus sites where the technology is first developed are readily accessible and that it is important to have 'buy-in' at the provincial or other level that is responsible for decisions on extension, as well as involving district officers in the process. A serious effort is made to invite key agricultural or political officials at district or provincial levels for various training workshops and courses. Even though some rarely stay for the whole duration of the workshop, if they are given the opportunity to give opening speeches or keynote addresses, a bond is automatically created. Courtesy calls to some politicians or administrators at municipal or provincial levels during some stage of the project have done wonders for creating acceptance of methodologies, gaining logistic or financial support, or straightening out misunderstandings.

Capacity has been created among national partners to conduct training events autonomously. These events and other cross visits are also vehicles for inviting and networking with NGOs and other government administrative units that the project is not directly involved with, but promote a further scaling-out. It is very likely that more farmers benefit from the forage methods and technologies than the project actually records. At several sites where FSP has been operating for more than five years, and where local multiplication systems have been established, the testing, evaluating, utilisation and scaling-out of improved forages have become a sustainable process.

FSP scaling up

Table 1 shows how the FSP scaled up its activities with many more farmers beginning to evaluate forages and forage systems. Some 5,400 farmers participated in 297 participatory diagnosis sessions conducted in the six participating countries. Not all these farmers are necessarily adopters. Field staff note which farmers show enthusiasm and these are offered a trip to visit more experienced farmers who are evaluating and adopting forages.

Although only 3,163 farmers participated in the cross visits, 4,155 farmers planted forages. The higher number can be attributed to the 'ripple' effect of these visits; many farmers are organised in groups and share new experiences in group meetings.

Table 1. Scaling up of FSP and number of new farmers involved.

Year	No. of participatory diagnoses conducted	No. of farmers participated in PD	No. of new groups	No. of cross visits organised	No. of farmers partic. in cross visits	No. of new farmers planting forages
2000	45	1087	52	n.a.[1]	n.a.[1]	748
2001	151	2173	179	187	1330	1537
2002	101	2148	52	141	1833	1870
Total	297	5408			3163	4155

[1] Not applicable

Multiplication systems are essential for scaling up; without planting material scaling up cannot happen. In East Kalimantan farmers have organised themselves in groups for the purpose of producing planting materials. In several cases a piece of land is made available by a farmer who has spare land. Every Friday, farmers come together to work on this multiplication area. They weed the field, uproot plants of improved species, divide them into splits, bag them and sell the material to other farmers. A few splits are returned to the land to produce more splits. If the forage becomes rank, the owner of the land is entitled to harvest fodder for his animals, a reward for making his land available. The whole group benefits from the income of the sales of planting material. Members of the group can obtain materials free of charge.

Production of seeds is more difficult and is usually done by individual farmers. Regulations on seed importation are still a problem in some countries. Seed-producing countries such as China, Thailand and Vietnam face difficulty in trading with other countries because of the lack of knowledge on individual countries' export-import regulations.

After the initial germplasm screening at regional level, investments were made at each site in terms of rural appraisal, creating partnerships, participatory diagnosis and planning, and capacity building. This resulted in modest numbers of farmers adopting forages in the first few years. However, when local research and development systems were well established, the project gained momentum and the number of farmers adopting the new forage systems increased exponentially.

BENEFITS

Socio-economic studies were conducted in East Kalimantan, Indonesia; northern Vietnam; and Mindanao, Philippines, with farmers who had been with the FSP project for two years or more (Bosma et al., 2001; Bosma et al., 2003). The aim of the study was to measure impact. Benefits which were mentioned across sites were: increased forage availability; better growth rates, health, fertility and body condition of animals; and reduced labour requirements to feed animals. The drastic reduction in labour requirements was caused by the fact that farmers had to spend less time collecting the natural forages, which are traditionally stall fed at night. In the Philippines and Vietnam, women and children benefited more than men from reduced workload. In the Philippines and Vietnam, work capacity of draught animals

increased. In Indonesia, the value of manure applied to food and cash crops often contributed to 40 % of the income generated by livestock, and manure production has become a lifeline in crop agriculture.

The benefits mentioned resulted in better financial performance of the livestock enterprises at household level. In Indonesia, the income from livestock increased from US$ 311 to US$ 392 per household per year, for systems with beef cattle and sometimes goats. In Vietnam the income increased from US$ 99 to US$ 199 for mixed systems with cattle, buffaloes and ponded fish. In the Philippines, the income increased from US$ 54 to US$ 157 for beef cattle systems, and from US$ 68 to US$ 503 for dairy cattle or dairy buffalo systems. When saved labour was valued in money, the additional increases in income were US$ 87, 52, and 36, respectively, for Indonesia, Vietnam and Philippines, respectively. Poorer farmers in Vietnam benefited most from improved forage technologies.

CONCLUSIONS

Several lessons were learned that have helped to develop the current research and development strategy used in the FSP:

- We need to provide "building blocks" and not "finished products." In other words, the project should show the farmers the species and forage systems that have worked in other places and at the same time allow the new farmers to evaluate a range of optional species and develop their forage systems within their overall farming system.
- Adoption is a continuous process, taking in account that farmers modify the technology options that we provide and expand the areas cultivated with forages only if benefits are experienced.
- Impacts of forage technologies are on individuals within families and on particular groups within communities (e.g. wealth, gender and ethnic groups). If women, for example, spend most of the time cutting feed, then labour savings from introduced forages would benefit them. If the poorer sections of the community do not own cattle, forage technologies directed towards cattle feeding would provide them with no benefits. It is essential to be aware of the effect of technologies on different groups within the community.
- Investment in training of attitudes and skills of field staff is more difficult than training in technical subjects, but not less important. Results of some of these training courses can only be observed in the field.
- There are no short cuts in scaling-up, new farmers need time to experiment as did the old farmers. However, advantage should be taken of the "momentum" that is generated by the enthusiasm of staff, and the rapid expansion of training, development and research activities in the initial years of the project.
- Participatory approaches are fragile. Even where the project is highly effective at the local level, if officials at higher levels do not appreciate the use of participatory approaches, the project field staff will receive little support for what they believe in.
- Building partnerships at local, provincial and national level was crucial to obtain broad support for the initiative.

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