PARTICIPATORY APPROACHES TO AGRICULTURAL TECHNOLOGY DEVELOPMENT IN SLOPING LANDS

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ABSTRACT

The traditional approaches to forage technology were able to identify forage species that were well adapted to the environment. However, it has not resulted in widespread adoption of these species, although it did provide a good understanding of how the species could be grown and utilized in resource-poor farming systems. Participatory approaches, involving active participation of farmers in all aspects of forage technology development, are proving more successful. This paper describes the participatory approach used by the Forages for Smallholders Project, and lessons learned from its application in the field.

INTRODUCTION

In all but the most intensive upland farming systems in Southeast Asia, crop-livestock integration has been a reality for many generations. Crop and livestock production are inextricably linked. The benefits of livestock in these systems, especially for the livelihood security of smallholder farmers, are numerous.

Benefits of Livestock Production

Ease of Marketing

Livestock can be sold at any time. There is a constant market demand for livestock, at relatively stable prices. By comparison, fruit and vegetable crops must be picked when ripe and often sold on a market where prices are depressed by oversupply.

Large livestock (cattle, buffalo, sheep and goats) can be walked long distances to market. The marketing flexibility this provides is especially important for farmers in remote upland areas. If markets are distant, farmers have limited options for producing cash crops. Most crop products are bulky, and have to be carried to market for a low return per unit of weight.

Manure

Livestock provide manure. Where soil fertility limits crop production, manure is frequently an essential input for maintaining crop productivity.

High Returns on Labor Input

Livestock provide a high profit per unit of labor input. The two most common livestock rearing systems in Southeast Asia are:

- Daytime grazing, with livestock being penned at night, and
- Continuous grazing.

Both require a low labor input compared to cropping. Often children provide the labor after school.

Keywords: Forages, livestock, legumes, participatory technology development
**Utilization of Resources**

Larger livestock (cattle, buffalo and goats) use feed resources that cannot be utilized for any other purpose. These livestock are commonly grazed in communal lands (forests, grasslands) or in fallow fields, where they survive by feeding on grasses, shrubs, tree leaves and crop residues.

The interactions between crop and livestock production in these systems are complex. Forage technologies that are developed to improve livestock production may have a profound impact on crop production. The only way we can reasonably hope to deal with this complexity, when developing forage technologies for slopeland farmers, is to work within it. That is, to develop the technologies with the farmers within the systems in which the technologies will be used.

**DEVELOPING AGRICULTURAL TECHNOLOGIES WITH FARMERS**

Fig. 1 illustrates the steps that were often followed in the past to develop forage technologies* for farmers. Researchers controlled all steps of the process, with little, if any, input from farmers. With only a few exceptions, this approach has not resulted in widespread adoption of forage technologies.

There are many reasons for this low rate of adoption. The most significant is that it is not enough for a forage species to be adapted to the soils and climate of a region, and be a useful source of feed. Forage technologies cannot be developed in isolation from the way they are grown and utilized on farms. It is the advantages and disadvantages of the forage technology as a whole that farmers will consider, not just the advantages and disadvantages of a particular forage species. While the traditional approach was efficient at identifying forage species that are well adapted to the environment, we lacked a good understanding of how these could be grown and utilized in resource-poor farming systems.

**Criteria for Technology Adoption**

Participatory approaches to Technology Development (PTD) incorporate the criteria farmers use for judging technologies. The criteria farmers use for judging technologies are frequently different from those perceived by researchers. With forage crops, researchers usually focus on adaptation and yield potential. Farmers, on the other hand, may select species based on such criteria as “greenness of leaf in the dry season”, “softness of leaf” or “hairyness of leaf”. In Tuyen Quang province, Vietnam, for example, we initially offered farmers forage species to feed their buffalo, as this seemed to be their major concern. They quickly discovered that some of these species were ideal for feeding to fish. They selected species largely on the basis of “palatability”, “softness of leaf”, and whether the leaf would float on the water (grass carp are surface feeders). Understanding these criteria allows us to narrow down the types of species that farmers need.

**Experimenting by Farmers**

PTD takes advantage of the ability of farmers to experiment and solve problems on their own farms. Unlike the relatively modern field of scientific research, farmers have been conducting experiments for thousands of years. Often all they lack to solve their problems is access to information and new technologies to test (such as forage planting material).

**Improved Technology Adoption**

PTD improves the chances of wider adoption of agricultural technologies. Any new technology developed and expanded by farmers themselves has a better chance of wider adoption than technology developed solely on research stations for extension to farmers.

**THE PTD PROCESS**

The principles, methods and skills of PTD are well documented (see e.g. Okali et al. (1994), van Veldhuizen et al. (1997a, 1997b)). The main difference between PTD and the traditional approach to forage technology development is that PTD is based on active, decision-making involvement of farmers in all stages of the technology development process (Fig. 2).

* We define forage technologies as the way forages can be grown and used within farming systems. An example of a successful forage technology is the use of the tree legume *Gliricidia sepium* as a fence in Bali, Indonesia. Farmers use this tree legume to delineate fields and control animals (or protect crops from stray animals), while the leaves are sometimes used as a feed supplement during the dry season.
Participatory approaches to technology development (PTD) are becoming widely adopted as the best way forward in developing agricultural technologies with resource-poor farmers. This comes from a general acknowledgement that PTD has several distinct advantages over the traditional approaches to technology development.

Problem Diagnosis

The first step we usually take when starting forage technology development in a new area is Problem Diagnosis (similar to Participatory Rural Appraisal: PRA). Researchers work with a representative group of farmers to gain a greater understanding of their agricultural and livelihood systems. The farmers:

- Identify the problems that are of most concern within their agricultural and livelihood systems;
- Identify causal links between these problems;
- Describe what actions they have taken in the past to minimize each problem;
- Decide which of the problems have the highest priority; and
- Discuss what actions they would like to take to solve these problems in future.

If diagnosis identifies problems that the farmers want to try to resolve, and there are technologies with the potential to resolve those problems, researchers and farmers can together test these technologies (See Fig. 2). In the case of forage technology, the role of the researcher at this stage is to provide farmers with as broad a range as possible of adapted forage species. Researchers should avoid the temptation to provide only the species that they prefer. In south-central China, forage researchers introduced a broad range of forages for evaluation locally. This included one legume species, *Chamaecrista rotundifolia*, which was well adapted to the poor soils but which the researchers did not prefer because of its low feeding value. In the end, however, it was this species that farmers selected, not primarily for animal feed but as a ground cover in orchards.
Experimentation

In PTD, the stage of Experimentation (Fig. 2) can take two forms; formal and informal experimentation. In formal experimentation, farmers conduct formal and statistically valid experiments in their own fields. Two problems, with this approach are:

- On-farm trials frequently have very variable results, and
- Researchers want to control how trials are carried out, since they are more concerned with statistical validity than with encouraging farmers to innovate.

The approach being taken by the Forages for Smallholders Project is to allow farmers to test forage species on their farms in whatever way they want. At the same time, they are provided with information about the experience of other farmers and researchers with each species. When farmers develop promising technologies, controlled experiments can then be conducted, to validate and quantify the farmers’ experiences.

Evaluation

Once farmers have begun testing technologies, and have selected the most promising, there follows a period of Evaluation (Fig. 2), in which farmers describe which of the technologies they like and why. They also explain which technologies they do not like, and why, and what characteristics of the preferred technologies could be improved. Evaluation not only indicates which technologies are showing promise for extension to other farmers, but also provides insights into farmers’ criteria for judging technologies that can be used to guide on-station research.

The key principle of PTD is active, decision-making involvement of farmers at all stages of technology development (Fig. 3).

PTD – THE NUTS AND BOLTS

Much of the documentation of PTD has focused on the specific tools and methods which help researchers to understand farmers’ problems during Participatory Rural Appraisal. Those include village mapping, matrix ranking and transects. These tools are a two-edged sword; both useful and dangerous. They help us understand farmers’ needs and perceptions, but they may also lull researchers into a false sense of achievement. The goal is to use these tools to gain the information you need to start PTD. Our experience is that too much attention is given to the application of these tools, and not enough to solving farmers’ problems (i.e. there is too much PRA and not enough PTD). Whilst it is important to know how to use these tools, it is far more important to focus on the following basic principles of PTD.

Careful Selection of Sites and Farmers is Essential

Successful forage technology development is in no way related to how much seed you distribute. A small quantity of seed distributed to farmers with a real need for forages will be far more successful than large quantities distributed where there is no problem that forages can solve. Selection of sites and farmers is critical, and is often not given the attention it requires. Ideally, like all who are involved in developing agricultural technologies, we
Fig. 3. Extent of farmer participation in technology development

want to work first with those farmers who are innovative, natural researchers and representative of a broader group of farmers with common problems that forages might be able to resolve. How do we identify such groups of farmers? The approach being used by the Forages for Smallholders Project is as follows:

- Identify villages, districts or communes where the farmers appear to have a real need that can be addressed by forage technologies. This is achieved by using secondary information, consisting of both data and key information and observations. Examples of the kinds of secondary information we use to help identify places to start forage technology development are shown in Table 1.
- At each selected site, we then confirm that there is a genuine problem as identified in the secondary information. This sounds trivial, and is often overlooked. Confirming the problem is done during problem diagnosis with representative farmers. A common example is when researchers hear of a demand from farmers for forage to feed their cattle. When they investigate further, they find that the demand results from the requirement of credit agencies that farmers must plant forages before they can receive credit to buy cattle. These farmers do not know whether they will have a problem feeding their cattle.

**Is the Group Representative?**

What is meant by “representative group of farmers”? If, for example, we find from secondary information that weeds in upland crops appear to be a major problem, and women are responsible for most of the weeding work, then it is essential to include women in the diagnosis. If we find that livestock feeding problems are severe in the dry season, and that 90% of the animals are kept by the poorest farmers, these farmers need to be present at the diagnosis.

**Do Farmers Feel the Problem is Important?**

It is not sufficient that there is a genuine problem. We need to confirm that farmers regard the problem as important and want to work to solve it. Once again, this sounds obvious but is easily overlooked. One example comes from southern Lao PDR. When we first visited this area in the dry season, a provincial livestock officer told us that a
Table 1. Suggested secondary information required to select sites for forage technology development

<table>
<thead>
<tr>
<th>Data</th>
<th>Key information/observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>These are data and maps that can usually be obtained from district</td>
<td>These are results from personal observations and probing discussions with district officers,</td>
</tr>
<tr>
<td>and provincial offices</td>
<td>village heads and key farmers.</td>
</tr>
<tr>
<td>a) Climate:</td>
<td>g) Brief description of the area</td>
</tr>
<tr>
<td>Long-term data (at least 10 years) for:</td>
<td>• Key issues affecting development</td>
</tr>
<tr>
<td>• Monthly rainfall</td>
<td>h) Description of topography</td>
</tr>
<tr>
<td>• Number of rainy days/month</td>
<td>• Relative land area for each use (%)</td>
</tr>
<tr>
<td>• Monthly max. and min. temperatures</td>
<td>• Topographic location of each land-use type</td>
</tr>
<tr>
<td>• Extreme monthly temperatures</td>
<td>• What are the main land use systems and their benefits/constrains?</td>
</tr>
<tr>
<td>• Incidence of catastrophes (such as typhoons and floods)</td>
<td></td>
</tr>
<tr>
<td>b) Altitude range</td>
<td>j) Livestock farming systems</td>
</tr>
<tr>
<td>c) Soil</td>
<td>• Why are livestock kept?</td>
</tr>
<tr>
<td>• Ph</td>
<td>• What proportion of farmers keep livestock?</td>
</tr>
<tr>
<td>• Texture and drainage</td>
<td>• Is shared ownership of livestock common?</td>
</tr>
<tr>
<td>• Broad fertility status</td>
<td>• Are inputs used in raising livestock (e.g., supplementary feeding, veterinary medicines and</td>
</tr>
<tr>
<td>• Known nutrient deficiencies</td>
<td>vaccines?</td>
</tr>
<tr>
<td>d) Livestock</td>
<td>• How are livestock managed? (Where do they graze throughout the year, are they fed cut feed</td>
</tr>
<tr>
<td>• Type</td>
<td>who is involved in livestock management?)</td>
</tr>
<tr>
<td>• Number</td>
<td>• How are livestock marketed?</td>
</tr>
<tr>
<td>e) Topography</td>
<td>• What/When are the main constraints and opportunities?</td>
</tr>
<tr>
<td>f) Land use systems</td>
<td>• How have farmers been dealing with these constraints until now?</td>
</tr>
<tr>
<td></td>
<td>• How do they want to deal with them in future?</td>
</tr>
<tr>
<td>k) Trends in the farming system</td>
<td></td>
</tr>
<tr>
<td>• What changes are happening within the farming system?</td>
<td>l) What other rural development programs have been or are currently working in this area?</td>
</tr>
<tr>
<td>• What changes are happening within the livestock raising system?</td>
<td></td>
</tr>
</tbody>
</table>
major problem in livestock production was the poor condition of cattle in the dry season. There clearly was a problem, as all the cattle we had seen were thin and were grazing on dry, sparse pasture. We guessed that farmers would identify the dry season feed supply as a major limitation. Their response, however, was that although their animals lost weight in the dry season, they regained it rapidly when the wet season commenced. It was not a problem of sufficient importance for them to want to test forage technologies.

Another example comes from Oudomxay, in northern Lao PDR. We had been told that cattle and buffalo were underfed all year round, and that the feed resources in forests where they grazed were very limited. When we talked with farmers, we learned that a common form of management was to let the animals graze freely in the forest all year round. The only time the livestock were rounded up was when a farmer wanted to sell an animal. This is a system more akin to fishing than livestock management. It satisfied the farmers’ needs very well, as it requires little labor input in an area where lack of labor is a major limitation to crop production. Although the animals were definitely underfed, the farmers did not see this problem as sufficiently important to make them want to change their existing system.

Do Many Farmers Share the Problem

If farmers identify a problem they want to solve, we need to confirm that there are many farmers who have the same problem. We sometimes find situations where we are asked by two or three farmers for help with a genuine livestock feeding problem. When we investigate further, we find that they definitely have a problem and are motivated to solve it, but that they are the wealthiest farmers in the village. None of the other farmers have the same problem, as they do not have the same livestock management system. In this case, there would be little chance of widespread impact on our target group of smallholder farmers.

Are there Solutions?

We need to confirm that we have possible and appropriate solutions. There are some cases where farmers want to improve the feed supply for their livestock, but we have no realistic solutions to offer them. On the Plain of Jars in northern Lao PDR, farmers complain of a serious shortage of feed in the dry season. The soils are so deficient in phosphorus that very few species of forage will grow well. Even those species that will grow well have so little P in their leaves that cattle will continue to suffer the wasting and death from P deficiency that is common at the end of the dry season. The simple answer in this case was that to improve the system, P needs to be introduced, either as a fertilizer or animal supplement. Neither are currently feasible.

Another example comes from Binh Dinh province in Vietnam. The provincial agriculture and rural development office has had a successful campaign to introduce Brahman crossbreed cattle into upland communes. Farmers in these communes prefer the crossbreed cattle, as they grow faster than local cattle and fetch a higher price at market. They also recognize, however, that to achieve these faster growth rates, the crossbreeds need much better feed resources (in terms of both quality and quantity). Farmers have been testing forages on small plots of land, and have found some species that satisfy their needs. The problem they now face is that although these species are promising, few farmers have sufficient land to plant enough forage to have any appreciable impact on the productivity of their crossbreed cattle. If there is no spare land where forage can be planted, there is no chance of widespread impact.

Identifying Innovative Farmers

We try to identify innovative farmers who can take the lead in testing forages, expanding promising ones, and supporting neighbors who want to develop these technologies themselves. We learned that it is not difficult to identify these farmers. During a problem diagnosis, one crucial step is to ask farmers to describe what actions they have taken in the past to minimize the problems they have identified. At this stage, you will frequently find a few farmers describing actions they have taken, successful or otherwise. Examples we have come across are:

- Dzao farmers in northern Vietnam who cultivate small plots of Napier grass (Pennisetum purpureum) near their grazing lands to feed cattle in the dry season.
- Iko farmers in Luang Namtha province, Lao PDR, who plant creeping legumes as cover crops in their upland fields to control weeds.
- Lowland farmers in North Sumatra, Indonesia, who travel many kilometers to cut grass from rubber plantations to feed their cattle and sheep so they can keep them closer to home.
Farmers in one village of Xieng Khouang, Lao PDR, who collect *Brachiaria ruziziensis* seed from an old demonstration trial 40 km away and plant it near their barns, so they can keep animals closer to the rice fields to provide manure.

In each case, the technology was not the best available, but farmers had demonstrated their readiness to try and solve their own problems.

**Are There Active Extension Workers?**

We need to confirm that there are active local development workers who have an empathy for working with farmers, and a willingness to spend long periods of time in villages. The early stages of forage technology development require regular visits to each farmer to overcome any initial problems, answer questions and encourage the process of PTD. This takes time, energy and commitment. Without such people, participatory development of forage technologies will fail, regardless of whether all the other factors are ideal.

**Communication**

Basic communication skills are more important than the tools of PTD. The skills of listening to farmers (not just hearing), using probing questions to gain deeper understanding of farmers’ needs, working in partnership with farmers to solve their problems and providing information in a neutral manner are the most important aspects of PTD. Flexibility is also essential. You cannot use these tools like a recipe to get an end result. These skills are not obtained overnight or from formal training courses, but from field experience. Without these skills, the PTD tools (e.g. matrix ranking and participatory evaluation) are useless. A carpenter’s tools cannot build a table without the carpenter’s skills.

**PTD is a Process**

PTD is an ongoing (but not endless) process that starts with only a superficial understanding of technologies that may solve farmers’ problems. An example from Daklak province in Vietnam illustrates this process. We have been working with cattle farmers in M’Drak for four years. In the first two years, we tested more than 70 forage species for adaptation to the soils and climate. At the same time, we conducted problem diagnosis with farmers. Their cattle graze on the *Imperata* (cogon) grasslands all year round.

The most common problem mentioned by farmers was the poor quality of the grassland, especially in the dry season. As a result, the children have to take cattle long distances to find green feed each day. They prefer the cattle to graze close to the houses (within one or two kilometers), but when good feed is scarce, the cattle have to go much further than this. Most farmers cut feed, but only for animals that have to be kept back during the daytime (sick animals, cows in late pregnancy or cows that have just given birth). They cut whatever palatable native grasses they can find, but these are scarce, and cutting feed requires a lot of labor.

A second common problem was that during the wettest months of the year (November and December), the native grasses become tall and unpalatable. Furthermore, farmers do not want to tend their cattle in the rain. They therefore want to keep their animals closer to home during this time, and need extra feed in order to do this.

A small group of farmers selected eight promising species to test on their farms as a source of cut feed. Initially, many preferred the grass *Brachiaria ruziziensis*, which grew well during the first wet season. It is not, however, well adapted to the dry season. Farmers quickly changed their preference to more adaptable species. Some farmers found that these forages would not grow on waterlogged areas on their farms. A new species was introduced specifically for such areas. By the second year, 55 farmers were planting different combinations of 4 forage species for cut-and-carry feeding.

By the third year of on-farm development, most farmers were clear about which species they preferred. Some, however, were starting to experience problems of nutrient decline in their cut and carry plots, and problems of managing the forages to maintain best feed quality. The PTD process is now moving away from species selection and into developing sustainable management systems and scaling-up. If the process had only lasted six months, the incorrect conclusion would have been that *Brachiaria ruziziensis* was the solution to the farmers’ problems.

**PTD – WHAT LESSONS HAVE WE LEARNED?**

The methods we use in forage technology development have evolved over the last four years, and will continue to evolve in response to lessons learned in the field. The most important lessons we have learned are:
Speed of Action

Planning and working with farmers should happen rapidly and with commitment. We have generally found that farmers want quick action following problem diagnosis. Frequently, the experience of farmers has been that outsiders who come to help them develop their agricultural systems are quick to collect information, but slow to provide new technologies in return. For farmers to realize that there is commitment from the development worker, our aim must always be to move rapidly beyond simply conducting diagnoses, by quickly leading on to participatory planning and testing of potential technologies.

Working Partnership

Working in partnership with national government and non-government organizations is essential to achieve sustainable results through institutional change. This requires compromises, commitment and time. FSP has only one “commodity” to offer, which complicates an objective diagnosis. Linkages with community or regional development projects are an ideal way of overcoming this problem.

PTD is a Learning Experience for Farmers

Allow farmers to learn and choose what to do with forage technologies. This will result in novel technologies appropriate for each situation. Farmers are not always right. PTD often encourages people to believe that farmers always know what is best. Researchers and farmers each have knowledge to contribute.

Contribution of Researchers

Researchers must contribute their knowledge and experience. The challenge is to give farmers all relevant information, so that they can make an informed decision, without telling them what they should do. Finding a few farmers who will champion the forage technologies results in rapid adoption and spread of successful technologies. Working with a small number of enthusiastic farmers whom you can support is more successful than working with many farmers with whom you have little contact.

Regular Visits

Regular visits to collaborating farmers and informal “farmer training” are crucial for successful forage technology development.

Individuals and Groups

The impact of technologies is on an individual farmer, not on groups of farmers. The type and degree of impact will vary greatly from one farmer to another. Impact assessment needs to be focused on the level of the individual, rather than trying to find an average level of impact for the whole community.

Working with individual farmers is usually (but not always) more successful than working with groups. Farmers are most motivated to solve their own problems on their own land. Imposing formal networks or groups on farmers is unnecessary, unsuccessful and undesirable!

Are All Activities "Participatory"?

Not all of our technology development activities need to be participatory. The PTD process often encourages people to think that every activity needs to be participatory. Some activities are necessarily not participatory (for example, PTD has no chance of success if there are no potential technologies to offer, and new technologies are usually generated by researchers on research stations).

Minimizing Risks

Smallholder farmers don’t generally maximize their most profitable activities, but tend to first minimize their risks. It is wrong to assume that farmers will not plant forages, for example, if coffee production is very profitable in their area. “Don’t ask me whether I will plant sugar cane or forage” one farmer recently told us. “They are both useful and I will plant both!”

REFERENCES


The question was raised about extending technology on a larger scale once technology proves successful. Dr. Horne replied that the first step is to demonstrate that technology exists which has significant interest for farmers, and which farmers can develop themselves on their own farms. Scaling up is difficult, because farms are very complex systems. It is unrealistic to develop a new system with three farmers, and expect it to spread to 1000 farmers. He referred to resettlement areas in Sumatra, Indonesia, where farmers originally began with standardized farm plots. Over time, farmers developed their farms according to their own ideas, so that farms are now very varied.

One participant commented that if farmers are defining and solving the technical problems, this seems to turn scientists into some kind of extension worker. Dr. Horne felt that it is important for scientists to offer a broad range of solutions to the technical problems identified by farmers. In a forage project in Mainland China, scientists had tested 110 forage species. The one species which was selected and spread by farmers had been low-value to researchers, who had used different criteria. If this species had been eliminated at an early stage, an opportunity would have been lost. He emphasized the importance of taking great care during the first stage of diagnosing problems with farmers.

Dr. Sajise of the Philippines commented that the participatory approach is gaining ground. However, to be sustainable, this approach needs the support of local and higher levels of government, and this is generally lacking. The reason is because PTD empowers the farmers, and in doing this it threatens the prevailing social structure of the existing system, including the extension system.

Dr. Horne commented that in beginning the forage program, he and his colleagues had thought in terms of training courses for farmers. The participatory approach had developed gradually. He hoped that as the project became successful, it would be a vehicle to convince others that the PTD approach works. He also emphasized that researchers should not be thinking in terms of a “final solution” to a problem. Many farmers who used to keep livestock in Lao PDR no longer do so. This is not a failure. The livestock were part of a transitional phase, a way of accumulating capital in order to convert to a more sedentary and productive system.

Dr. Horne was asked about the time frame involved, and how long researchers need to be in contact with farmers to get real participation. Dr. Horne answered that during the first visit, when the researcher will meet with a group of 50-60 farmers and their families, there is initially a great deal of uncertainty and reserve. However, problem diagnosis is a powerful tool. It is usually possible to get to the stage when action can begin within a single day. Problem diagnosis and activity planning can begin at the same time. Farmers are often surprised when researchers come back for a second visit. When they return for a third visit, farmers begin to believe that the researcher is serious in trying to help them. The number of visits needed varies from one situation to another. Dr. Horne gave as an example the first planting of forage seed in north Vietnam under the Forages for Smallholders Project. During the first few months, when the plants were very small, the extension worker needed to pay frequent visits. As the plants grew and farmers began to realize their potential, no more visits were needed.

Participants discussed the role of demonstration farms in extension. Dr. Horne felt that demonstration farms rarely lead to technology adoption. Others questioned this concept, and felt that demonstration farms could be effective. Dr. Horne pointed out that many countries have well-maintained, well-funded demonstration plots which are “graveyards of agricultural technology”. Although farmers visit them, they do not adopt the new technology demonstrated. It was generally agreed that new technology must be integrated into the existing farming system, and that it is the farmer himself who must do this. As Dr. Horne commented, “The best demonstration is a successful farm!”