SOCIAL FORESTRY NETWORK

MAKING FORESTRY RESEARCH RELEVANT TO THIRD WORLD FARMERS

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by
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Many developing countries, crippled by large national debts, are unable to initiate and sustain tree-planting programmes on the scale needed to tackle the high rates of deforestation taking place within their borders, even with international assistance. Fuelwood plantations, because of high establishment and maintenance costs will do little to reverse deforestation and environmental degradation (French, 1986). Effective reforestation strategies must have the support of villagers and small farmers on their own terms. The promotion of multipurpose trees and shrubs to meet people's immediate needs is often considered the key to effective action (Postel and Heise, 1988). But conventional approaches and methods have often produced the euphemistic 'limited success'. Introduced technologies of 'best bet' species have not been enough.

Researchers and other development workers involved in agroforestry initiatives or broader aspects of 'Social Forestry' often have the same clients as the agricultural community.

This paper looks at some of the lessons of agricultural research in the development and promotion of technology and suggests steps that 'social foresters' should consider in order to make their programmes more relevant, or as relevant as possible, to the needs of small-scale farmers and other land users.

THE TRANSFER-OF-TECHNOLOGY MODEL

Agricultural research as developed in western industrialized societies and introduced into Third World countries has often followed the 'transfer-of-technology' or 'top-down' model (Chambers and Jiggins, 1987). Research is carried out on experimental stations under controlled conditions with high levels of inputs and the results are presented to farmers for adoption. This model is successful where farming conditions are similar to those of

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research stations—fertile soils, unlimited water supplies, low risk—and where farmers have good access to capital, inputs, markets and information. These resource-rich farmers are usually articulate and often capable of forming politically powerful lobbies to influence research agendas (Farrington, 1989).

In the early 1960s, recognition of wide-spread poverty, hunger and malnutrition resulted in international efforts to raise farm productivity and increase food self-sufficiency in developing countries (Pearse, 1977). New varieties of high-yielding food grains, particularly wheat and rice, accompanied by energy-intensive inputs (fertilizers, mechanized equipment, irrigation systems) did increase food production in some areas of some countries. In Pakistan for example, production of both cereals rose by over 60% between 1965 and 1970 (Eckert, 1977). Modifications of the photoperiod sensitivity of some varieties made shorter growing periods possible, permitting double and even triple cropping in some instances (Lipton, 1989). Other biological improvements included the increased tolerance to moisture stress, better disease and pest resistance, and higher nutrient-use efficiencies.

But many small farmers have not benefited as much as expected from these so-called 'green revolution' technologies. While a few make some gains (and continue to do so), rates of adoption vary widely within and between countries. In many cases the poorest farmers have become poorer, often being forced into debt and eventually off the land. These packaged technologies are often too expensive and/or too difficult to obtain for many farmers in high-risk environments (Richards, 1985) although social and political constraints also often limit adoption.

The evolution of agricultural research for poorer farmers, those at the lower end of the social ladder, is instructive (Table 1). The responses to poor or non-adoption typically follow a top-down approach (Chambers and Jiggins, 1987). Extension services were to be improved and intensified in order to overcome 'farmer ignorance'. Cropping systems research began to focus on crops and conditions found on small-farms. On-station research designs were modified to reflect small-farm complexities. But yield differences between farms and research stations persisted, and were considered the result of farm-level constraints. There were attempts during the early 1970s to change farming conditions to make them more like those of research stations. But farmer adoption of researcher technologies only marginally improved.

Table 1: Responses to Non-Adoption of Agricultural Technologies (Chambers & Jiggins, 1987)

1.	Extension Services: improve and intensify extension efforts to overcome 'farmer ignorance' (1950s-60s)
2.	Cropping Systems Research: change research agendas to focus on the crops and conditions of small-scale, resource-poor farmers but excluded farmer criteria and end uses for selection (1960s)
3.	Recognition of Complexities: modify research designs to reflect complexities of small-scale farming (early 1970s and interest in intercropping research)
4.	Constraints Research: change farming conditions to make them more like those of the research station (early 1970s yield differences between farms and research stations were due to farm-level constraints)
5.	Farming Systems Research: attempt to understand 'holistically' farming systems and develop both on-station on-farm research (late 1970s and 1980s)

CDR AGRICULTURE

A surprisingly recent observation has been that small-scale farmers operate under conditions quite different from those of research stations (Chambers & Jiggins, 1987). They have less control over the physical conditions of their farms (less flat land, less fertile soils, less or no irrigation), less access to inputs (credit, chemicals, draft power, improved seeds and information) and their farming practices involve complex interactions (multiple crop-animal-tree relations and sequences).

Chambers (1988) calls this complex, diverse and risk-prone farming or 'CDR agriculture', complex in farming systems and diverse in environments. Risk reduction is a major preoccupation of CDR farmers. They often depend entirely on family labour and may own, rent and/or share all or portions of the lands they work. They struggle to meet both consumption and production goals often under marginal conditions. Not surprisingly, their priorities are different from those of the research station.

Farming systems research which developed during the late 1970s was an attempt to understand small-scale farming 'holistically'. Both on-station and on-farm research was initiated. Unfortunately much of this work was (and often still is) researcher designed and driven, focusing on the farm, failing to fully consider the whole economic system being exploited by the farm family.

Farmers do not just farm. In many instances, farming — raising crops and/or animals — is not even the most important activity. Income generation is often an important objective, income earned from non-farming activities and from off-farm employment (Arnold, 1987). A major limitation to most farming system research has been to underestimate the importance of non-farming activities, thereby failing to understand why farmers often reject 'improved' technologies (Behnke and Kerven, 1983).

In East and Southern Africa, Low (1988) found that additional family income sources came fom the making of handicrafts, beer brewing, trading, teaching and wage employment, all of which served to reduce labour available for farming. Zinyama (1988) discovered that shortages of family labour was a major constraint to increase crop production on communal farmlands in Zimbabwe. Many males were away working in urban areas or on large commercial farms and their wives, the actual farmers, had social and family commitments in addition to farming.

When one compares the physical, social and economic circumstances of resource-poor farmers with those of research stations, it is little wonder that station-based technologies are frequently irrelevant and unacceptable.

New interpretations of limited or non-adoption of agricultural technologies stress the need to involve farmers and farm families as much as possible in the research process, to attempt to understand their objectives and views (Farrington, 1989). Similarly, foresters working with small-scale farmers need to know what their clients want (if anything), what their objectives and goals are, how and why they use trees, how they make a living — to develop what Diane Rocheleau calls a 'user perspective' and see the issues through the farmers' eyes (Rocheleau, 1987).

PARTICIPATORY RESEARCH

Rural people, typically, have too little involvement in most projects. Their first opportunity usually comes at the implementation stage, long after research topics, solutions and farmer collaboration have been assumed or taken for granted (Hoare & Crouch, 1988). Failure to consider their views and needs right from the start should cause little wonder at the 'limited success' of many projects. Even in farming systems research where one expects a good deal of farmer participation, farmers often end up as passive players, reduced to the status of labourers or, at best, contractual, lesser partners (Farrington, 1989).

'Participation' obviously has a different meaning to different researchers (Table 2). A distinguishing feature of the different forms of participation is the attitude of researchers (Biggs, 1989). Reviewing nine national agricultural on-farm research programmes, he found that most started with methodologies which limited farmer participation to set roles in the consultative mode. With experience, several eventually developed flexible and cost-effective methods to involve farmers as collaborative partners. There were few examples of collegial participation although components were found in programmes of Zambia's Adaptive Research Planning Team and in activities of Zimbabwe's Farming Systems Research Unit.

In a global survey of some forty-one farming systems research projects, Lightfoot & Barker (1988) noted that the type of trial management was a key factor in determining the degree of farmer involvement. In researcher-managed and researcher/farmer-managed trials, the role of the farmers varied from a nominative one to one of consultation. They found few examples of farmer-managed trials and even in these, researchers often continued to make management decisions.

Biggs (1989) suggests that the level of participation depends on the primary research activity to be carried out. Where technical problems are poorly understood and research resources are scarce, collaborative and/or collegiate approaches can be effective, low-cost strategies. Supporting farmers' research efforts can shift some of the costs of research from the formal institution to the farmer, helping to address such problems as maintaining research sites in isolated areas and the high turnover of field staff.

Table 2 Types of Farmer Participation (Biggs, 1989)

a)	Contractual—	researchers contract with farmers to provide land, labour or services — farmer involvement is minimal and there is little if any interest in indigenous technical knowledge (ITK) or informal research
b)	Consultative—	researchers consult farmers about their problems, determine priorities, take most of the decisions, design trials and surveys — farmers evaluate technologies; ITK & informal research recognized as important but on-farm research seen as extension rather than a research activity (used by CIMMYT & IRRI in their cropping systems programmes)
c)	Collaborative—	researchers & farmers collaborate as partners in the research process; diagnosis & assessment is continuous to help on-farm & on-station research each year; emphasis is given to tapping ITK to better inform researchers & to actively learn from the informal research system; wide variety of different types of meetings held with farmers for different reasons
d)	Collegial—	researchers work to strengthen farmers' informal research & development systems; major emphasis is given to activities to increase ability of informal systems to do research and farmers have major say in running research sites

Some national agricultural programmes have promoted farmer participation successfully. Ashby (1987) found that farmer collaboration in the design of fertilizer trials in Columbia was cost-effective and led to conclusions about the technology which were different from trials where researchers had more active roles. Farmers also pre-screened a large number of crop varieties, giving researchers opportunities to understand the basis for selection. She also found that when diagnostic work focused on trying to understand the informal, farmer research system, the practices being followed by a minority of farmers were at the 'leading edge' of farmer experimentation — something frequently lost by diagnostic and design exercises which focus on 'representative farmers'.

Most importantly, one of the main advantages of early farmer participation is to strengthen the 'demand-pull' on the research agenda (Farrington & Martin, 1988). Without farmer involvement, can researchers' priorities really reflect what farmers need and want?

In Indonesia, plant breeders, without consulting farmers, developed a dwarf coconut palm which produced more fruit, matured earlier and was easier to harvest than the traditional variety although it was not as long-lived. The farmers however, grew coconut palms in homegardens. While their traditional tall palm grew above all other plants and caused little shading, the shorter 'researcher-designed' plant competed with space reserved for bananas and other crops. Earlier and increased fruit production was also of little value to the household. More useful for the family was the more limited production over a longer period by the local variety. The shorter variety was even more difficult to guard from theft (Hoskins, 1987).

In an agroforestry programme in South-East Nigeria, researchers found that the 'limited success' of two systems of browse tree cultivation, alley farming and intensive feed gardens, was also largely due to the absence of farmer participation early in the research process (Francis & Atta-Krah, 1989). There was little diffusion of the technology beyond the original participants to other farmers even though all farmers had identified fodder supply as a major farming constraint. Most farmers were unable to adopt and utilize the technologies being promoted, even though based on 'perceived needs'. This was related more to sociological and institutional arrangements within and between households which determined access to and allocation of resources, and not to any flaw in the technology.

EXPERIMENTING FARMERS

Small farmers and other rural land users often have considerable information and expertise to complement the formal research system. Where people earn some or all of their living from the land, they are usually successful managers of their environment — able to make a living from understanding and manipulating diverse, varied and complex ecological relationships (Richards 1985). While they may be income-seeking, rational and risk-averse, they are also innovative, experimental and adaptive (Biggs & Clay, 1981). Experimenting by farmers is a common practice to solve problems, adapt technology and even to satisfy curiosity (Chambers, 1989).

Bunch (1989) found that in Central America some farmers experimented with ridges of compost and Napier grass along contour ditches to check soil erosion, tried different plant spacings and numbers, and also looked at non-toxic methods of pest control and alternative uses of native plants. Lightfoot (1987) observed that many farmers in the Philippines maintained several lines of sweet potato and that their breeding objectives were quite different from those of researchers. Richards' well-known work documents the practices of Mende farmers in Sierra Leone in rice breeding, selecting varieties for specific characteristics, the evaluation of new of unfamiliar lines, experimentation on marginal sites and conducting quantitative input/output studies (Richards, 1985). Rocheleau *et al.* (1989) record the traditional practices of some Kenyan farmers in applying plant biomass to cattle pens (boma mulching) to produce compost. And Clawson (1984) notes that intercropping principles are well-established in many small-scale farming systems, especially where soils are poor and rains unreliable. In fact, he suggests that the more adverse the environment, the more farmers tend to value experimentation.

Researchers in India considered it too costly and impractical to attempt to replicate the numerous and varied conditions under which rice farmers operated (Maurya *et al.*, 1989). By adopting a decentralized and collaborative approach, where new material closely matched traditional varieties and by allowing farmers to carry out trials using their existing practices, technology testing and adoption by farmers was simple and inexpensive. The farmers' simple split-plot comparisons permitted the rapid screening of a wide range of varieties and the release of several lines in a much shorter period than would have been possible under normal station conditions.

There are few detailed examples of farmers and other rural people deliberately experimenting with woody species, although a certain amount of spontaneous tree planting does take place where there are traditions of settled agriculture. Even if people may not plant trees, they often protect and manage certain natural ones for particular benefits (Foley and Barnard, 1985). Shepherd (1989) found for example, that farmers on the slopes of Mt. Kenya were "deeply committed to trees and to tree-planting". As plots became consolidated, species diversity increased and their location and use on farms changed.

In an informal survey of farmers in North-Eastern Zambia, Rocheleau (1987) found that trees play an important role in the land-use system, including those planted or retained in fallow fields and outlying croplands. People had considerable knowledge and experience of indigenous and exotic, wild and domesticated species. Some had expertise in horticulture, including layering and grafting techniques. Many were well informed on site requirements, management potential (tolerance to coppicing or pollarding), relative growth rates, and leafy biomass production. Farmers also experimented with mounding of grass and woody plant material to improve soil structure and fertility and to check erosion. She found that the survey results highlighted the differences between researcher-defined and farmer-defined research topics, and by learning first what people already knew about trees, the research programme was altered to reflect people's real needs and concerns.

Homegardens or compound gardens are good examples of indigenous experimentation at work. They represent creative management for diversity, stability and continuous production. Labour efficiency is enhanced and risk is minimized. Such gardens are dynamic farmer 'research' sites.

In Tanzania, the results from years of trial-and-error experiments allow farmers on the slopes of Mount Kilimanjaro to propagate and manage a large number of species for a variety of products and functions (Fernandes *et al.*, 1984). And in Kathema, Kenya, Rocheleau and co-workers found that women collect several species of wild food and medicinal plants for propagation and domestication in their homegardens (Rocheleau *et al.*, 1989).

DISCUSSIONS AND CONCLUSIONS

There are obvious advantages to first finding out what local people know about trees before deciding on research agendas. As permanent rural residents, they are usually better informed about many aspects of indigenous species of trees, including their flowering and fruiting habits, their growth and management. They are also more knowledgeable on their uses than urban-trained and urban-based researchers. Farrington & Martin (1989) caution however, that such indigenous knowledge has its limitations. It is usually restricted to the local pool of techniques and genetic materials, and many genetic possibilities are not explored. It is also slower and more limited than formal research in its classification, storage and retrieval of information. Information is usually distributed by word-of-mouth.

Nevertheless, by learning first from people, many programmes would be more relevant to local interests and needs, and less wasteful of time and scarce financial resources.

Farmers and villagers should also be involved, as early as possible, in research activities, and not just as hired labourers. On-station experiments designed and run solely by researchers cover only a few experimental variables at a time. Trees require time and space to grow and only a few experiments with a few replications can be handled effectively (Rocheleau *et al.*, 1989). On-station trials also cannot take into account the numerous distinct environments and socio-economic conditions found on small farms and in rural communities. Furthermore, because of the long-term nature of tree crops, the large number of species and varieties to choose from, and their potential for multiple benefits and interaction with other farming activities in production and protection roles, it is imperative to involve rural people at an early stage to help overcome these limitations. Rocheleau (1985) stresses that self-correction in tree crop programmes is essential if years of research efforts are not to be lost. Technologies and designs must be subject to change based on farmer response, and this flexibility must extend to species choice and management.

More importantly however, there is the danger that technologies developed only within the confines of research stations will ignore the social, cultural and economic dimensions of rural life and be unacceptable to farmers. But by learning from and developing opportunities to work with local people under 'real life' conditions, forming partnerships of mutual respect, relevant research may be developed and the 'limited success' typical of many forestry projects avoided.

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