1

An Introduction to Farmer Participatory Research

Farmer participation in agricultural research is more than talking to six farmers or putting ten experiments in their fields. Above all, it is a systematic dialogue between farmers and scientists to solve problems related to agriculture and ultimately increase the impact of agricultural research. By responding closely to farmers' concerns and conditions, researchers can develop technologies that are adopted more widely and that respond to important social issues such as equity and sustainability.

Developing this dialogue between farmers and scientists is not as simple as one might think, because farmers and scientists have different needs, world views, knowledge systems, methods, and tools. When it is successful, dialogue between farmers and scientists can lead to more productive, stable, equitable, and sustainable agricultural systems. Achieving this goal should be good for farmers, because it enhances their welfare; for scientists, because it increases their job efficiency; and for society in general, because it adds to the food supply and encourages the conservation of natural resources for future generations.

Farmer participatory research has been defined as "the collaboration of farmers and scientists in agricultural research and development" (Bentley 1994:140). The need to improve our understanding of farmers' conditions and incorporate their perspectives into the development and testing of new agricultural technology is not new. The current interest in farmer participation is related in large part to farming systems research (FSR) (Tripp 1989). The FSR perspective recognizes that most small farms are an integration of multiple enterprises that require the management of diverse household resources to meet a range of subsistence, income, and community goals. A farming systems perspective also implies a commitment to include farmers' criteria and goals when setting research priorities (Tripp and Woolley 1990).

What, then, is new about farmer participatory research (FPR) methodologies? How do they differ from the FSR approach? It is useful at this point to consider the four approaches to farmer participation described by Biggs (1989:3):

- *Contractual:* Scientists contract with farmers to provide land or services.
- *Consultative:* Scientists consult farmers about their problems and then develop solutions.

- *Collaborative:* Scientists and farmers collaborate as partners in the research process.
- *Collegiate:* Scientists work to strengthen farmers' informal research and development systems in rural areas.

Farming systems research has focused mainly on the first two approaches, whereas FPR stresses the third and, to a lesser extent, the fourth. Furthermore, FPR emphasizes three aspects of farmer participation, which are recognized by FSR but not given such importance:

1) Most farmers have extensive, well-developed knowledge of their environment, crops, and cropping practices.
2) Many farmers carry out experiments on their own and generate innovations.
3) Farmers actively exchange information and technologies.

A short review of each of these aspects of FPR follows.

Farmers' Local Knowledge

As anyone who has worked closely with farmers knows, they possess knowledge about their crops, their farming environment, and their socioeconomic conditions. In many instances they can clearly articulate the rationale behind their management practices and their decisions. This knowledge, which has been documented formally by numerous social and biological scientists, includes their soils and productive environments (Bellon and Taylor 1993; Kamangira 1997; Edwards 1987), their crops and crop varieties (Richards 1986; Sperling et al. 1993), insects and pests (Bentley 1992; Bentley and Rodriguez 2001), and soil and water management practices (Wilken 1987; Lamers and Feil 1995). Understanding this knowledge is a fundamental step towards generating a dialogue between farmers and scientists. It is a key reference point that farmers use to make decisions and to communicate among themselves. Scientists need to understand farmers' knowledge if they want to contribute to farmers' welfare by providing new information to them, by developing appropriate technologies with them, or communicating effectively with them. To understand farmers' knowledge, scientists must first elicit and analyze it.

Farmers' knowledge can be classified into three categories: perceptions, taxonomies, and rules of thumb. Distinct methods are required to elicit and analyze these different kinds of knowledge.

Perceptions are mental images obtained through the senses. Perceptions may or may not be shared widely among a group of farmers. In some cases, they can be idiosyncratic, be particular to an individual, and bear little or no relation to the perceptions of other members of a group. In other cases, they may be widely shared and agreed upon.

For our purposes, farmers' perceptions about alternative technologies are very important, particularly the characteristics they identify to assess whether technologies are appropriate for them. This assessment of whether a technology is appropriate does not necessarily consist of an absolute "yes" or "no" answer. It usually consists of a ranking of technologies from more to less appropriate. Knowing how to elicit these perceptions, translate them into criteria for evaluating a technology, and use them to rank alternative technologies is important for working with farmers to develop and assess agricultural technologies.

Taxonomies are the abstraction of perceptions into categories with names and defined properties. Taxonomies are organized in a hierarchical fashion. They are usually widely shared, and a given population will show a high degree of agreement about them. Among farmers, the most widely studied taxonomies are associated with soils. For example, Kamangira (1997:43) reports that farmers in the Songani catchment area of Malawi have ten local soil classes, mainly referring to soil texture and color. Kamangira also demonstrates how farmers' soil knowledge can be combined with scientific views about soil classes. Sandor and Furbee (1996) show how soil classes are organized in a taxonomic tree, and they compare farmers' local knowledge with soil physiochemical properties and their scientific classification.

Rules of thumb are logical propositions that relate two events in a cause-and-effect relationship: "If *this* occurs (or if I do *this*), then *that* happens." These rules may or may not be widely shared or agreed upon within a group of farmers.

In many cases, rules of thumb relate taxonomies to specific behaviors. A farmer may think that if a modern maize variety is not weeded early in the season, its yield will decrease significantly, but he or she may not believe this to be the case for a traditional variety (e.g., Bellon 1991). The farmer may therefore have the rule of thumb that if he/she can ensure access to sufficient labor early on, he/she should plant a modern variety; otherwise, a traditional one should be planted.

The elicitation of rules of thumb and their organization into behavioral decision models for the adoption of specific technologies has been developed by social scientists; see, for example, Gladwin (1979) for timing of fertilizer application and Franzel (1984) for the adoption of an improved maize variety. These methods are particularly complex, however, and they can be time consuming.

Farmers' knowledge should not be dismissed or, conversely, idealized. As mentioned previously, farmers know many things about farming and their conditions, but there are many other aspects of farming that they do not know or misunderstand. Farmers' knowledge is well developed for phenomena that can be observed readily and for relatively straightforward cause-and-effect relationships. Their knowledge of soils and potential productivity is usually well developed, as is their knowledge of weeds and their impact on crop development. For phenomena that are difficult to observe or that have multiple and sometimes interacting causal factors, farmers' knowledge is often less precise, or incorrect, or non-existent. For example, farmers' knowledge of pests and diseases is usually deficient or non-existent. Smallholders lack the microscopes or sophisticated equipment that would allow them to make finer or deeper observations beyond the capacity of the naked eye, and they also lack the basic scientific concepts, such as knowledge of microorganisms or genetics, that would allow them to interpret many of their observations (Bentley 1994). Furthermore, farmers' knowledge may be inadequate in the presence of extremely rapid technical change, since farmers may not have enough experience with a technology to have understood all its dimensions.

One should not assume that farmers' knowledge leads to specific behaviors or vice versa, just as knowing that smoking is harmful certainly does not deter many people from smoking. As anthropologists frequently find, actual behavior deviates from and often contradicts the cultural rules of appropriate behavior (Johnson 1974). People often make unarticulated decisions that, though subconscious, have a definite impact on their behavior (Gladwin and Murtaugh 1980). In participatory research, we are particularly interested in how knowledge affects behavior and how behavior affects knowledge. For this reason, it is not enough simply to elicit and appreciate farmers' knowledge; we also need to link that knowledge to specific behaviors and vice versa. When interacting with farmers, scientists should always ask themselves, "If what they are telling us is true, what should we expect to see in their behavior?" and, if possible, probe for it. This attitude of scientists towards farmers should not be interpreted as arrogant and distrustful but rather should be seen as a desire to understand farmers better. Understanding evolves from testing perceptions and expectations against reality. Scientists should also keep in mind that many farmers may have a similar attitude towards scientists.

Finally, it should be pointed out that farmers' knowledge is dynamic. Farmers incorporate new information and concepts from extension, schools, input suppliers, the media, and others into their knowledge base and abandon other knowledge. They are particularly likely to create new categories or terms that reflect changes springing from newly adopted technologies. The response of varieties to new inputs such as fertilizers or herbicides may generate local concepts such as "sturdy" and "delicate" varieties: sturdy varieties can withstand delays in weeding and/or fertilizer application without a substantial decrease in yield, whereas delicate ones cannot (Bellon 1991). In some cases, knowledge that proved correct under earlier circumstances may now lead to poor decisions. For example, fire is a common means of managing crop residues in the tropics. Fire is essential in swidden agriculture, and it may not be harmful provided that fallow periods are long enough to allow natural vegetation to regenerate and restore lost nutrients. Nevertheless, in an intensive tropical agricultural system its use is questionable at best and disastrous at worst. In these systems, using fire to recycle nutrients often results in their depletion; although nutrients become readily available, the efficiency of nutrient release is low (Lal 1987). It is important to identify such knowledge and try to modify it, although this may be difficult.

Farmers' Experiments

The fact that small-scale farmers in the developing world conduct experiments on their own is well documented (Johnson 1972; Richards 1986) and has become a pillar of farmer participatory research (e.g., Ashby et al. 1995; Buckles 1993). Farmers' experiments are important because they promote knowledge and evaluation of new and unproven technologies without jeopardizing farmers' livelihoods or scarce resources. These experiments may be farmers' basis for generating and adapting new technological options that fit their specific needs and conditions.

Farmers conduct different types of experiments (Rhodes and Bebbington 1988; Scoones et al. 1996):

- curiosity experiments—just to see what happens;

- problem-solving experiments—to address a specific problem they face;
- adaptation experiments—to adapt new technologies to known environments or known technologies to new environments; and
- fortuitous experiments—chance events that lead to changes in practices, which in turn lead to a new learning experience.

In the farmer-scientist interaction, the adaptation and problem-solving experiments are, respectively, the most relevant. The most common experiments involve comparing a new variety with a familiar one by planting a few rows of the former next to the latter (adaptation experiment). Scoones et al. (1996) report an example of a problem-solving experiment in which a farmer tested various planting strategies to improve sunflower germination.

Farmers' and scientists' experiments often differ (Bentley 1994; Perales 1993). Three key differences are:

1. Farmers' experiments commonly lack a control treatment.[1] Scoones et al. (1996:135) say that the farmer may carry the control "in the head."
2. In the fields where farmers' experiments are located, many factors may be modified simultaneously, or extraneous factors may not be controlled for.
3. Farmers usually do not replicate an experiment, although it is often said that they do so over time. For example, they may compare the current season's results with those of previous seasons.

From a scientist's point of view, these characteristics make farmers' experiments hard to analyze and interpret. As mentioned previously, the main source of data and evidence for farmers is their own observations; they usually lack instruments to observe such phenomena as nematodes or lack conceptual tools such as statistics to isolate one event from another. This difference serves to emphasize the point that many of scientists' experiments may not make sense to farmers, who probably lack the instruments and conceptual background to employ the scientific method.

Farmers and scientists can have different degrees of interaction or involvement in the design, management, and analysis of experiments. Different degrees of involvement are appropriate for accomplishing different objectives (Table 1). On one end of the continuum, the experiment is located in the farmer's field, but the scientist designs, manages, and analyzes it. This strategy may be effective for developing a basic

Table 1. Levels of interaction between farmers and scientists and possible outputs

Degree of interaction		
Scientist	**Farmer**	**Possible output for which interaction is appropriate**
Designs, manages, analyzes	Provides the field	An understanding of processes, components of new technology under farmers' biophysical conditions
Designs, analyzes	Manages, provides input into the analysis	An understanding of processes, components of new technology under farmers' biophysical conditions and their management
Designs, manages, analyzes	Designs, manages, analyzes	Joint evaluation and modification of a new technology
Training, guidelines, technical support	Designs, manages, analyzes	Capacity building, empowerment

[1] In many cases farmers conduct simple experiments, however, varying one factor at a time and comparing the results with their normal practice. These experiments are easier to interpret and comparable to those made by scientists.

understanding of processes or of the components of a new technology in the biophysical conditions where farmers operate. Further along the continuum, the experiment is located in the farmer's field; the scientist designs it and analyzes the results, but the farmer manages it and provides the scientist with some input to interpret the results. This form of experimentation brings the farmer's actual management into consideration.

Even further along the continuum, the farmer and scientist jointly design, manage, and analyze the experiment. This approach may be particularly useful for jointly evaluating a new technology and modifying it. Finally, at the other end of the continuum, the farmer designs, manages, and analyzes the experiment, which is located in one of his or her own fields. The scientist helps to improve the farmer's experimental methodology through training, provides some basic guidelines, and, in the early stages, offers technical support. Eventually, however, the farmer performs these tasks completely independently. This approach is appropriate for building capacity, empowering farmers, and fostering a process that perhaps can continue without the scientist's long-term involvement. We will return to these themes later in the discussion of guidelines for farmer-scientist experiments.

Farmers' Exchange of Information and Technologies

Farmers constantly share information about things that are important to them. These exchanges have been particularly well documented for seeds of different crops and varieties (Cromwell 1990; Sperling and Loevinsohn 1993). Many innovations have spread from farmer to farmer without the intervention of any formal agricultural extension services, such as the diffusion of the moldboard plow in many parts of Africa (M. Blackie, personal communication) or the diffusion of velvetbean (*Mucuna* spp.) in Mesoamerica (Buckles 1995). Farmers exchange information as well. For example, farmers in Portugal exchanged a great deal of information through their laborers, who worked for different farmers and shared ideas such as using silage cutting machines (Bentley, personal communication).

Information and technology commonly are diffused through a social network, which can be defined as a group of people who share certain bonds, usually as a result of family or traditional social obligations. Social networks may play a fundamental role in the adoption of new technologies, particularly if they require collective action, such as constructing contour dikes for soil erosion and water control, which cannot be accomplished by a single individual (Smale and Ruttan 1997). Social networks also affect the flow of farmers' own experimental information. For example, the propensity of rice farmers in Sierra Leone to discuss new rice varieties (Richards 1986) contrasts with the concern of many Ghanaian farmers that excessive interest in a neighbor's farming activities may be linked to witchcraft (Tripp 2000).

Exchanges of information and technology may extend beyond these networks to include casual contacts made through travel, migration, and off-farm labor. Social barriers to these exchanges also exist, however; social networks may include only members of one village, ethnic group, or social class. Diffusion of information and innovations outside the network may be difficult, and the network itself in some cases may act as a barrier rather than a conduit. For example, seed flows may take place mainly within a village, with few flows occurring between villages (Smale et al. 1999). Another interesting case is reported by Scoones et al. (1996), who point out that fear of witchcraft or of generating envy from others may prompt farmers to conceal their knowledge and innovations.

It is important to keep in mind that farmers are not isolated individuals but members of social networks, and that these networks can play an important role in the diffusion, or lack thereof, of information and technology.