

  
Agricultural Administration Unit  
Occasional Paper 9

# Farmer Participation in Agricultural Research: a review of concepts and practices

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## Glossary

ACES	Agency for Community Educational Services (Philippines)
ATIP	Agriculture Technology Improvement Project (Botswana)
BARI	Bangladesh Agriculture Research Institute
CGIAR	Consultative Group on International Agricultural Research
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo (International Maize and Wheat Improvement Centre)
CIP	Centro Internacional de la Papa (International Potato Centre)
CUSO	Canadian Universities Service Overseas
FBTF	Farmer-back-to-farmer approach (Rhoades and Booth, 1982)
FFL	Farmer-first-and-last approach (Chambers and Ghildyal, 1985)
FPR	Farmer participatory research
FSR	Farming systems research
IARCs	International Agricultural Research Centres (funded by the CGIAR)
ICTA	Instituto de Ciencia y Tecnologia Agricolas (Guatemala)
IFDC	International Fertilizer Development Corporation
INIAP	Instituto Nacional de Investigacion Agropecuaria (Ecuador)
ISNAR	International Service for National Agricultural Research
ITK	Indigenous technical knowledge
Kgotla	Traditional village governing assembly (Botswana)
NARS	National agricultural research service
NGO	Non-governmental agency
OFCOR	On-Farm Client-Oriented Research study (ISNAR)
OFR	On-farm research
IRRI	International Rice Research Institute
RPF	Resource-poor farmers
RRFH	Regular research field hearings (Knipscheer and Suradisastra, 1986)
TOT	Transfer-of-technology approach



# 1

## Introduction and Conceptual Framework

Participation in agricultural research draws on two broad sources: it was preceded by a move towards participation in social science research, motivated by concern that conventional quantitative and neutral research methods tended to preserve social inequality. Its features included problem orientation, a respect for people's capability to produce and analyse knowledge, the researchers' commitment to and involvement with the community, the rejection of 'value neutrality' and the recognition that research is an educational process for researcher and community. An underlying purpose of participatory approaches was therefore the 'empowerment' of disadvantaged groups — a recurrent theme in some of the literature reviewed here — and one of the principal means of interaction between researcher and people became known as 'action research', a widely-used social science research technique which has found some application in agriculture (ILEIA, 1985).

Participatory research was one of the two major themes adopted by UNRISD for the 1980s (Pearse and Stiefel, 1979) and formed the theme of an international conference held in Yugoslavia in 1980 (Dubell *et al.* (eds.) 1981) at which three parallel purposes of participation were defined:

- community involvement in social research
- community action for development
- community education as part of the mobilisation for development

Freire's (1972) 'conscientisation' as a strategy for liberation was recognised as a pioneering effort to popularise participatory research on an international scale.

A second source on which farmer participatory research (FPR) draws is Farming Systems Research (FSR).

Considerable confusion has arisen over the relationship between FSR and FPR. As indicated below, some proponents of FPR seek to distance themselves from conventional agricultural research institutes which are seen as defending the status quo in relations between researcher and farmer, and, ultimately, in the imbalance between rich and poor farmers in Idcs. On the other hand, even in its earliest formulations, FSR stressed the need to involve and learn from the farmer in research, and where departures from this principle occur, they are generally attributable to poor interpretation of FSR's objectives or to funding constraints.

To some extent, the tension between FPR and FSR reflects that between participatory approaches and institutions in the social sciences. As Dubell *et al.* (1981) note, participation is likely to be constrained by the expectations and intentions of any sponsoring agency. Furthermore, any material arising from participatory approaches and released beyond the community in which it was generated may be interpreted and used in unintended ways, having repercussions beyond the control of the community. For these reasons, in the social sciences approaches have been favoured which are independent of existing institutions. Such 'distancing' is much more difficult in the agricultural sciences, where a vast body of technical knowledge has accumulated in institutions and, for problems to be solved and opportunities exploited efficiently, elements of both institutionalised and indigenous knowledge must be drawn upon. The central concern of this paper is not, therefore, whether one mode of research should replace the other, but how — in terms of methods and institutions — the most relevant aspects of each can be brought to bear on the issues at hand.

The more immediate origins of interest in FPR lie in the realisation that resource-poor farmers (RPF) stand to gain little from the processes of development and transfer of technology characteristic of the Green Revolution, namely the breeding of early maturing fertilizer-responsive semi-dwarf varieties and their diffusion into environments enhanced by irrigation and agro-chemicals. For them, production increases in the future would derive more from evolutionary than revolutionary processes, requiring an understanding of the diverse and complex environments in which they operate so that developments in technology can be tailored to suit their circumstances, building, where possible, on farmers' indigenous technical knowledge (ITK).

## Conceptual framework

Analysed below are the concepts underlying three approaches to farmer-participatory research, by Harwood (1979) on the basis of IRRI experience; by Rhoades *et al.* (1985) derived from work at CIP, and by Chambers and Ghildyal (1985).

Before examining the approaches proposed by these, a useful point of reference for comparative purposes can be obtained from an approach suggested for CIMMYT's on-farm experimentation (Tripp, 1982) which, in turn, is drawn from the Production Research Programme at Ecuador's INIAP. The main features of all four approaches are summarised in Figure 1.

1. *Tripp* (1982) outlines the main opportunities offered by OFT and the methods most appropriate to exploit these.

Learning from farmers is a piecemeal, fragmented and iterative process requiring repeated interaction between researcher and farmer over an extended period. An attitude of honest curiosity on the part of the researcher will generate confidence among farmers to react openly and frankly to what they see. The researcher stands to gain an understanding of the role of the technology he is introducing within the frequently complex farming systems, and an insight into how farmers might adapt the technology. Farmers stand to benefit from technology more adequately tailored to the 'recommendation domain' of which they form a part.

The design of the experiment is principally the responsibility of the researcher, as is management of those variables being examined in the experiment. The farmer will be responsible for the remaining operations, but it should be ensured that his practices correspond with the norm for the target group. Collinson (1987 and per. comm.) emphasises the significance attached by CIMMYT to techniques (such as the recommendation domain) which allow the costs of participatory approaches to be spread over a large number of clients.

2. Whilst *Harwood* (1979) recognises the continuing need for 'basic research into varietal improvement, disease and pest management, plant physiology and soil fertility' (p.33), he proposes a method in which 'the major emphasis is on production research, planned and carried out by and with the farmers on their own fields'.

Emphasising flexibility and local adaptation as the key to success, he draws on elements of three existing research systems:

(i) the Japanese practice of establishing many small testing stations throughout the country to ensure local adaptation.

Figure 1: Conceptual features of principal approaches to farmer participatory research

	Tripp	Harwood	Rhoades and Booth Rhoades, Batugal and Booth	Chambers and Ghildyal Chambers and Jiggins
<i>Methodological issues</i>				
Who decides on trial design/content?	researcher incorporating farmers's views on content	farmer and researcher jointly	farmer, technologist, extensionist (where possible) and social scientist, jointly	principally farmer with consultative inputs from researcher, if required
Who manages the trial?	researcher manages the variables being tested, farmer manages the remainder	farmer and researcher jointly	farmer and researcher jointly	farmer
Who evaluates the trial?*	not indicated	researcher and farmer, in the light of farmer's goals	farmer has final judgement on appropriateness	farmer
What should characterise farmer/ researcher relations?	'honest curiosity' by researchers	farmer and researcher equal	farmer and researcher equal partners	ITK and farmer goals fundamentally important; 'reversals' required if researcher is to learn from farmer; researcher as consultant
What should characterise the research process?	OFT as iterative multi-season process; time needed to gain farmer confidence, and test new hypotheses arising from trial results and his views of them	OFT as iterative multi-season process; farmer to decide whether/in what form he wishes to continue trial; important to test through inter-year	flexibility needed: consult farmer through research process and change design where necessary. May be useful to conduct an experiment <i>before</i> a	farmer to dominate all decisions on research process. Apparently unstructured

'other research' should have a purely referral role. No indication that it should provide ideas for OFR testing or that OFR results can usefully be fed back into it

'other research' to provide ideas as one component in 'constructive conflict' process of defining researchable problems. Station-based research should complement OFR

OFR teams should be based at the same stations as other research to facilitate interchanges. Unproductive to send 'basic' researchers to field for long periods.

ideas for OFR testing to be obtained in part from other components of research, and trial results to feed back to them

What should be the interaction between OFR and more basic or commodity/factor oriented research?

none defined

involved throughout research, especially in spreading technology among farmers

may be brought in to assess trial and learn from successful ones

help identify sites; to help run trials which may eventually become demonstrations

What is the role of extensionists in OFR?

not indicated

in detail, to facilitate dissemination and monitor consequences

in detail, to facilitate dissemination

in detail, to facilitate dissemination

How far should OFR researchers monitor the agro-ecological and socio-economic environment with a view to introducing the technology elsewhere?

\* Rhoades (pers. comm.) indicates that CIP makes the useful distinction between an evaluation (done mainly by the farmer) of 'solutions' arising from a trial and that (done by researcher and farmer) of the trial's technical performance in combining materials and techniques in order to produce a set of outcomes. The former interpretation is principally of interest here. Collinson's (1987) discussion of the (mainly CIMMYT-based approach to FSR indicates the need for a wide range of evaluators, which is not incompatible with Tripp's earlier exposition.

- (ii) the Chinese requirement that all research scientists spend at least a year living with farmers (though he recognises that it would be unfruitful to send *basic* researchers out to the field for long periods).
- (iii) the IRRI programme of testing packages of seeds and materials on farmers' fields, dating back to the 1960s.

Drawing on these observations, Harwood proposes a methodology progressing in a 'logical sequence of steps' through selection of target area, description of the environment, design, testing and evaluation of technologies, and their dissemination.

The design of alternative technologies is participatory in character: 'working closely with the selected farmers, the scientist plans what tests can be done to accomplish specific mutual goals with the available resources . . . The range of possible alternative technologies is determined by the scientists, based on their knowledge of the area and its production potential. The farmer, however, should have the last word on what innovations will be made on his land'.

Evaluation should be conducted with the farmer and in the light of his goals.

Harwood emphasises that this participatory approach should be clearly distinguished from research in farmers' fields initiated and controlled completely by scientists.

3. *Rhoades and Booth* (1982), whilst welcoming the emerging trend in the 1970s towards complementing research with a farming systems approach, note that practically all reported efforts had been multi-rather than inter-disciplinary. The development of potato storage technologies at CIP which they describe is an example of *inter-disciplinary* research, and provided the impetus for their participatory 'farmer-back-to-farmer' model. This they contrast with both top-down technology transfer (research station to extensionist to farmer) and feedback (ie topdown modified by farmer feedback) models (*Rhoades et al.* 1985).

The principal stages of the FBTF model are:

- |                                    |  |
|------------------------------------|--|
| 1. Diagnosis                       | Common definition of problem by farmers and scientists     |
| 2. Interdisciplinary team research | Identify and develop a potential solution to the problem.  |
| 3. On-farm testing and adaptation  | Better adapt the proposed solution to farmers' conditions. |

4. Farmer evaluation/adaptation Modify technology to fit local conditions; understand farmer response; monitor adoption.

But, by contrast with some presentations of FSR, the emphasis in FBTF is on developing a broad approach flexible enough (if necessary) to begin with an experiment and end with a survey, or to abandon lines of research which emerge as unpromising during the course of work, and reformulate the problem and develop new hypotheses. Collinson (pers. comm.) accepts that flexibility is a desirable prerequisite, but argues that prior training in a basic framework and logical sequence of the CIMMYT type is essential if ldc researchers are to gain the confidence necessary for flexibility.

4. The *farmer-first-and-last* approach entails 'fundamental reversals of learning and location' (Chambers and Ghildyal, 1985) from a pure TOT model. Some of these reversals are already evident in 'prototypes' of FFL, but 'have not been fully explored, fitted together and evolved' (ibid).

The FFL approach is characterised by 3 major components:

- (i) a diagnostic procedure involving learning from farmers;
- (ii) generating technology on-farm and with-farmer;
- (iii) using the level of farmer adoption as a criterion for evaluating research.

The Chambers/Ghildyal paper identifies five complementary or supporting measures essential to the wider implementation of an FFL approach: methodological flexibility and innovation; full interdisciplinarity; resources, particularly for travel; scientific rewards geared to practical field achievements and not to publications alone; training in the necessary techniques for learning from farmers.

Developing the FFL approach, Chambers and Jiggins (1986) argue that the ecological and social complexity of resource-poor farming systems can only be adequately addressed through a parsimony of demands on research resources. To facilitate the necessary simplifications, it is essential to 'encourage and enable RPF families themselves to identify priority research issues' (Chambers and Jiggins, p17). This, in turn, will require:

- training of scientists in 'reversals' — ie to treat the farmer on a basis of mutual respect and to take time to learn from his ITK;
- procedures to identify and work with RPF families;
- encouragement of farmer groups in the identification of researchable problems;
- diffusion of innovations (and the generation of hypotheses for new

research) through innovator workshops.

Two points meriting emphasis emerge from the comparison of these four approaches in Figure 1:

- (i) in *methodological* issues the approach advocated by Chambers *et al.* represents a strongly farmer-centric view; that of Tripp, whilst recognising the importance of farmers' views, places the researcher firmly in control of the trials. Harwood and Rhoades *et al.* occupy an intermediate position;
- (ii) Apart from that of Chambers *et al.*, all the approaches identify important and active *linkages* between OFR and other components of the research system. Chambers' focus on farmer-led experiments leaves both the interaction with the remainder of the research and extension system and the scope for disseminating successful trial results ill-defined.

## 2

# Farmer Participation and the Institutional Context of Agricultural Research

Prior to the institutionalisation of research in the last century, technology had evolved over millenia through natural and farmer-selection of crop varieties and the evolution of materials and methods. New technology slowly spread through word of mouth, and the pool of knowledge on which farmers could draw — apart from that embodied in the resources at their disposal — was limited during most of the period to what could be passed on by oral tradition.

Increased understanding of biological processes, and their careful documentation, has, from small beginnings, created a vast wealth of knowledge useful not only in its direct application but also as a melting pot from which theories develop and hypotheses are formulated. Improved communications have facilitated wide access to this pool, thereby permitting more rapid increases in agricultural productivity through institution-based research than would be achievable through the direct, applied empiricism of farmers' own trials. Underlying rapid productivity gains has been a stratification of investigation into specialist levels, research in the higher-order strata relying increasingly for ideas and methods on the accumulated body of knowledge, not merely in the biological, but in all natural sciences, giving rise to an increasing number of specialist disciplines and sub-disciplines.

A working typology of these strata was provided by the Second Review of the CGIAR, as summarised by ISNAR (1984):

*basic* research is designed to generate new understanding of biological processes (e.g. how the partitioning of assimilates is influenced by plant height)

*strategic* research aims to solve specific research problems (e.g.

detection of dwarfing genes)

*applied* research is that designed to create new technology (incorporation of dwarfing genes into crop varieties already having other desirable characteristics)

*adaptive* research is designed to adjust technology to the specific needs of a particular set of environmental conditions (e.g. incorporating dwarf wheats into specified farming systems)

No hard-and-fast rule governs the extent to which individual countries will invest public funds into each of these strata. However, *strategic* and *basic* research require highly sophisticated equipment and techniques and specialist researchers, and do not need to be located in specific agro-climatic environments. For these reasons they tend to be situated in industrialised countries or at international research centres. Ldcs engage principally in *applied* and *adaptive* research.

The principal concern of ldc national agricultural research systems, certainly up to the late 1970s, was to enhance the yield potential of individual crop varieties suited to adequately-controllable environments. Homogeneous, well-endowed environments also benefited primarily from the early work of the international research centres. During the 1970s, reactions to this trend set in: to be acceptable to RPF, technologies would have to be tailored to specific farmer needs and a detailed understanding of the systems in which farmers operated would be a prerequisite of good research (Wortman and Cummings, 1978).

The pioneering work in understanding Indian (Mellor, 1966) and subsequently West and East African (Norman, 1974; Collinson, 1972) farming systems through the adaptation of farm management techniques gave reason to believe that multi-disciplinary teams incorporating social scientists could make important contributions to understanding these farming systems, and Farming Systems Research (FSR) evolved as a response to the need to identify opportunities for appropriate technology change among poor farmers.

FSR is characterised by:

- an applied 'problem-solving' approach, conducted by multi-disciplinary teams, with a degree of farmer participation;
- assessment of the scope for, and potential impact of, technology change within an holistic farming systems framework;
- identification of relatively homogeneous groups of (usually

resource-poor) farmers within specific agro-climatic zones as the clients of research;

- a dynamic, iterative approach, in which one year's trials' results generate hypotheses for testing in the next;
- concern that the results of farm trials should influence on-station research priorities.

Much of the enthusiasm for FSR originated in the CGIAR-funded institutes in the wake of the Green Revolution, but with substantial variation in interpretation among institutes (Dillon *et al.* 1978).

Quite apart from the criticisms of FSR's inadequate consideration of externalities (Biggs and Gibbon, 1986) its inadequate articulation with the broader policy framework (Davidson, 1987) and of the substantial resources that would be needed for it to keep pace with the dynamics of farming systems (Maxwell, 1986b), further difficulties have been highlighted: on *institutional* grounds, Biggs and Gibbon (1986) have criticised the efforts in some quarters to establish FSR as a 'model' rather than simply an approach, thereby provoking a negative reaction from natural scientists. Development of FSR in the long-term depends heavily on its incorporation into local institutions, but to achieve adequate reflection of performance by FSR practitioners in salary scales and promotion procedures has proven especially difficult (Collinson, 1982). A major thrust hitherto has been the implementation of large expatriate-led FSR programmes; for the future, the nurturing of small FSR efforts led by local scientists within local institutional frameworks should be a priority (Biggs, 1984).

Criticisms of FSR on methodological grounds have been advanced by Chambers and Jiggins (1986):

- multi-disciplinary collaboration has proven problematic, FSR being resented by natural scientists as a social science innovation;
- attempts to broaden the systems studied, in pursuit of a more 'holistic' approach, have led to the collection of unwieldy volumes of data;
- FSR does not focus explicitly on RPF;
- FSR is still dominated by a transfer-of-technology approach;
- scientists are inadequately prepared for face-to-face dialogue with farmers. Their approaches, attitudes and reward systems need to be 'reversed' if they are to learn from farmers;
- researchers still tend to dominate the design, content, conduct and evaluation of OFT. The reductionist character of agricultural research, identifying interactions among a restricted number of

variables in controlled conditions, may be one factor underlying researchers' desire to lead field experiments.

We now examine these criticisms in more detail in order to arrive at a balanced view of the shortcomings of FSR before analysing the potential that FPR might offer for *complementing* FSR (as Biggs, 1980 and Richards, 1987 propose) or for extensively *replacing* it (as Chambers and Jiggins, 1986 suggest).

1. We accept Biggs and Gibbon's view that in some circumstances undue emphasis has been placed on the methodology of FSR, efforts to refine concepts (sometimes inventing new terms for them) and to define a sequence of 'stages' through which applications of the FSR 'model' must pass. This may have provoked some reaction of natural scientists against social scientists, the former resenting the latter's attempt to 'impose' their own creation on the research process. However, the over-emphasis on FSR as a 'model' distinct from orthodox agricultural research appears to be restricted to the early phase of its introduction. More recent FSR — both conceptual and practical — has adopted a more flexible and participatory approach, and there is a growing recognition that agricultural researchers in Idcs — at least in some quarters — did recognise the benefits of consultation with farmers long before the 'farming systems' focus became fashionable. Many of the FPR field experiences reported below in Chapter 4 have arisen within the context of broad-based FSR projects.

2. Biggs' (1985) argument that the long-term future of FSR depends on the development of local research capacities sympathetic to the approach, whose reward systems give due weight to field-level achievements, is irrefutable. Whilst some progress has been made by IARCs in the development of capacity among national research systems to implement FSR (Jahnke *et al.* 1987) certain problems appear intractable, including limited public sector budgets; the difficulty of improving conditions of service; frequent transfer of staff; the international 'brain drain'; reward systems geared towards 'publishable' research and therefore biased against field work and so on. Although some successes have been noted (Mathema *et al.* (1986) on joint treks in Nepal; Ahmed *et al.* (1986) on FSR in Bangladesh; Agrawal (1982) on maize trials in India; Biggs (1986) on rice research in eastern India, Kean (1988) on FSR in Zambia) it must be recognised that long term efforts will be required to achieve progress in this area.

3. Some of Chambers' and Jiggins' criticisms relate more to the application of FSR than to the concepts involved. These include inadequate orientation towards RPF, continued predominance of the technology transfer view, and, in some measure, problems with multidisciplinary collaboration and the generation of large volumes of data. On this last point, Collinson (1987) stresses the parsimony sought by CIMMYT methods which replaced diagnosis through quantification by diagnosis through understanding. Enormous challenges are presented by the need to capture the salient features of a farming system by fielding teams of relevant disciplines, in a way which produces rapid diagnoses, does not leave members of the team idle for long periods and is inexpensive enough to be replicable across a wide range of systems. These have been addressed by a number of approaches including Hildebrand's '*sondeo*' (1981); Knipscheer's and Suradisastra's 'Regular Research Field Hearings' (1986); 'joint treks' in Nepal (Mathema *et al.* 1986) and work with farmer groups in Botswana (Heinrich *et al.* 1987). We suggest in Chapter 4 that methods will not only have to adapt to individual conditions, they will also have to vary systematically according to whether the focus is on annual crops, perennial crops or livestock. Reliance on ITK may help in focussing the research effort and in enhancing its cost-effectiveness but the conditions under which useable ITK is to be found are likely to be limited (Chapter 3).

4. We accept the view advanced by Chambers and Ghildyal (1985), Chambers and Jiggins (1986), Rhoades and Booth (1982), Gupta (1986a) and others that scientists' attitudes and approaches to farmers do not always convey the mutual respect and interested curiosity conducive to learning from farmers' ITK. Techniques of interaction likely to draw out the farmers' knowledge and views can be learned (Rhoades and Booth, 1982) but there will be no incentive to do so until reward systems are altered to reflect the importance of field experience. Transfer of technology biases in the training of scientists are partly responsible for inadequacies in approach and technique. Further institutional changes are required if students' and researchers' bias towards experimentation in 'safe' areas of adequate rainfall which guarantee a result each season is to be corrected (Gupta, 1977). However, in all of these cases it is easier to state what approaches and attitudes are desirable than to *implement* the required changes. Collinson (pers. comm.) argues that CIMMYT's FSR efforts over many years have held changes in attitudes as a

central objective, but have had to proceed at a moderate pace in order to avoid alienating agricultural researchers.

5. Our strongest disagreement with Chambers' and Jiggins' views on FSR concerns the scope for application of scientific method. Chambers and Jiggins appear to equate the application of 'reductionist' scientific methods with a transfer-of-technology approach, though, in fact, the two are not necessarily connected. In this context it should be noted that Chambers' and Jiggins' use of the term 'transfer of technology' is somewhat narrow: they apparently use it to mean the top-down promotion of inappropriate exogenous technologies. But it also embraces transfer as a result of demand-pull by potential users, which is unlikely to be inappropriate. The phrase 'on-farm trials' is frequently used to describe the testing under a range of agro-ecological conditions certain components of the technology portfolio derived from the accumulated body of scientific knowledge. It is inevitable that scientists will dominate the trials, and in this context it is important to stress that such trials are unlikely to incorporate the full range of farmers' management practices and preferences or constraints. They are therefore better regarded a sub-locations of the experiment station. By contrast, in trials designed to address specific problems faced by farmers, farmer/researcher interaction should be designed to broaden the range of options at the farmer's disposal and to speed up the rate of change achievable solely through application of ITK. Scientific method is not irrelevant to this process: scientists must be able *a priori* to decide what components to introduce into a trial, to analyse the interactions between them, and to interpret the outcome to facilitate both diffusion (if successful) and incorporation of trial results into the body of scientific knowledge.

If the scientist is unable to make these contributions then FPR is unlikely to be more rapidly productive than would farmers' own evolutionary selection of method and technology, which is informed by a corpus of knowledge based on oral traditions and direct experience, and inevitably more specific to time and location than the institutionalised knowledge on which the scientist can draw.

The papers reviewed here generally argue for closer interaction between farmer and researcher, often regardless of trial type. But FPR is not a panacea, nor is it a cost-free process: to design a single set of trials to meet farmers' need to know whether, and researchers' additional need to know why and how a new technology out-performs an existing one is not necessarily the most cost-effective approach.

Informed judgement is necessary in order to decide at what point to begin addressing certain issues on-station instead of on-farm.

We now seek to identify in what ways greater participation may lead to improvements in the focus, content and cost-effectiveness of research directed towards RPF.

- (i) Strong farmer participation is essential if farmer goals and problems are to be identified properly, if trials are to reflect practices and materials used by farmers and if the degree of success of a project, and requirements for future research, are to be accurately evaluated.
- (ii) However, whilst farmer participation will always assist researchers to understand farmers' constraints and goals, it is by no means clear that farmers have useful ITK to contribute under all conditions (see Chapter 3).
- (iii) The critical component in FPR is the partnership between researchers and farmers. Work conducted by either to the exclusion of the other will be less efficient in defining the options for research, conducting trials and evaluating results. To this extent, we view the extreme farmercentric stance in the FFL 'model' of Chambers *et al.* as unjustified: scientists and scientific method *do* have a more important role to play than they suggest. Our review below of field experiences with FPR supports this contention.
- (iv) FPR has been advocated as an approach to research, not as a 'model', by many of its adherents. By avoiding the exclusiveness which accompanied early attempts to gain status for FSR, proponents of FPR are less likely to elicit hostile reaction from scientists and more likely to place FPR in its proper context — as a method complementary to those currently available in client-oriented research.
- (v) Much of the experience gained with FSR hitherto has been on the basis of case studies, usually with heavy expatriate involvement. As the number of target areas to be covered is increased within any one country, client groups increasingly refined (and therefore increased in number) and the frequency of repeat-visits to client groups increased in pursuit of the 'moving target' (Maxwell, 1986b) the costs of implementing a fully-fledged FSR approach by national research systems will become substantial. Greater participation by farmers in defining problems, conducting trials and exercising a demand-pull on station-based work stands to enhance the cost-effectiveness of

research. But FPR is itself expensive and time-consuming. Can methods be developed which allow these advantages to be captured without incurring excessive cost penalties?

In Chapter 4, experience with FPR is reviewed against the opportunities and constraints identified here. However, it is first necessary to ask what the farmer can be expected to contribute to participatory research.

# 3

## The Role of Indigenous Technical Knowledge (ITK)

Numerous case studies exist of the rationality of indigenous systems of knowledge of the biophysical environment (Brokensha *et al.* (eds), 1980; IDS, 1979). Studies of traditional practices and technologies in varietal selection and irrigation include Richards (1986a). Basant (1988) reports on ITK in mechanical technologies. It has been argued convincingly (Moore, 1980; Basant, 1988) that the relevance and prospects of success of innovations brought in from outside will be enhanced if they build upon indigenous knowledge. Where this is not done, the risk of project failure is high (Gladwin, 1980) and cases are beginning to be reported of the contribution to success that incorporation of indigenous knowledge has brought (Richards, 1980; Scott and Gormley, 1980). To learn from farmers in this way can be highly cost-effective, since such knowledge is not readily available to scientists, and techniques often relying on game and role-playing have been devised which allow indigenous knowledge to be elicited rapidly (Barker, 1980; Knight, 1980).

### **Defining ITK**

Indigenous technical knowledge must be distinguished from farmers' objectives and constraints. Prospects of success will be enhanced if technology development takes into account both, but the former is objective and of wide validity, whilst the latter can be subjective and highly variable among individuals. In some cases, ITK is based on knowledge, beliefs and customs which are internally consistent and logical to those holding them, but at odds with the objectively deduced findings of formal science. In such cases, it is important for scientists to build upon the components of ITK, which are not inconsistent with scientific knowledge, seeking to change over time

any potentially counterproductive practices associated with local belief systems.

Howes and Chambers (1979) provide a useful comparison between ITK and formal science. ITK has a much more limited capacity to break down data presented to the senses and to interpret and reassemble them in different ways: the mode of ITK is concrete, not abstract; it relies almost exclusively on intuition and on directly-perceivable evidence. Its strongest contribution is therefore as a system of classification of biophysical environments. As a system of explanation and prediction, and in terms of its speed of knowledge accumulation, it is likely to be inferior to formal science.

### **The limitations of ITK**

Swift (1979) identifies a number of constraints: in particular the transfer and use of information is likely to be constrained since it has to be passed on orally or by direct experience and held in the heads of practitioners. Biggs and Clay (1980) detail further limitations:

- the scope for improvements via 'pure' ITK is limited to what can be done with the local pool of techniques, materials and genetic resources, plus whatever is introduced casually (and, in a few instances, purposively) by the indigenes;
- many genetic possibilities are not explored within the informal system, such as the crossing of self-pollinating crops where specific plant breeding techniques are required;
- the informal system has neither the necessary forward perspective nor resources to anticipate the opportunities and constraints arising from changing environments.

The evidence suggests that ITK is far from uniformly distributed within or across communities:

- the capacity of individuals to generate, implement and transfer ITK will vary;
- explicit attempts may have been made to institutionalise the maintenance and transfer of ITK in the hands of a select group (Swift, 1979);
- differences in the function of social groups will influence the type and extent of ITK developed by each (Swift, 1979);
- economic stratification is likely to play a role in all rural societies: richer individuals are likely to innovate more in aggregate, but poorer people may be forced to innovate in some fields because of their poverty (Swift, 1979);
- ITK, technology and technology-centred relations do not emerge,

and cannot be manipulated, independently of the social, political and economic structures within which they occur (Bell, 1979).

These contextual issues are perhaps particularly important in relation to common property resources: to implement ITK in respect of, for instance, communal grazing without irreversible resource depletion, requires a respect for the common good — characteristic only of strong social organisations. Where these have broken down, vestiges of ITK relevant to resource management may survive, but will not necessarily be relevant to new organisational forms that may have to be developed with external assistance. The inability of ITK to cope with crisis conditions in the Sahel is discussed by O'Keefe and Wisner (1975) and the efforts of an external agency (Oxfam) to introduce a key technology into Burkina Faso which assist in restoring to farmers a degree of control over the the environment are discussed by Wright (1986).

### **ITK and resource-poor farmers**

The potential contribution of ITK to problem solving will vary according to the extent to which the limitations on its use that we have identified actually occur in the farming systems under investigation. Despite the wealth of case-study information on ITK, no systematic attempt appears to have been made to investigate the circumstances conducive to development of strong ITK. This is important both as a guide to scientists on where useable ITK is likely to be found, and as an indicator of what conditions may have to be changed if attempts to strengthen it are to flourish. Richards (1979) poses the question as follows:

'The first and perhaps critical question is if African peasant farmers were capable of managing their environmental resource base and responding to environmental changes in the past why are they increasingly incapable of doing so now? Is this because the planner has too low an expectation of what farmers can achieve for themselves or because the problems and issues are now on a different and much less readily manageable scale than previously? Or could it be that 'agricultural science' and the key role assigned to the 'expert' are key elements in establishing technocratic hegemony in furtherance of the interests of 'agri-business' or 'state capitalism' in the development process?' (Richards, 1979).

Yet he addresses only the last of the three questions posed. Harwood (1979) provides something of an exception to the general neglect of these wider issues: he implies that smallholder

development can be classified into 'growth stages' along the lines postulated by Boserup (1965) and shows how ITK has developed much more fully within the same growth stage under some sets of environmental conditions than under others. Whilst 'stages' provide certain insights into the nature and process of development, our inclination is towards a comparative systems approach which allows innovations based on ITK to be viewed as a response to pressures, or the seizing of opportunities. By contrast, the 'stages' approach tends to view innovation solely as a response to pressure (Richards, 1985).

A very preliminary classification of RPF drawing out the implications for useable ITK — many still at the level of hypothesis — is attempted below on the basis of two criteria: quality of infrastructure and degree of stability of farming communities.

(i) *quality of infrastructure*. By definition, the poverty of RPF located in areas of moderate-to-good infrastructure is more likely to arise from personal than environmental conditions. The case of a family cultivating rice on a gravity irrigation scheme with adequate water but barely sufficient land to secure a livelihood serves to illustrate the argument. Here, formal transfer of land is commonly prohibited in government-funded irrigation schemes, but family crises of various kinds may incur debts, default on which leads to *de facto* loss of control over land. Lack of competence or effort may set in motion the same chain of events. In circumstances such as these, optimal biomass exploitation seems likely to follow the broad pattern established for larger farmers, perhaps with adjustments to the type and volume of inputs. In general, major difficulties faced by RPF here need to be addressed by a range of policy measures on land tenure, credit availability and so on, of which agricultural research may be a minor component.

In a situation where resource-poverty stems from both quantitative and qualitative limitations (e.g. families occupying small plots at the *tail ends* of canal-irrigated schemes, where water supplies are unreliable and yield variability can lead to indebtedness) wider departures from farming systems prevailing elsewhere in the locality may be needed. There is a role for agricultural research here, but careful assessment would be needed of the potential returns from expenditure on research compared with those on, say, improved water management. Whilst ITK would undoubtedly assist an understanding of crop performance under unreliable irrigation, the

rapid turnover of settlers under these conditions may have hindered its emergence and potential role in research. (Moore *et al.* 1983)

By contrast, RPF located in remote areas of poor infrastructure may well be operating under conditions of soil, topography and rainfall so difficult as to have discouraged earlier 'opening up' of the area to commercial agriculture. Remoteness from markets will have encouraged a high degree of internal self-sufficiency. This, coupled with the dependence for survival on the exploitation of a wide range of biomass components in highly complex farming systems will have stimulated the development of ITK. By the same token, the interpretation of the complexity and (possibly) high degree of local variation in farming systems will require major interdisciplinary research efforts, the cost-effectiveness of which stands to be greatly enhanced by adequate interaction with farmers' own ITK.

(ii) *degree of community stability.* Practically all the case studies of ITK conveniently available are characterised by the long-term social and farming systems stability of the communities in which they originate. Indeed, there are strong *a priori* grounds for supposing that indigenous knowledge can develop and be passed on only under stable conditions. Thus, Heinz (n.d.), Conklin (1957) and Chapman (1977) report on the ethnobotanical knowledge of (respectively) the !Ko Bushmen, the remote Hanunoo tribe in the Philippines and tribal peoples in Bihar. Barker *et al.* (1977) draw on the knowledge of older Nigerian informants regarding pest attack. Appu (1974) and Dommen (1975) report on the bamboo tubewell developed in Bihar, Belshaw (1979) on traditional inter-cropping techniques in East Africa and Norman (1974) in northern Nigeria. Richards (1985) gives numerous examples of ITK in West Africa, including varietal selection by Mende farmers in Sierra Leone. Netting (n.d.) describes the innovativeness of the Nigerian Kofyar both in their traditional farming areas, and in bringing newly-acquired land into cultivation under commercial and labour relations differing widely from those which had prevailed earlier.

These evolutionary processes are interrupted, and their lessons disregarded, under two main sets of circumstances:

a) where the attractions of interacting with the cash economy become so great that the common good is sacrificed for that of the individual, and long-term sustainability for short-term gain. Rhoades (1985a) cites the example of a Peruvian village where young farmers seeking to maximise yields for sale to the market came into conflict

with their elders over the disruption of traditional fallow cycles that this would imply;

b) where population growth has exceeded the rate at which ITK can enhance the carrying capacity of land, contributing to such commonly observed phenomena as overgrazing, deforestation, erosion and soil exhaustion.

A third set of circumstances — spatially and temporally less common — may be added, viz. the incapacity of ITK to respond fast enough to cyclical variations in climate of the type that have occurred in the Sahel. This may also interact with the other two factors, exacerbating their effect.

Privately-controlled natural resources may be depleted under all three sets of conditions, but common property resources are generally the first to suffer, reflecting the difficulty of establishing and maintaining the social organisations necessary as vehicles for the implementation of ITK in non-destructive exploitation of commonly-owned resources.

In situations such as these where ITK has been deprived of the social context necessary for its implementation, it may retain a certain potential for interaction with formal knowledge systems, but external intervention will be necessary on two counts: first, to help re-establish organisational patterns compatible with non-destructive exploitation, and second, to restore confidence and dynamism in traditional knowledge systems.

Wright (1986) provides an illustration of the form that interaction can take between indigenous farmers and a sensitively-managed external intervention under these circumstances: the Oxfam project in Yatenga (Burkina Faso), which, over several years of technology development incorporating modifications proposed by farmers, sought technical innovations to counteract the sheet erosion and reduced infiltration resulting from uncontrolled runoff and to make a higher proportion of the runoff available for forestry and crop production. Scott and Gormley (1980) report on how confidence and control over the environment was enhanced by a livestock project incorporating traditional ways of sharing and exchanging cattle among pastoralists in Upper Volta.

## **Conclusions**

ITK is potentially an important complement to formal scientific knowledge, principally in its capacity for location-specific classification of aspects of the biophysical environment, though it

may supplement science in the functions of explanation and prediction. Science's principal role lies in the provision of technology options to address the problems and constraints identified by farmers, and those relevant to their conditions of which farmers might be yet unaware (Gupta, 1987).

The potential of ITK will vary within and across communities, according not only to the aptitudes of individuals, but also their economic status and function. It is likely to be of high potential value in those (usually remote and self-dependent) communities which are poor in infrastructure and have not been subjected to unpredictable external shocks. It is much more difficult to generalise about the potential of ITK among what is likely to be a minority of RPF in well-endowed environments.

There are many instances in which community arrangements for the sustainable exploitation of (frequently communal) resources through putting ITK into practice have broken down, generating a requirement for external interventions which may be able to draw on only fragmentary remains of ITK. If this view is accepted, there emerges a research need to quantify by agro-ecological area and resource characteristics the RPF facing system breakdown of this type, and to identify participatory research procedures in order not only to re-establish community control over resource exploitation, but also to re-vitalise indigenous knowledge systems.

ITK should be viewed not as a stock of knowledge to be mined by scientists, but as evidence of a dynamic process of experimentation and enquiry. Insensitivity on the part of institutionally organised scientists can cause loss of confidence in, and breakdown of, these systems (Howes and Chambers, 1979). But, in the interests of cost-effectiveness of research, indigenous knowledge systems should be strengthened so that their capacity to classify, evaluate and, to some extent, predict the outcome of innovations in the local environment can complement science-based development of technology. Strong ITK systems are likely to facilitate incorporation of a component of farmer demand into the (usually) supply-driven agenda of on-station research, and the development of ITK is essential to empowerment in a wider context (McCall, 1987).

## 4

# Review of Recent Field Experience with FPR

This section reviews the methodologies of farmer participatory research conducted by a range of agencies: farming systems programmes of International Agricultural Research Centres, National Research Programmes and non-governmental organisations. Our approach is deliberately selective: we present approaches and case studies which illustrate the range of initiatives in participatory research and the problems encountered. Abstracts of the methodologies reviewed have been published elsewhere (Martin and Farrington, 1987). Much of the material is related to crop research; we have so far found fewer case studies describing participatory methods in livestock research. We have, however, drawn on particularly innovative cases from social forestry.

Three general difficulties were encountered: first there is a tendency throughout the literature to describe the intention and rationale behind farmer involvement, but to give only a brief summary of the procedures and problems, making it difficult to gauge the success of participation in practical terms. Second, the effectiveness of participatory methods in terms of time and cost is rarely assessed, although the importance of these criteria is sometimes recognised (Galt & Mathema, 1987). Third, there are several case studies of projects using innovative methods at the outset, but which have not yet produced an evaluation of their experience (Chavangi *et al.* 1985; Hatch, 1981).

Various schemes exist for classifying field experience with farmer participation. Biggs (1987), for instance, suggests a typology by degree of interaction for analysing data from the nine country case-studies of ISNAR's OFCOR project:

*contract*: in which the farmer's land and services are borrowed or hired to provide more agro-ecologically diverse conditions for local

verification of technologies developed on-station. This would not constitute participation by most definitions, but constitutes a useful farmer-researcher link in the view of many scientists.

*consultative*: a 'doctor-patient' relationship. Researchers consult, generally progressing through each of the 'stages' of research (diagnosis, design, technology development, testing, verification and diffusion). They then make the bulk of decisions regarding content and conduct of surveys and trials, calling farmers in again to participate in evaluation. This, and the collaborative mode of interaction, Biggs argues, are perhaps the most common, being central to the work of IRRI, CIMMYT and many national programmes.

*collaborative*: involves continuous interaction, farmers being consulted not only on potential new technologies, but also on how to go about cost-effective village-level research. Consultation can be on a group or individual basis; 'research-minded' individuals are often sought out.

*collegiate*: in which the formal research system actively seeks not simply to consult farmers on specific technologies or methods of experimentation, but also actively strengthen the local capacity to conduct informal research and development at farmer and community levels. Several examples, particularly arising from the work of NGOs, are discussed below.

An alternative approach, adopted here for convenience, is to structure the literature review around the different processes of research and problem solving. These we treat separately below under the following headings:

- defining researchable problems
- conduct and evaluation of research
- dissemination

We recognise that problem oriented research is an iterative process, not necessarily following 'stages' in chronological order. It is also recognised that certain approaches represent integrated efforts to promote interaction between farmer and researcher at all stages in the process of technology development. Notable examples are Conway's agro-ecosystem analysis (1986) and work with groups of farmers by Norman *et al.* (1988) and Ashby *et al.* (1987). Although referred to throughout the discussion, case studies are summarised under the section where their methodological contribution has been most important.

## **Defining Researchable Problems**

### *Issues*

The significant contrasts between approaches to problem identification are in the extent to which the research agenda are formed through farmers' initiatives, rather than through farmers responding to the concerns of researchers (Conway, 1987).

At the start of most projects in agricultural research institutions, priority is given to the collection of information from farmers who respond to researchers' questions; the focus is usually on collecting information relevant to the problems of a particular crop or technology (Rhoades & Booth, 1982; Tripp, 1985). This is an iterative process and the responsiveness and sensitivity of the project to farmers' needs is expected to improve over time. But this is politically 'unempowered' participation, (Cornick *et al.* 1985), and assumes that institutional and political conditions are exogenous in the short run. More radical (but comparatively rare) approaches are explicitly premised on the need for greater empowerment in a community context (Tan, 1986; Fernandez, 1986).

Under the 'unempowered' approach, researchers are the implicit judges of the technology characteristics suitable for client groups: some choose the 'best bet' technological components (Byerlee *et al.* 1979, 1982); others may seek risk-averting technologies with more modest productivity increases but greater robustness under adverse conditions. Researchers' working assumptions about appropriate technical intervention often arise from the mandates of the institutions for which they work. But there are many examples where interaction with farmers has significantly changed the content of research programmes, through informal interaction (Werge, 1977) or through on-farm trials (Biggs, 1982, 1983; Colfer *et al.* 1987a,b,c). There are fewer examples of programmes where farmers are specifically encouraged to articulate their technology requirements (Lightfoot *et al.* 1988), or choose from alternatives presented for testing by researchers (Heinrich *et al.* 1987; Maurya, 1986).

The extent to which farmer participation can be developed in specific research contexts relates closely to the state of indigenous technical knowledge. Farmers may be more or less able to suggest innovations, and formal science in some circumstances can build on upon and strengthen informal research (Raintree, 1978; Richards, 1986b; Moran, n.d.).

## Methods

**Informal survey.** The most usual approach in problem identification is through a quick informal survey, variously described as rural appraisal, diagnostic survey, informal survey, *son-deo*, joint trek or group survey (Collinson, 1982; Hildebrand, 1979; Mathema *et al.* 1986). The aim is to identify the range of farm resources and physical environments, production priorities and practices in a specified study area, through interaction with farmers and local informants. This is a preliminary to the specification of a research agenda, experimental programme and 'research domain' (Norman, 1974; Tripp, 1985). Informal surveys generally have a previously agreed agenda in the form of a check list of subjects for discussion, and are often based on a tentative definition of the potential technology to be tested. This is the first stage in a process of interaction with farmers throughout the research cycle (Tripp, 1982; Rhoades *et al.* 1985). Participation of scientists from different disciplines is considered vital (Byerlee *et al.* 1979; Tripp, 1985; Mathema *et al.* 1986).

Exception and diversity can be indicative of innovation, which might otherwise be missed if surveys concentrate on average practice (Ashby, 1986). As an aid to understanding the rationale of farmers' management decisions, farmers at one extreme of a practice are shown the methods adopted by farmers at the opposite end of the spectrum. Careful interpretation of their reactions can be illuminating (Gupta, 1986a).

'Innovator surveys' seek to identify what types of technology farmers are currently experimenting with and to strengthen this research through inputs from the formal system. Such farmers are identified by asking field assistants or extensionists, through meetings with farmers groups or personal visits to observed farms. It is important to establish how many farmers currently use the practice, how many could, and the reasons for the discrepancy, which might include innovators' access to greater resources. Care must be taken 'not to think that these advantages are a natural part of the innovation' (Macdonald, 1985).

**Building on indigenous research.** It is useful for projects to start by exploring indigenous technology and research. An historical perspective is important, especially concerning the responses of communities to changes in land availability and use (Netting, n.d.). Johnson (1972) argues that there is strong empirical evidence that experimentation is common, perhaps even the rule in traditional

agriculture. There are many examples of farmers' own experimentation and of farmers developing complex and indigenous cropping patterns adapted to specific micro environments (Brammer, 1980; Biggs, 1980). Brammer describes unofficial research and extension networks independent of government programmes and often more practically oriented and more widely adopted. As emphasised in Chapter 3, researchers can and should explore opportunities for strengthening informal systems, e.g. informal potato seed systems in Peru (Horton & Prain, 1987); exchange of local varieties between similar agroecological areas of the Solomon Islands (Jones *et al.* 1986); distribution of new varieties of rice among Sierra Leone farmers and observation of their response as a basis for seed multiplication schemes (Richards, 1986b). Elsewhere, local institutions and customs may be more important for researchers to consider than the levels of indigenous technical knowledge (Chavangi *et al.* 1985, see case 1A).

**Identification of groups.** How do various projects identify groups to work with in the first instance and subsequently other groups for whom the same technology might be relevant, in order to spread research costs over as large a number of clients as possible? Socio-economic criteria are considered as important as technical in stratifying farmers into 'domains' (Perrin *et al.* 1976; Byerlee and Collinson, 1980; Galt and Mathema, 1987). The domains do not necessarily coincide with geographical or administrative distinctions (Collinson, 1981). Wotowiec *et al.* (1986) argue that the concept and definition of domain should change in each research stage, according to the individual applying it and the end in view.

They propose refining the concept to distinguish research domain, in which there should be a problem focus and sensitivity to variability; the recommendation domain, based on homogeneous groups for whom the tested solution is appropriate; and a diffusion domain using local interpersonal communication networks. They stress the importance of maintaining flexibility in the designations.

Participatory approaches to delineation of domains have shown that farmers can classify their own communities using wealth ranking techniques (Grandin, 1983). Households are listed, one to a card and several individuals from the community are asked to sort the cards into groups according to their own criteria of wealth. This process can be supplemented by farmers' capacity to map out the agro-ecological bounds of the relevance of new technology (Edwards, 1987; Brammer, 1980).

**Group/individual approach.** Experience in some projects indicates the advantages of contacting groups rather than individuals:

'We have found group dialogue to have the advantage of reducing the imbalance of status that often limits the spontaneity of one-on-one encounters. Groups of researchers meeting with a single farmer has proven to be the least effective forum for effective dialogue' (Horton & Prain, 1987, pp8-9). Group interviews were also found to be more effective in the Samuhik Bhraman (joint trek) (Mathema *et al.* 1986). Norman *et al.* (1988) describe how groups set up in Botswana, sometimes as a development of traditional village assemblies, provided scope for discussion of problems and opportunities. Bunch (1985) gives an account of a 'brainstorming' session with farmers in the San Jose project, Guatemala, which involved nearly all the village men and women. This was an attempt to elucidate farmer defined problems and priorities from the outset. All the problems mentioned by farmers were written down on large sheets of paper in the order they arose in the meeting. The problems were grouped to eliminate repetition and the causal relationships between them were discussed. Farmers then ranked the problems in order of priority, and specific problems were identified for the programme to address.

Other authors suggest caution is necessary with group approaches. There is a tendency for groups to bias their responses according to their perception of the identity and objectives of the researchers, or to present a consensus which may arise from the dominance of a particular section of the community. Response may also be a product of norms of polite behaviour (see case 2B). In an initial exploratory survey, particularly in the absence of local extension or community workers, this may not be obvious to outside researchers. Vierich (1984) gives an example from her study among the Bantu and Bushmen of the Kalahari, where the stereotypical response of the two ethnic groups generated misleading information on labour use and participation, in the early stages of her work. There may also be conflicts of interests between men and women (Case 1A), and between landholders and landless (Gupta, 1986b), which need to be ascertained at the problem identification stage.

**Case Studies.** Maxwell (1986a) argues that case studies can illuminate a broad problem area. They are useful where observation and measurement require skill and accuracy, where attitudes are studied through unstructured interviews, and where continuous frequent interviewing is necessary. They are also an advantage where causality and change are being investigated. Hildebrand in the

socio-economic unit at ICTA developed a program of simple farm records, filled out daily by the farmer and covering labour, tools, power, fertiliser use and other inputs (Whyte and Boynton, 1983). The understanding of livestock production problems requires stable, long term data series which pastoralists themselves might be encouraged to undertake (Swift, 1981).

**Chain interviews.** These are useful when a system or a hierarchy is being explored. For example, to understand rural credit, the following might be interviewed: banker, money lender, landlord, ministry official, extension agent, farmer (Rhoades, 1985b).

**Intra household interactions.** In problem definition with farmers, researchers need to be aware of the disparate and sometimes competing interests of different groups. Farms are not necessarily units of cohesive interest, under the management of a single individual or corporate unit (Fernandez and Salvatierra, 1986; Mook (ed), 1986), but more complex arrangements in which social, economic and agroecological processes are outcomes of a negotiation of interests. (e.g. Richards, 1986a, on rice cultivation in Sierra Leone, and Rocheleau, 1987, on user groups and rights to agricultural resources in the Dominican republic). The most heavy users of resources or technologies do not necessarily find them the most critical for their livelihood. It is necessary, therefore, to explore which groups in the community have particular responsibilities and access to the associated agro-ecological knowledge. Quick informal methods may be inadequate to generate this kind of insight and longer term FPR may be needed.

### *Discussion*

Problem definition and refinement are seen as an iterative process. Feedback and interaction with farmers is the crucial ingredient, irrespective of sequence or method. There are good examples of interdisciplinary cooperation at the problem definition stage (Horton, 1984; Mathema *et al.* 1986), and recognition of the problems that can arise in its absence. However, the limited staff and financial resources of small national institutions may limit the opportunity for natural and social scientists to work together (Mathema *et al.* 1986).

The extent to which the potential of group approaches can be realised varies widely among communities. The main difficulty is in how to identify the best approach for a community about which little is known, without a long period of anthropological field study.

Problem defining surveys may be biased in their perceptions towards the (usually) crop based remit of the investigating institute, to the neglect of livestock and forestry. Broader environmental problems, e.g. erosion, requiring long term strategies may be neglected (Biggs & Gibbon, 1984). Without strong external policy initiatives, participatory research may have little to offer those groups (e.g. landless labourers) who are not conventionally classified as farmers yet who are affected by the process of technology change. One noteworthy exception is provided by a Ford Foundation sponsored project in Java, where responsibility for design of agroforestry systems for state lands was given to landless labourers who have historically implemented them (Poffenberger pers. comm.). Even the more sensitive problem identifying surveys (e.g. at BARI), exhibit differing conceptions of the boundaries of the farming system (Ahmed *et al.* 1986).

A premature assumption of homogeneity within a research domain can lead to bias resulting from factors not considered initially, such as long term climatic trends, and the wide range of activities, on- and off-farm, which secure the survival of the household (Cornick & Alberti, 1985; Jiggins, 1981).

Specific skills are required for effective interaction, facilitation of discussion, interviewing and observation, summarising, recording data, notetaking (Norem, 1986; Mathema *et al.* 1986). There are problems of establishing rapport. Researchers do not always find it easy to learn to listen, or avoid a didactic or authoritative role. Skilled back up and advice from other researchers is important.

It is important to consider intra household and intra community divisions of obligations and rights at the earliest stages of research. For example, problem definition rarely takes women's views into account. The initial contact with outsiders is traditionally dealt with by men, male informants respond to household surveys, women may be excluded from attendance or participation at group meetings, and key informant interviews rarely include women. Wayhuni *et al.* (1987) indicate the potential levels of bias, if men are the sole information source. Informal methods are not necessarily better in this respect than formal surveys (Jiggins, 1986). These biases are likely to carry over to the stages of technology testing, on farm trials and evaluation.

The communities referred to in case studies vary enormously in education levels, literacy, group consciousness and solidarity and confidence. The most striking cases of participation in problem definition are in contexts where these features are relatively

developed (Bunch, 1985) or where project personnel have put in considerable time and commitment towards building these capacities (Tan, 1986; Fernandez, 1986).

### *Case Studies*

**Case 1A: An understanding of how intra-household interaction influences problem definition in the Kenya Woodfuel Development Programme (Chavangi *et al.* 1985).**

The aim of this programme's work in Kakamega district was to establish self sustaining systems of tree planting to solve the problem of scarce, expensive fuelwood and charcoal, which appeared to originate in both increased fuelwood demand and reduced supply as the cultivated area expanded.

The initial objectives were to build on existing skills, to help local groups to establish and maintain nurseries to produce seedlings for their farms, to upgrade existing nurseries, and to run an extension programme to improve nursery and tree management skills. These proposals and the understanding of the problem were transformed after interaction with the farmers.

Beginning with a reconnaissance survey of 528 households, it was found that tree numbers were greater than previously assumed, and 75% had been planted by farmers themselves. Pressure on resources was found to limit the scope for the intended communal plantations. Additionally; 'the survey results gave firm grounds for believing that the observed fuelwood shortage is not the result of a shortage of woody biomass on individual farms, but that it is due to social and cultural forces within households which determine control over and access to the wood produced on the farms'.

In response to these findings, the project strategy changed to examine the motivation for tree planting and rights of access, through discussions with groups of men and women (often separately), in seven locations. Indigenous technical knowledge was adequate to solve the problem of tree shortage, but the traditional rights, beliefs and taboos associated with land tenure and control presented obstacles. Men have overall control of household resources, permanent ownership rights in land and the exclusive rights to plant trees. Women have rights of access to household land but not to the trees. Women find it increasingly difficult to fulfill their responsibility for collecting fuelwood from common land. They are therefore forced

to reduce household energy consumption and intensify their income generating activities to earn cash for fuelwood purchase.

The project was faced with a problem; to attempt to alter the traditional conception of land rights might generate antagonism and fear of expropriation, nor would men readily give up their rights to income from the sale of wood. A strategy was needed which would allow men to help their wives obtain fuelwood or plant trees, without being subject to ridicule, or perceiving it as a challenge to their authority. A possible solution was found in a tree which is not categorised as a tree with respect to rights of use or the usual taboos against women planting. *Sesberiana sesban* is intercropped with food crops by women to increase soil fertility. It is defined rather like a perennial crop. The project saw great potential in developing this and similar species which would be fast growing and have multipurpose uses.

A 'mass awareness' programme was organised; 'a women's project in which men are the prime target'. They contacted a large number of farmers in the communities, presenting the problem in songs and dramatised form, followed by discussion and distribution of seeds. Plots for demonstration and seed production were planted by local extension workers.

No evaluation of progress is yet available.

**Case 1B: The Samuhik Bhraman (joint trek) as a multidisciplinary approach to problem identification (Mathema *et al.* 1986)**

The 'Samuhik Bhraman' as it is now called in Nepalese, is the term given to an informal 5-6 day field survey conducted by a multidisciplinary group of scientists. The approach was developed independently within three institutions, the Naldung, Pakhribas and Lumle Agricultural Centres. The main common features are outlined here.

The participating scientists come from different disciplines and agricultural divisions: agronomy, horticulture, fruit production, forestry, veterinary and extension. They focus on a limited geographical area 'to efficiently and quickly interact with farmers to determine predominant crop, livestock and forestry patterns, problems and constraints' (Mathema *et al.* 1986, p1). Teams then address these problems by formulating a programme of on-farm trials, with a view also to extrapolating the results to other areas. Information is fed back to the commodity and disciplinary

agricultural research programmes, to orient current and future research to farmer realities.

The most significant feature of the exercise is consultation and interaction with farmers. As the Samuhik Bhraman becomes an established part of research station activities, new sites may be visited for initial appraisal and research prioritisation while others are revisited for evaluation, analysis and discussion, highlighting the iterative nature of the process.

The preparation involved study of secondary data, selection of target areas, a survey of key informants (knowledgeable farmers, the district headman, agricultural officers and businessmen) and pre-trek briefings.

Combinations of individual and group interviews have been used, the latter proving to be a more efficient use of researchers' time, but some cross checking of findings between approaches was necessary. The predominant production patterns and yields for crops, livestock, horticulture and forestry, off-farm income, migration, credit sources, inputs available and other socio-economic problems are explored. Technology options are assessed according to their productivity, stability, sustainability and equitability. Attention is given to the economic context of production, marketing and market flows for different products, social and political relationships, and seasonal and historical patterns, and to farmers' previous experience with technology. The disciplinary mix of the scientists' work groups changes daily for maximum interaction, but the whole group discusses their findings in the evenings.

The Centres emphasise the importance of:

- contacting all sections of the community; men, women, young, old and marginal groups.
- note-taking and checking information
- courtesy and consideration for the timetable of farmers by establishing the best time of day for discussion.
- limiting the length of discussions.
- Report drafting in the field

The problems initially encountered included bias in farmer response to comply with perceived extension recommendations or political pressures; inadequate representation of women; farmer demands for services (electricity, veterinary sub-centres) beyond the remit of the research staff.

Problems of inadequate per diem allowances in the national research service to cover trek costs remain, but experience to date

is that the trek is a useful vehicle for cooperation between disciplines; 'disciplinary rivalries so destructive to cooperation at higher bureaucratic levels of research establishments can be overcome through careful consultation, joint field work and sensitive management' (Nepal, 1986, p22).

**Case IC: Innovator Workshop. Rice/Fish Project, Thai Department of Agriculture and CUSO (CUSO, 1983)**

In 1983, twenty nine farmers and a similar number of research and extension workers plus fieldworkers attended a workshop for farmers growing rice in combination with fish culture. It aimed at encouraging active participation by farmers, open discussion of personal experience and included site visits. Farmers' narratives were presented in the seminar as a basis for discussions. The level of participation was high despite differences in the extent of farmers' experience with rice/fish farming. Farmers had found that the addition of fish made a substantial contribution to food requirements and income, requiring no extra land. Natural production systems are distinguished from 'full care' systems which require supplementary food. Farmers jointly defined problems in need of research or assistance. These were poor water quality and control, appropriate stocking rates, feed, pesticide, fish enemies, lack of credit, a limited seed fish supply and low survival rates. Action was recommended to increase the availability of larger seed fish from nursery facilities, to establish an information unit on fish culture and to improve extension and financial support.

## **Conduct and Evaluation of Research**

### *Issues*

'The farmer's actual participation in the planning, execution and evaluation of research should be clearly distinguished from mere research in farmers' fields initiated and controlled completely by scientists . . .' (Harwood, 1979, p.40).

The optimum level of farmer participation depends on the objectives of the on-farm research eg. to test the performance of technologies developed on-station (or imported) under a wide range of agro-ecological conditions (eg. variety and altitude trials), which do not primarily rely on a high degree of participation, or, at the other extreme, to focus research on farmers' problems, for which a high degree of participation is essential.

Many have noted a useful interaction between the two approaches: farmers' solutions may, for instance, provide the basis for on-farm experiments (Lightfoot, 1987; Ashby, 1986; Colfer *et al.* 1987a,b,c; Biggs, 1980). A combination of conventional and indigenous research 'exploits farmer participation in the role of adapting technical options to specific farm conditions and providing feedback on more appropriate basic research needs' (Lightfoot, 1987).

There are many examples of how on-farm trials have significantly affected the researchers' definitions of appropriate input levels, and changed research focus and priorities. In the Indonesian 'Tropsoils' project, farmers' implementation of components of the trials changed researchers' perceptions of how fertility might best be enhanced (Colfer *et al.* 1987a,b,c). Horton and Prain (1987) give examples from CIP in which farmers' contributions in the early stages of true potato seed technology development were critical in redirecting researchers' attention to problems of seedling vigour rather than genetic segregation.

The desire to design trials so that more can be learned about farmers' management practices and evaluation criteria, and, ultimately, so that technologies more relevant to their needs and opportunities can be developed, has led to a number of innovative field methods, distinguished according to whether farmer and researcher work jointly on the same trial, or separately, on different aspects of a trial, or even on different trials.

### *Methods*

#### **Farmer and researcher conduct trials jointly**

##### *(a) Adaptation of standard techniques for greater farmer participation.*

Several authors consider that on-farm testing methods have progressed little from on-station research methods, and are interested in creating trial designs to facilitate greater farmer participation (Okali & Knipscheer, 1985; Lightfoot, 1987).

'It has always been intended that cooperating farmers understand the design and hypothesis of a trial so that they can implement the trial independently and provide comments from their independent observations'. Problems arise where farmers have 'failed to appreciate the questions being asked in the trial' (Norman, 1986, p.43).

Opinions differ on the degree of complexity that can be introduced into farmer-managed trials. Some maintain that complex treatments and instructions lead to misunderstandings, lost data, the confounding of treatments and selection of cooperators who are unrepresentative of the poor farmer target group. Trials should not depart too radically from existing practice and should involve few financial inputs (Sollows, n.d.). On the other hand, Sumberg and Okali (1988) show how farmers' experiments with alley cropping are more complex than those envisaged by researchers, and Ashby *et al.* (1987) show that farmers are capable of ranking as many as 35 varieties of beans from a single programme of trials.

Lightfoot suggests the superimposition of treatments on to the appropriate existing crop or soil condition, e.g. nitrogen top dressing on maize. A healthy plot is divided, one half receiving the treatment.

Plots are replicated between farms, therefore the number of participants must be fairly high. Researchers help select the plot, instruct on the treatments, check and measure (Lightfoot, 1986a,b).

In this approach, understanding and feedback from farmers is improved, and there may be a range of technology choice for farmers, but the objectives and design of the trial are generally determined by the researchers.

*(b) Farmers design experiments with researchers.*

Perhaps because of the ratio of researcher:farmer input required there appear to be few examples of this approach. One notable exception is found in the fertiliser trials conducted at CIAT (Ashby, 1986, 1987). See case study 2C.

**Farmer and researcher interact, but do not conduct trials jointly**

*(a) Farmer and researcher conduct their own experimentation.*

Farmers are provided with new inputs or methods, and, usually after a brief period of explanation of their use, they are free to incorporate these into their farming system in whatever way they decide. Researchers involvement is usually limited to evaluation of the outcome, not only to assess the impact on productivity of the new technology, but also to understand the criteria by which farmers assess technology and to gain insight into possible further changes that merit experimentation.

Examples of this approach include that of the E. Visayas project, Philippines, in which improved sweet potato varieties were given to 12 participating farmers with the purpose of understanding how

varieties were assessed. The researchers found that conventional breeding objectives for sweet potatoes, i.e. high yield, long maturity periods, sweet taste and single harvest, are inappropriate to resource-poor farmers, who expressed their need for a range of types for different strategies and made their preferred characteristics known (Lightfoot, 1987). Sumberg and Okali (1988) report on farmers' innovative development of new alley-cropping based systems once they had been shown how new components (trees) could interact with existing features of the system.

In a highly innovative approach, Maurya *et al.* (1988) seek to shorten the time normally needed for breeding new rice varieties by matching Indian rainfed farmers' traditional landraces with advanced breeders' lines of higher potential, allowing farmers to grow them under their conditions, and to reach their own conclusions regarding their suitability.

The various initiatives to make 'minikits' available to farmers are a further example of the same approach (eg. Chand, 1987). However, we note that most of these examples involve farmers' testing of new varietal material. Such an approach may be less feasible in the case of other types of technology such as tillage techniques, pest control and animal nutrition recommendations.

*(b) Farmers evaluate researcher designed trials.*

In this approach, farmer participation in on-farm trials is significant only in the evaluation stage, although this may lead to greater farmer participation in subsequent experiments. At G.B. Pant University, Uttar Pradesh, farmer clients changed scientists' assumptions about triticale grain quality, and focussed on the need for winter planted rather than spring planted varieties, and for materials for different altitude zones. Subsequent trials were planned on the basis of altitude and rainfall (Biggs, 1982). In Ecuador, farmers who informally tested early maturing maize taken from on-farm trials, prompted researchers to seek farmers' evaluation of the maize characteristics; growth habit, cooking quality and main uses in the diet, marketability etc (Tripp, 1985). Ashby *et al.* (1987) report on the different criteria which farmers and researchers use in assessing new varieties of beans and cassava, and the resultant differences in ranking.

**Livestock research**

The characteristics of livestock require specific and usually more complex forms of research and farmer participation, both in the

conduct of trials and their evaluation (Knipscheer and Suradisastra, 1986; de Guia *et al.* 1984; Taylor-Powell & von Kaufmann, 1986; Okali & Knipscheer, 1985; Baker *et al.* 1988). Continuous interaction between stock owners and researchers to build up trust is particularly important (Case 2a). Animals are mobile and have a longer life cycle than crops, making the tracing of technology impact difficult. Further problems arise due to the non-divisibility, large size and lack of synchronisation of the experimental units. They interact in multiple fashion with other components of the farming system, and frequently involve inputs and products which are not readily marketable, thereby complicating economic evaluation; they often rely on child labour, they consume crop residues and, apart from meat, milk and hides, supply draught power, manure and fuel. Their capital value is difficult to estimate, since it may incorporate elements of risk aversion and ceremonial value (Knipscheer and Suradisastra, 1986; Bernsten *et al.* n.d.; McDowell, 1984). Small stock are rarely an individual household concern alone; with small ruminant systems, the level of observation is perhaps more appropriately the community rather than the household, avoiding the experimental problems caused by small individual flock size and allowing factors external to the household to be taken into account, e.g. the management of common property resources (Okali & Knipscheer, 1985).

Examples of approaches and problems in livestock research:

An ILCA project in N. Nigeria conducting on-farm fodder trials with settled Fulani pastoralists (Taylor-Powell & von Kaufmann, 1986), experienced problems in: identifying the key groups of stock owners; initial dependency on voluntary cooperation sustained by incentives; identifying and monitoring experimental animals, and in 'interference of producers in experiments by feeding control animals, adding fertiliser to test plots, applying their own ethnoscience, etc'. The Fulani fed supplements to all animals, not only those recommended by the project, as a maintenance and survival feeding strategy for the whole herd. They adapted the fodder bank to their own needs and resources. Consequently a broader approach was adopted by the project based on feeding strategies consistent with producers' objectives.

In Peru, a village group discussed sheep diseases with researchers, led by an ex-shepherd, and identified external parasites as the major dry season problem (Fernandez, 1986). Veterinary products for dipping were too expensive for local families. One of the group remembered seeing his grandmother use a traditional remedy made

from a local wild tobacco which was rubbed into the animal's hide. The group's idea was to test whether this plant, ground up and mixed with water, could be used as a dip. They agreed a day for the experiment, and prepared the mixture. The dip proved to be effective. Scientists advised that all the animals should be dipped together to reduce contamination, a new community dip was proposed and areas where the tobacco plant grew were identified for protection and multiplication. The plant was analysed in the laboratory to determine the minimum concentration for an effective dip.

### *Discussion*

Numerous methodological issues emerge from the examples discussed of farmer participation in experimentation and evaluation. The more important are considered in turn:

**Evaluation criteria.** Enough evidence exists to show that farmers' criteria for evaluating new technologies, particularly genetic material, can differ substantially from those conventionally applied by researchers. Whilst some farmer criteria (eg. the yield and palatability of straw, not merely grain yields, in cereal variety trials) are now well enough known to be widely applied, other criteria (colour of grain, processing and storage qualities) are likely to be highly location specific and knowledge of these needs to be gained before technologies are developed for specific areas.

**Conduct and evaluation of trials.** The conventional tendency for researchers to be the sole evaluators of trials and to design and conduct them accordingly has been countered by an overreaction in some of the participation literature claiming that technologies stand or fall according solely to farmers' evaluation of them. Farmers' evaluation is important; nonetheless, as stressed above, researchers have valid and generally broader reasons than farmers for evaluating trials: whilst it is usually sufficient for farmers to know *that* a new technology produces better results, researchers need to know *why* and *how* this occurs.

**Statistical validity.** Once the respective roles of farmer and researcher in evaluation have been recognised, much of the confusion over the extent to which formal statistical criteria should govern trial design can be dispelled. Eye estimates of differences in eg. yield may be adequate for farmers, but much stricter monitoring and statistical evaluation of experiments will be required by researchers seeking to quantify causal relations. Where these requirements are not

adequately recognised research can be unproductive. Jones *et al.* (1986), for instance, comment that the South Pacific smallholder project generated very few significant recommendations over 20 years as scientists repeatedly delayed in order to obtain more statistically conclusive results. A more participatory approach was later shown to be more productive as it built on farmers' skills. 'The bulk of agriculture research in terms of testing and selecting new cultivars and technologies in the Solomon Islands is done not by the ministry, but by farmers' (op.cit. p.6).

Recent efforts to design trials allowing both on-farm participation by farmers and statistically sound interpretation of results generally involve replication across, not within, farms (Lightfoot, 1987; Maurya *et al.* 1988) and whilst major efforts have been made to assess the efficacy of different trial and survey designs (Kirkby, 1981), there remains a widely-recognised need to develop statistical methods for analysis of trials where input levels and environments vary among sites (Horton and Prain, 1987; Bottrall, per.comm.).

**Cost constraints.** The risk of failure of technologies being assessed on-farm in difficult environments is high. Where this is due to factors beyond the farmer's control (eg. weather) then any failure of the technology constitutes an important observation for researchers. Frequently, however, trials are damaged by livestock or harvested before yields can be measured, so that a large number of trials must be laid out if enough valid observations for statistical testing are to be obtained, and so costs rise. These factors have encouraged even the most participation-minded researchers to revert to on-station testing for certain types of experiment (Box, 1987). More negatively, they have also powerfully biased doctoral research in agriculture towards better endowed areas (Gupta, 1987).

**Sequential decision-taking.** If trials are to be fully farmer-managed, farmers must be encouraged to treat the trial crop as their own, particularly incorporating any late changes in strategy as the season progresses. Horton and Prain (1987) describe how a Peruvian participating farmer increased his potato seed rate on his commercial plots to compensate for poor seed condition, but to respect researchers' requirement for uniform treatments, did not do so on experimental plots, with the result that the commercial plot performed better than both experiment and control.

**Responding to farmer requests.** A further question concerns the extent to which researchers should respond to farmer defined experimental requirements. Farmers may expect unrealistically that

scientific method will give definitive answers to their questions on, for example, appropriate input levels in variable soil fertility and moisture conditions.

These issues proved problematic in a farmer requested fertiliser trial in Syria (Martin & Gibbon, 1980). Fertiliser response was so highly variable that few recommendations could be made from the trial which had not already been worked out by farmers for themselves.

**Incentive Payments.** The long periods over which participation is required in eg. livestock farming before results become known may necessitate payment to farmers in cash or kind, but such interventions may interfere with the trial and/or farmers' evaluation (Kujawa & Oxley, 1986; Taylor-Powell and von Kaufmann, 1986).

Many of these difficulties could be resolved if sufficient resources were allocated to them. However, as Horton and Prain (1987) imply, the resources used in research have a high opportunity cost. As we argue at more length in our conclusions, to be cost effective, FPR must occupy a role clearly defined within the context of allocation of public funds not only to agricultural research but to economic development more generally.

### *Case Studies*

**Case 2A: Regular Research Field Hearings (RRFH). USAID and Institute for Animal Production, Bogor, West Java, Indonesia.** (Knipscheer & Suradisastra, 1986)

The Small Ruminant Collaborative Research Programme aims to increase animal productivity and incomes of smallholders through on-farm testing of technologies. Early attempts at technology diffusion at three agro-ecologically and socio-economically diverse sites provoked animated discussion and response from farmers. In an effort to capitalise on the qualitative information and evaluative potential inherent in this response, animal and social scientists collaborated in setting up monthly hearings.

The RRFH enhanced dialogue between farmers, researchers and extensionists, through discussion of specific problems in breeding, nutrition, health, management, marketing and so on. The meetings fostered scientists' awareness of farmers' production constraints and opportunities, sharpened the focus of technology development and increased the probability of new discoveries and adaptations by the farmers themselves.

Animals form a substantial part of farmers' capital and trials on animals can be particularly risky. The developing trust and understanding between farmers and researchers increased the farmers' willingness to participate in on-farm trials. Because of high variability in management, animal performance and environmental conditions, and the lack of sufficient replications, differences between treatments may be difficult to verify statistically. Farmers' evaluation of the trials, drawing on their own accumulated production experience is all the more vital. A treatment rejected by the researchers might be impressive to a cooperator. Trials and their economic analysis must be kept simple in order for cooperators to contribute fully.

The RRFH attracted participation from extensionists and administrators, but care had to be exercised to prevent them, and occasionally the scientists, from adopting a didactic instead of a debating approach. 'It is clear that the person leading the RRFH has a strong responsibility to maintain its 'hearing' character' (op.cit. p.213).

RRFH were multidisciplinary, researchers of different disciplines taking turns to chair the meetings. RRFH are not merely exploratory, but have important monitoring and evaluative components.

**Case 2B: Farmer participation in on-farm research and extension. Eastern Visayas Farming Systems Research Project (Cornick *et al.* 1985)**

Identifying the reasons for successful farmer participation is difficult since the issues are confounded by social structure and cultural norms. Cooperation may be part of appropriate farmer behaviour toward outsiders, superficially indicating agreement and involvement on the part of the farmers that perhaps does not exist. These problems are likely to be worse if material incentives are offered.

The Eastern Visayas project (collaborators: Philippines Ministry of Agriculture; Visayas State College of Agriculture; Cornell University) began in 1982 with a high commitment to involving farmers in the development of small scale upland farming technologies. Two case studies are described in which similar methods were followed but with very different results.

In Barangbang village, discussions had repeatedly identified soil fertility and erosion as problems. Researchers' suggestions for planting *Leucaena* on field contours as hedgerows and for fertility-enhancing cropping patterns were accepted in principle by farmers

but they were reluctant to allocate scarce land to *Leucaena* until nine farmers had been taken on a visit to a neighbouring island to see how *Leucaena* was being utilised there.

The research agenda was finalised with the help of all the village, and trials rapidly went ahead, limited only by seed availability. Enthusiastic cooperators planted not just the trials, but also on their other plots including some of the control plots, interfering with the 'proper' conduct of the research trials. Farmers were selling the leaves to processors of animal feed, for a ready cash income instead of incorporating them into the soil as researchers had recommended. Farmers experimented with pruning practices, and with appropriate crops for shaded areas.

Barangbang farmers conducted 'farmers teaching farmers' training courses, and began to collaborate in the control of the leaf hopper *Psyllid*, a source of damage on *Leucaena*. Cornick *et al.* note that the use of farmer associations and incentives to maintain and reward farmer cooperation 'has divided the community between those directly associated with the project and those without direct association'. However, the participatory base remains and the continuing role played by farmers is considered to be the most important feature.

In Jaro village, research focused on possibilities for improvement of the lengthy fallow period through the restoration of soil fertility, control of *Imperata cylindrica*, reduction of costs for clearing and improving pastures. As in Barangbang, meetings, surveys and discussions were held. Farmers chose the legume type and combination they wanted to test from several different trial designs. Problems with legume establishment and cooperation became evident after first planting; *Pueria* cuttings failed to establish and *Centrosema* had a low germination rate and slow growth. Additional trials were planted by site staff. Many trials were damaged by grazing livestock, and six months later they were ploughed under or abandoned.

The authors suggest these inter-site differences in the quality of farmer participation reflect differences in the way it was initiated, differences in the farming communities and in the suitability of the technology. In Barangbang the technology was familiar because farmers had experience of local *Leucaena* varieties. It provided significant short term cash benefits. In Jaro, recommended techniques for legume establishment were untested and farmers had no information about expected growth rates. Meetings for

cooperators took place in the project office, biasing the discussion away from possible dissent of non-cooperators. Researchers took over trials in order to safeguard the research programme, rather than allowing time to do it at the farmer's pace, thereby undermining the basis of participation.

**Case 2C: Farmers' involvement in on-farm experiment design and management.** (Ashby, 1986; 1987)

The IFDC/CIAT project to investigate the agricultural potential of Columbian rock phosphate materials contained substantial farmer participation in two experiments designed to evaluate:

1. How differences in the farmer/researcher relationship affect the management of on-farm trials, the agronomic results and the evaluation by researchers and farmers.
2. Farmers' participation in defining criteria for testing technology under small farm conditions and for experimental design.

The test crops were beans (*Phaseolus vulgaris*), in an extensive fallow farming system area, and potatoes in an intensive crop/livestock area.

1. In the first experiment, different types of farmer participation were:

- a) *Nominal participation.* Farmers were chosen from among the 'technically progressive'. The trial was researcher-designed, managed and implemented. Non-experimental variables were set at optimum levels defined by scientists.
- b) *Consultative.* Farmers were chosen from a cross section of socio-economic conditions. The trial was researcher-designed and farmer-implemented in close consultation with researchers. Non-experimental management practice was defined from representative practice identified in an agroecological survey.
- c) *Decision-making.* Farmers were chosen from 'innovators' identified by key informants. The trial was researcher-designed, farmer-managed and implemented without advice. Non-experimental practice was defined by the farmer.
- d) *Control group.* No trials as such. Farmers' plots were monitored.

Response to different types and levels of rock phosphate was tested in all the trials, but the nature of farmer/researcher contact differed. In a) and b), the management operations were checked by the researcher. In c), researchers limited visits to observations in the company of the farmer.

The difference in the management relationship between b) and c) had little effect in the case of potatoes, where farmers were already highly innovative and using a high level of inputs. In the case of beans, farmers in the 'consultative' group achieved higher bean yields for any given treatment than the decision makers, especially at higher fertiliser rates. The most significant management difference was in spraying for pest control; the group receiving supervision and advice made more timely and correct applications than the decision-making group.

2. Farmers participated in designing the trial and treatments, and determined the non-experimental factors. The new fertilisers were introduced by locally hired farmer assistants. After discussion, farmers were asked how they would try out the fertiliser. Farmers made suggestions and compiled a list of questions, objectives and possible treatments. These were reviewed by the research team and a soil scientist who developed an experimental design to address farmers' questions. The design was discussed and reviewed by farmers to make sure it was consistent with their requirements.

The principal innovation in farmer-designed trials was the mixing of rock phosphate with the (expensive) chicken manure, conventionally used by farmers, in order to maximise returns to their perceived working capital constraint. Additionally they sought to establish the performance of rock phosphate and compound fertilisers in both sole and mixed application. The potential importance of fertiliser mixtures had not been suggested by the agro-economic survey, which had '...tended to screen out practices followed by a minority of farmers in favour of a focus on representative practices followed by the majority'. Mixtures had been excluded from researcher-designed trials largely because of the difficulty of evaluating their performance. Researchers collaborated in setting out the trials to minimise possible bias in the treatments, using methods which farmers could readily grasp, e.g. drawing numbers from a hat, and using farmers' units of measurement.

Although the published account of the trials lacks clarity in some respects and so does not yet constitute a final assessment, these trials constitute one of the very few efforts made by researchers to design trials to test what farmers saw as important interactions and to assess the impact on net returns achieved by trials with varying degrees of farmer participation.

### **Case 2D: Farmer assessment groups**

The Agricultural Technology Improvement Project (ATIP), Botswana is concerned with increasing the arable production of limited resource farmers, many of whom are women (ATIP, 1986a; 1986b; Norman, 1986; Norman *et al.* 1988). A basic tenet of the project is that farmers should play a strong role in establishing research priorities and in trying out and evaluating technologies.

In their Mahalapye location the team decided to work with a small number of representative farmer cooperators, some to be involved in on-farm trials and others to take part in a multiple visit study of resource use. Farmers' groups were formed in 1984/85 to hold monthly meetings in which farmers discuss problems arising and alternative methods, and help plan trial activities and site visits. Information on government programmes is disseminated and farmers receive feedback from ATIP staff on monitoring and trial results. Two sets of trials are implemented by group members: secondary crops sole planting trials and post-establishment management trials.

ATIP in Francistown had informally involved farmers since inception and formally since the beginning of field work in Tutume district in 1985, using the traditional village assembly (kgotla) as a basis for group formation. Trials of improved methods were to be farmer-managed and implemented. They would discuss their progress, problems and observations with extension and research staff and other farmers in monthly meetings. Reports from the meetings were circulated to the regional agricultural office. From the range offered by research and extension personnel, farmers could choose the trial of most interest to them, to plant on 10x50 metre plots adjacent to their own field. Material inputs were given by the project but draught power and labour was supplied by farmers.

In 1985/86, 12 farmers tested double ploughing. A field day was held at the end of the season, attended by about 75 farmers and discussion followed. In the second year trials were established in the other villages and the range of technologies offered and tried out increased beyond that achievable under researcher-managed, farmer-implemented format.

As a result of farmers' selections, technologies were matched to individual needs and the local opportunities and constraints in a much more detailed way than would have been possible for the existing research and extension cadre to achieve without farmer participation. Thus, the hand row planter was adopted in one village where the lack of draught power and reliance on hired tractors often

resulted in untimely cultivations.

## **Dissemination**

### *Discussion*

Farmer participatory research gives rise to three broad questions regarding dissemination:

- (i) to what extent can farmers who have adopted a new technology participate in extension *functions*, disseminating the technology to other farmers and feeding back farmers' ideas to researchers in order to spread research and development costs over as wide a clientele as possible, without loss of relevance?
- (ii) what role do official extension *services* have to play as participatory approaches draw researchers and farmers into closer interaction?
- (iii) what role do other institutions such as NGOs have in performing extension functions?

### **(i) Extension functions**

Numerous examples can be cited in which farmers have successfully demonstrated technologies to others, leading to successful and rapid dissemination. Case study 3A documents efforts by Khon Kaen University in N.E. Thailand to facilitate diffusion by farmers of technology for a rice/groundnut rotation. A feature of the Philippines E. Visayas Project was farmer-to-farmer training in *Leucaena* management techniques (see Case Study 2B) as also in the Baudha-Bahunipati Family Welfare Project, Nepal (Arens & Nakarmi, 1987). An NGO (World Neighbours) has successfully arranged village-level classes taught by farmers (Bunch, 1985). In Ubon, NE Thailand, Sollows (pers. comm.) notes of a CUSO-sponsored farmer-to-farmer diffusion of rice/fish technology that within two years, adopters were themselves acting as hosts and instructors to visiting potential adopters from elsewhere: 'Inexperienced farmers can see what has to be done in various situations and can discuss the practical and associated problems with experienced farmers who speak the same language in more ways than one. Having seen a number of different farmers' systems, the 'new' farmers will have some idea of how to adapt the practice to their own unique situations'.

Participatory dissemination usually relies on word-of-mouth communication. But this is not always the case. Hatch (1981), for

instance, encouraged Bolivian farmers to write a textbook. This activity developed into farmer discussion and action groups. In a 3-day conference in 1980, farmers from the Highlands area and from the valleys gave each other talks on their traditional practices.

In other situations, perceptive farmers, using evaluation criteria different from those of researchers, have obtained, multiplied and distributed genetic material discarded by researchers in variety trials.

One of the main potato varieties of N. Peru was originally propagated and distributed in this way (Horton & Prain, 1987).

Farmer-to-farmer dissemination has played a major role in soil and water techniques in the Sahel (Reij *et al.* 1986). e.g. the diffusion of water-harvesting techniques developed by Oxfam in collaboration with villagers in Yatenga, Upper Volta (Wright, 1986). In a much earlier Oxfam project, air fares were paid to allow cross-national farmer-to-farmer contact in Central America in the late 1970s (Oxfam, pers. comm.).

Feedback from farmers to researchers has generally relied on researchers' initiative to learn — sometimes in a planned (Norman *et al.* 1988; Ashby *et al.* 1987) but more often in an ad hoc manner — what farmers wish to see researched, or what modifications should be made to new technologies as a result of their response to them. Cases are known (in Bolivia, for instance — author's observation) in which producers' organisations are represented on the governing bodies of research centres and are forceful in their proposals for research, to the extent of putting up the necessary finance, but these are not generally the smallest and most resource-poor of farmers.

From these and other examples two important facts emerge:

(a) participatory dissemination has generally been promoted by agencies (NGOs, universities) other than the national agricultural research and extension services of ldc's, and its initial stimulus has always been directly from researcher (or facilitator) to farmer, without intervening input from extensionists

(b) successful participatory dissemination has generally been between people of comparable status.

Some might argue that the Training and Visit Extension System's 'contact farmer' is an example of participatory dissemination. In reality, however, the circumstances in which these operate are generally different from those described above and may in part account for their limited effectiveness. Given the temptation to select as contact farmers those having better than average resource endowments, the messages they are supposed to convey may be

inappropriate to many, and non-adoption may be a rational response to differing resource bases. Perhaps for the same reasons, the farmer-to-researcher information flow, initially seen as a major potential advantage of Training and Visit, has not materialised to the degree anticipated (Uphoff, 1987).

**(ii) Extension services**

Extension agents' training and attitudes conventionally have led them to expect unquestioning and universal acceptance by farmers of the technologies they promote, whereas participatory approaches require a spirit of collaboration in 'trying out' a range of technologies which may or may not meet farmers' evaluation criteria. Progress has been made in Farming Systems Research and Extension work to narrow the gap between conventional and desirable approaches (Byerlee, 1988), and some success has been achieved in incorporating extension agents into participatory trial management in Zambia (Kean, 1988), into informal diagnostic surveys in Honduras and Guatemala (Whyte and Boynton, 1983) and into the development of farming systems technologies in Khon Kaen, Thailand (Charoenwatana, *per.comm.*).

Some see extensionists taking on completely different functions as FPR expands, such as facilitating input supply (Harwood, 1979), whilst others envisage the roles of researcher and extensionist being combined into that of village-level 'catalyst' (Fernandez, 1986; Raintree, 1978; Tan, 1986).

**(iii) The role of NGOs**

NGOs such as co-operatives, producers' organisations and charitable or religious-based organisations are developing capacities of their own to strengthen and diffuse technologies for agriculture on an area or social group basis. Given their knowledge of local agro-ecological and socio-economic conditions, their ability to articulate requirements on behalf of farmers and their broad 'facilitating' approach to rural development, they have a strong potential role in linking with formal research systems in the design and diffusion of technology. Yet, in very few cases does this potential appear to have been exploited. An important exception is eastern Bolivia, where, in the absence of effective publicly-funded extension, a UK-funded technical co-operation team and its host institution rely heavily on long-established NGOs in the design of research agenda, the conduct of location-specific trials and dissemination (Stobbs, Farrington and Irvin, 1987).

### *Case Studies*

#### **Case 3A: Farmer to farmer extension at Khon Kaen, N.E. Thailand.** (Jinrawet *et al.* 1985)

Farming systems research at the university of Khon Kaen, which began in 1983, has aimed to establish participatory extension methodology in order to replace rice/fallow with a rice/groundnut rotation in poor upland conditions. Researchers devised a programme of trials and farmer-to-farmer contacts to facilitate adaptation of the rotation to local conditions.

Ten farmers were initially selected according to their interest in groundnuts, and the suitability of their farms for the crop. Researchers discussed the trials' objectives with them and supplied seed and insecticides. Slides on the cultural practices of groundnuts after rice were shown. Their reactions and ideas were discussed. Demonstration plots and on-farm trials were established with the help of agronomists.

After the first harvest, two farmers visited Surin where the rice/groundnut rotation was long established. They observed techniques and practices directly from other farmers. On their return both farmers changed their land preparation methods to better suit their environment, reducing ploughing and harrowing with no detriment to yields. No official programme was arranged for their second trip later in the season; farmers determined the pace, order and content of discussions.

Farmers from three districts and agricultural extension officers from twelve districts were invited to a subsequent field day. Owners of the plots acted as guides and explained the practices, and three host farmers demonstrated planting techniques. Discussions and lunch followed.

At the end of the growing season, researchers sought to evaluate the experience, conducting informal interviews with five participating farmers from different socio-economic backgrounds. The responses of the two farmers who visited Surin, one a subsistence farmer and the other a semi entrepreneur were very different. The former appreciated the opportunity, but to save time would prefer local technical advice. The other found that the visit had given him 'personal assurance of his own success, comparing those with his own field before growing something he had never grown before' (*op.cit.*, p.40). The responses are consistent with their different production

objectives; groundnuts fit into the economy of small producers for consumption and local exchange whereas market relations and anticipated profitability are critical for higher risk commercial producers.

Overall evaluation of the project concluded that whilst some constraints to yield could be removed by farmer-initiated experimentation, others would require researcher-led investigation. Farmers could function effectively as educators of their peers, leaving to officials a 'facilitating' function.

**Case 3B: Farmers' involvement in seed production. A diffusion strategy based on the indigenous system. (Prain and Samaniego, 1986)**

In 1984/85, CIP began investigation of informal seed potato production and distribution systems in the central highlands, Peru, prompted by concern over the limited uptake of 'improved seed' through the official ministry channels. The study was conducted by an anthropologist and agronomist through informal discussions with farmers, seed growers, extension staff and key informants on seed exchange, credit and marketing. An interesting feature of the methodology was the selection of 45 families for multiple visits allowing the researchers to build a more personal relationship. Researchers found that:

farmers have a self sufficient seed system. They select from the previous year's production except where there is a disease problem. They rely on social ties and exchange. Only 19% of seed requirement is obtained from merchants.

the skilled job of post-harvest seed selection is women's responsibility. Healthy potatoes are selected (although disease may be asymptomatic). The traditional control and expertise of women over seed selection is eroded by male contact with the ministry and seed merchants (Fernandez, 1986).

— seed was stored in the light.

seed distribution channels relate to the division of labour, to inheritance, kinship and friendship networks and are linked across zones.

The study indicated that the seed quality provided through the formal channels was inferior to farmers' seed, and that the informal seed distribution system worked better than specialists had previously assumed. A seed distribution strategy based on large farmers would not be successful as it would not have access to the existing channels.

These findings led to the establishment of a small informal seed programme. Loans of 50-200 kg of seed were given to eight farmers in four communities 'to see whether the farmers and communities were able to successfully manage the production of seed, and thereafter, whether these informal seed centres would act as conduits of the quality seed to other farmers within and beyond the locality' (op. cit. p.10). Researchers helped in plot selection but no uniformity was imposed. Seed production was good, loans were returned and interest was high, but, as yet, it is too early to evaluate the flows.

**Case 3C: Community involvement in research (Tan, 1986)**

This project was initiated in 1978 by the Agency for Community Educational Services (ACES) in eight villages of the Central Plains, Luzon, Philippines. Problems of debt, poor returns on harvests, unfinished irrigation works and slow land reform implementation were widespread in the community, against a background of dependency on a paternalistic administration. Agriculture was dominated by capital intensive rice monoculture.

An ACES community organiser lived in each village to act as a facilitator or catalyst in the emergence of knowledge and the development of farmers' self confidence. They aimed 'to bring about a situation where small farmers can actively participate in determining what is best for themselves', and so resisted the role of instructor, attempting rather to elicit farmers' own views and analyses.

There were two levels of action:

1. An early phase in which small groups of villagers were mobilised around specific issues and through discussions planned action to solve their problems, contacting outside agencies where necessary. Farmers' understanding of political and institutional forces at local and national level was enhanced.

2. Participatory technology development. The community organiser acted as the catalyst in an iterative process of problem definition, prioritisation of solutions, experimentation, evaluation, replanning and reflection. Discussions were held to spread technical knowledge with the emphasis on innovation rather than adoption of 'packages'. The community organiser could introduce technologies as potential solutions, which were beyond farmers' experience but the farmers decided whether to request further information, whether to test the technology, and assessed its suitability. Informal groups of villagers conducted their own experiments.

In Malabon Kaingin village one village member and his sons dug three fish ponds and bought fingerlings, while the rest of the fishpond group waited to see the results. The pond remained intact throughout a typhoon, and over the next six months twenty-two ponds were built by group members. From their discussion and evaluation process they compiled a report which they 'shared with other farmers interested in knowing the do's and don'ts of fishpond culture'. They continued by researching into suitable crop species which thrive in ponds. A range of ideas was tested; some like hog raising, bamboo and *Leucaena* did not develop, through lack of capital or land. Others lacked potential as a source of income. Structural impediments, particularly the viability of the government institutions to respond to their immediate and long-term needs, hampered their research initiatives.

### **The farmer/scientist partnership for development**

In 1982, ACES conducted a study of HYV technology, comparing rice cultivation practices and costs between 1970 and 1981. Eight villages were studied intensively and country-wide observations were made. Farmer presenters were trained to use visual aids to present the findings from the initial villages as a basis for discussion in others, and a questionnaire was sent to fifty farmers' groups. A national consultation on rice held to consolidate the analysis and synthesise recommendations, was attended by representatives from thirty-one farmers' organisations. The farmers decided to take the initiative for research with the help of local scientists, since the authorities were not responsive. They identified their main problem as low returns from rice monocropping and in partnership with scientists aimed to 'bring back genetic diversity of rice and other crops into the farms'. Forty-one local rice varieties obtained through the farmers' organisations were planted for propagation on an experimental farm in one of the villages. Farmers took turns in observing the growth characteristics. This initiative was the foundation for a network of community seed banks, and further farmer/scientist cooperation in solving other problems over a wider geographical area.

## 5 Conclusions

From this review of conceptual approaches to FPR and recent field experience, what conclusions can be drawn regarding its usefulness as a mechanism for making technology development more relevant to farmers' needs?

Numerous methods have been identified to incorporate farmers' ideas, but the focus of activity hitherto has been only in specific areas within the general contexts of:

- technology development processes;
- types of technology;
- institutional frameworks.

In the *technology development process* there are many instances of successful participation in problem identification — often involving substantial re-orientation of initial objectives defined by researchers alone. There is also a substantial number of cases in which farmers' evaluation of technology has provided researchers with new insights and in which farmer-to-farmer dissemination has been successful. Where researchers already have good knowledge of a technology, a common and cost-effective technique is to offer to farmers several technology options having a bearing on the problem or opportunity at hand, and leave it to them to experiment in an ad hoc fashion.

As they become familiar with new technology, farmers are likely to change other components of their farming system in order to exploit the advantages it offers. Such changes (referred to by e.g. Chambers (pers.comm.) as 'multiple simultaneous innovation') can be complex and variable over time and space so that researchers have little prospect of predicting them on the basis of their own trials (Sumberg and Okali, 1988). Observation by researchers of the evaluation criteria used by farmers can then be fed into the next round of technology development for release to farmers.

The search for new participatory methods has led to efforts to meet both researchers' and farmers' requirements in a single set of

trials, usually via *inter-* instead of *intra-*farm replication. These have been particularly useful in accelerating the release of new genetic material (Maurya *et al.* 1988), though in other cases they have incurred both a substantial cost and a high risk of uninformative failure, prompting a move back to on-station trials (Box, 1987).

Most of the material reviewed has implied participation at the individual farmer level, but other important opportunities for participation should not be neglected. For instance, individuals sometimes develop special expertise in certain areas, and serve as community 'spokesmen' in these (Rocheleau, 1987). Important divergencies of obligations, rights, technical knowledge and, therefore, acceptability of technologies have been found *within* farm households implying a need to involve (especially) women in technology development (Moock, 1986). Other experiences have shown the community to be the more appropriate level of participation: this is the arena in which technologies concerning the exploitation of common properties need to be partly defined by incorporation into collective ITK, and where community mechanisms for the non-destructive exploitation of such resources need to be understood and strengthened. Certain technologies — such as innovations in animal-drawn equipment — have traditionally developed through interaction between farmers and artisans, implying a need to build on these channels of local knowledge (Basant, 1988).

In terms of *technology* type, FPR has been reported far more frequently in the selection of genetic material than elsewhere. Important but isolated examples have been reported in the management of soil and water resources, of crops themselves and of storage facilities. Examples from crop protection, fertilisation and farming equipment are very few indeed. Perhaps because of the complexities involved, the numbers of examples relating to livestock research are also very few. The focus on genetic material perhaps highlights the area of greatest complementarity between researcher and farmer. The former have a vast range of material on which to draw and have developed breeding methods exceeding in both scope and speed those available to the latter. On the other hand, in highly variable and complex agro-ecologies the weight given to individual criteria in evaluation of a new variety is likely to vary between farmer and researcher and among farmers, and it is here that the strength of the farmer's input lies.

As regards the *institutional framework*, with the exception of isolated but important examples from central and southern Africa and South and South-east Asia, practically all FPR has been located outside NARS. Numerous examples have a continuing institutional base in IARCs, NGOs and universities. However, many more have emerged from specific research projects of limited duration with no apparent commitment to their eventual incorporation into any institutional framework. There appears a real danger that FPR, especially in its more sophisticated forms, is already exceeding the capacity of ldc institutions to incorporate it. Where NARS are strong and are moving towards implementation of a flexible and iterative type of farming systems research, the priority should be to develop FPR methods amenable to incorporation into NARS after, perhaps, some training of staff in techniques of learning from farmers. Where they are weak, close collaboration with NGOs to promote participatory approaches is perhaps the most appropriate alternative.

Although the costs (materials, transport, researchers' and farmers' time) of FPR are not explicitly considered in many of the examples reviewed, it is clear that they vary widely according to method and 'stage' of the research process at which they are practised. Ease of implementation and a substantial cost-effectiveness advantage over existing methods are the prerequisites of their incorporation into local institutions. Problem identification and varietal improvement are two areas in which these conditions appear to hold as is farmer-to-farmer dissemination.

As inevitably occurs with new approaches such as FPR, methods are being developed in a piecemeal fashion, though proposals for more systematic participation exist and merit empirical testing. A notable example is Buhr and Galt's (1986) proposal to accelerate the release of acceptable plant varieties through efforts to understand, at an early stage in the screening process, the criteria by which farmers accept or reject genetic material and, at a later stage, by exposing advanced lines (prior to F6 or F7) to a wide range of on-farm growing conditions and to farmers' evaluation criteria before final selections are made. So far this type of approach appears to have been implemented only in the work reported by Maurya *et al.* (1988).

## **Future Research**

From this review several gaps in knowledge emerge which could usefully be addressed by future research.

1. More case studies are needed of instances where the incorporation

of FPR into NARS has been attempted. Both successes and failures should be reported, in order to facilitate generalisations by some future review on such matters as: the types of FPR method most easily incorporated; the features of institutions likely to facilitate their incorporation; and the types of institutional change most conducive to fuller incorporation of FPR. Information is also required on long-term incorporation of FPR into ldc institutions outside NARS, such as universities and voluntary agencies.

2. Reports of unsuccessful (not merely successful) attempts to conduct FPR should be written up and published in order not only to facilitate distinction between methods, technologies, etc which are or are not amenable to FPR, but also to delineate variations in the capacity to contribute to the research via ITK within and among households, and across communities.

3. Much closer attention needs to be given to the role of extension once researcher and farmers have been drawn closer together in a participatory approach. Hitherto this issue has been widely neglected both conceptually and empirically.

4. Participation by *groups* of farmers in the research process appears in principle to be more cost effective than an individual approach. Yet experiences with group approaches appear few in number and of highly variable outcome;

5. How to identify homogeneous groups without a prior and time-consuming anthropological study deserves more attention than it has received hitherto. Similarly, the role of local organisations (women's groups; farmers' clubs; cooperatives; church groups) and of non-indigenous NGOs in articulating client demand for, and mediating participatory inputs into, agricultural research has hitherto received little attention, yet appears to offer considerable potential;

6. Whilst the conceptual literature recognises that FPR can lead to greater cost effectiveness not only in problem-focussed but also in commodity and factor research, precisely how the results of FPR influence the agenda for research in these areas is rarely illustrated from empirical evidence. More detailed understanding is needed of the organisational and institutional arrangements between field and research station that might facilitate incorporation of FPR at this level.

## **Conclusion**

Farmer participation is not, as some might claim, a substitute for FSR but a complement to client-oriented ('problem-focussed') research

and development, which, in turn, is one component of the agenda for research in Idcs. Other research will be required on the development of technologies to address opportunities or constraints of which farmers will be unaware. We — and practically all the FPR literature reviewed — have hitherto assumed away the problem of allocating national research resources between these two levels of technology development, and, within the problem-focused, between participatory and other methods. Such decisions require skill, knowledge and wisdom if they are *ex ante* even to approximate what *ex post* transpires to have been the optimal allocation. It is as a complementary method within this framework that the appeal of FPR is most immediate;

Going beyond this, FPR has the potential to generate user-demand for technology which historically has sharpened the focus of research in developed countries, but hitherto has been widely absent in Idcs. As part of this process, indigenous knowledge systems would be made more dynamic, and (especially) community-level mechanisms for the implementation and enforcement of ITK strengthened. This is to be welcomed as — in philosophical terms — a move towards democratisation of the processes of technology development and — in practical terms — towards a greater cost-effectiveness in the design, implementation and diffusion of technology.

Existing centralist tendencies are challenged at several points in the work reviewed, not merely in technology design, but in support facilities (such as local gene banks and seed multiplication) and in legislative provisions (governing eg. certification and release of new varieties) (Maurya *et al.* 1988). As FPR develops, pressure will increase for a paradigm shift away from central control and towards local control and a blend of locally and centrally available support facilities, data banks being a prime example of the latter;

Finally, understanding of the complexity and variability of agro-ecological conditions under which resource-poor farmers operate, the wide range of biomass on which they must draw for survival and the diverse criteria by which they will assess new technology is of critical importance to the technology development process — whether future change is revolutionary or evolutionary — if the resource-poor are not to be denied the opportunities for increased production and welfare which technology change offers. The resources simply will not be available for researchers alone to undertake this task, even if they could grasp the opportunities and constraints in all their diversity. This remains one of the most

compelling reasons for promoting farmer participation in the development of technology.

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In *Farmer Participation in Agricultural Research* the authors assess the conceptual framework underlying four different approaches to farmer-participatory research, and analyse the institutional context in which such research is undertaken. The book includes an examination of the role of indigenous technical knowledge, and a major substantive review of recent field experience with FPR.

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