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A Farming Systems Approach: Some Unanswered Questions*

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SUMMARY

This paper reviews major features generally found in Farming Systems Research (FSR) programmes and projects. The paper argues that while considerable attention has been given to the development of FSR manuals, survey techniques, etc., insufficient attention has been given to issues concerning the evaluation of FSR projects and the organisation and management of agricultural research in developing countries. The paper discusses important institutional issues such as control over agricultural research resources, creative conflict between disciplines, communications methods, evaluation and the need for research groups to define the specific clients (specific group of farmers) for whom they are working.

FARMING SYSTEMS RESEARCH: A BRIEF REVIEW

The term 'Farming Systems Research' (FSR) is used here in a broad sense to cover the activities of, and the growing literature concerned with,

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and different types of communication methods. Some of the common features which are important to this work are that:

(1) It is a strongly applied and empirical 'problem solving' approach to research.

(2) All activities of the farmer are analysed in an 'holistic' farming systems framework. For example, decisions concerning the production of one crop are not diagnosed in isolation from other crops, off-farm employment, access to credit, or household consumption preferences.

(3) Relatively homogeneous groups of farmers are identified as the clients of research in specific agro-climatic zones. While FSR is not confined exclusively to small farmer situations, it is mostly concerned with their problems. In fact, one experienced writer has said 'the FSR approach gives the small farmer, often for the first time, a "voice" in tailoring research priorities, both technology and evaluation, to his needs' (p. 9).[22]

(4) It is an interdisciplinary approach, involving social scientists and natural scientists.

(5) It is mainly concerned with 'downstream' (applied) research issues and with ways of ensuring that there are effective linkages to influence 'upstream' (basic) research activities.

(6) It involves on-farm trials, surveys (socio-economic and technical), and sometimes specifically designed field workshops and other communication methods.

(7) It involves farmer participation.

(8) It is a dynamic 'learning by doing' approach, in which implications for research priorities, extension programmes, etc., are drawn out each year, and the programme is expected to change in response to these implications.

(9) The FSR approach is to be judged by the extent to which it influences the production of socially desirable technologies that diffuse quickly amongst specified groups of farmer clients.

There are, as might be expected, many variants of FSR. The more ambitious methodologies look at a farmer's complete farming system, while others study cropping systems or look at a specific important crop (or other technology) but in a farming system context.[10,16] Food crop production technology has been the main focus of FSR. However, post-harvest technology has also been analysed[23,25] as well as mixed livestock

and cropping systems.[17] A farming systems approach is also evident in much of the recent action research literature on irrigation technology and management at the farm and village level.[24] In fact, the approach advocates that the choice of technologies to be worked on should be determined by the priority problems of a defined group of user clients and should not be justified only by academic or other criteria.

A recent review of FSR by Gilbert *et al.*[19] included an eleven-page bibliography and described in detail the different farming systems research programmes in five of the International Agricultural Research Institutes (CIMMYT, ICRISAT, IRRI, IITA and CIAT), and in three national programmes (those of Guatemala, Senegal and Colombia). Other international centres also use different types of farming systems approach, for example, CIP[1,25] and ICARDA.[18] The bibliographies of Biggs,[4] Whyte,[30] and TAC[28] also list a large number of different FSR studies. Recently, agricultural extension has featured more prominently in some FSR approaches and there has been an attempt to synthesize 'a set of integrated, multidisciplinary farming systems R and D methodologies adapted to the personnel and financial constraints of LDC's, packaged for easy delivery in the form of a comprehensive handbook or handbooks to LDC institutions'.[27] A brief review of this large comprehensive handbook reveals that there is almost no aspect of field level, farmer-orientated agricultural research and linkages to extension systems that is beyond the purview of FSR. One of the problems now is that the term FSR can cover virtually everything that does not take place on an experiment station.

A start has been made by some of the social scientists at CIMMYT to try to define what different practitioners and authors mean by an FSR approach. They 'discuss that subset of FSR which has the following characteristics: (a) it aims to generate technology to increase resource productivity for an identified group of farmers, especially in the short term; (b) it is conceptually based on a farming systems perspective; (c) it uses on-farm research methods'. They call this 'on-farm research with a farming systems perspective (OFR FSP)' (reference 11, p. 897).

Many FSR projects have been funded by aid sources and often staffed and directed to a greater or lesser degree by expatriate personnel. [illegible] the most important questions to ask is how much the FSR approach and the various methods used for surveys, trials and communications will be relevant and viable when the 'special project' personnel and funds are withdrawn.

While there is much written about the philosophy and methods of FSR, we appear to lack two types of study. First, analysis which seeks to understand which parts of different FSR methods have been most useful in helping to produce and extend technology for resource-poor farmer clients. Secondly, studies which analyse the contribution of different parts of FSR methods and projects to the sustained development of a local agricultural research capability.

The very fact that FSR is claiming to be capable of so much in some situations is leading to expectations far beyond what is achievable. In addition, it is possible that a number of 'new' FSR projects are now having to face some of the same old 'institutional problems' which established agricultural research systems have had to face for many years. For example, in India and Bangladesh there have been substantial programmes of field trials and adaptive research for at least 20 or 30 years.[14,24] The 'institutional problem' in many 'old' systems was that the information generated by formalized on-farm and village level research programmes failed to influence the content or direction of experiment station research activities or lead to extension advice relevant to farmers. This is in spite of the fact that the village level programmes were originally designed to have an adaptive research and 'feedback' rôle.

The difficulties of acquiring professional rewards and status experienced by those working in some of the 'new' applied agricultural research and extension systems is illustrated by Hildebrand:[20]

> 'How are the professional contributions of the individual on an FSR/E (Extension) team evaluated for purposes of promotion and salaries? Traditional evaluation procedures for researchers dictate the production of a number of articles published in referred journals; numbers of meetings and popular publications are criteria for extension personnel. Neither meetings nor publications is the primary objective of the FSR/E approach.' (p. 906).

In a review of the institutionalization of FSR programmes in Kenya, Tanzania and Zambia, Collinson[3] explains why FSR is not being adopted by local agricultural research systems. One of the main reasons is that rewards in the local research and extension institutions do not promote on-farm research.

Proponents of FSR methods talk about these 'institutional problems' as if they are new and unpredictable. However, this says more about the researchers who are developing FSR methods than about well known and

inherent characteristics of agricultural research and extension systems. These problems are neither new nor unpredictable, as Bunting[9] illustrated when reviewing the first fifty years of the *Journal of Experimental Agriculture*:

> '... For development, the most significant, but usually the least effective, part of the knowledge system is the extension or advisory sector, through which the objectives, potentials and difficulties of producers can be made known, and by which both the products of new research, and the accumulated experience of past research and practice, are conveyed to them. This part of the system is all too often conceived as a one-way stream, through which the "technology" developed by research workers, seen as the lead agents, is "transferred" by extension workers to the grateful and expectant producers. This flow often fails, sometimes because the technology is inappropriate, and often because the extension workers are poorly paid. The all-important reverse flow, which should be the leading stage in the whole system, is all too often omitted, neglected, or even held in contempt.'

Sivaraman,[20] in a paper on the agricultural research system in India, notes that a class and caste tendency permeates much of the research and extension system, and that field workers and those employed in applied research have lower status and pay.

It would seem that FSR workers – by being out in villages and close to poor farmer clients – are now running into the same type of predictable problem which their extension colleagues have had to face for many years.

In the light of both past and recent experiences of FSR it is worthwhile, therefore, drawing out some lessons which appear to be relevant to an analytical framework for a farming systems perspective.

IMPLEMENTING A PROBLEM-SOLVING APPROACH

FSR is an applied problem-solving approach to technology generation and diffusion. Figure 1 illustrates its underlying principles. Research is seen as a dynamic process. Information and knowledge flow between farmers, researchers and extension staff. There is no starting or ending point; research and information transferral is a continuous process.

FSR is frequently seen as the critical research component which

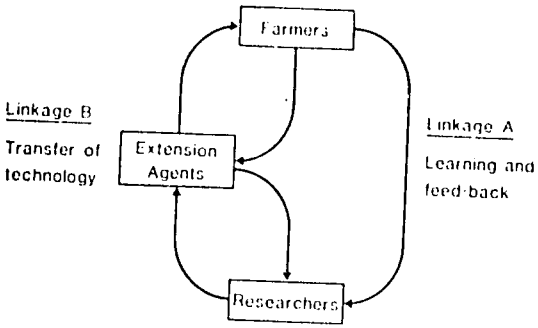

Fig. 1. Farmer, researcher and extension linkages. Source: Biggs.[3]

facilitates the linkages and flows of information between farmers, researchers on experiment stations and extension staff.

Institutional models for the delivery of extension information, such as the Training and Visit (T and V) system, depend upon these feedback mechanisms working effectively.[2] The suitability of FSR for this rôle does not diminish the difficulty of getting it used in practice. Numerous 'problems' arise when a problem-solving approach is implemented. For example, it may be decided that the field testing of technology be done by one division of a Ministry and the experiment station research by another. Although committees exist for consultation and the transfer of information there may, in fact, be no effective dialogue between the two departments. Many similar problems often encountered in trying to institutionalize a problem-solving approach to agricultural research have been discussed elsewhere.[5] However, in this paper we shall examine some principles which appear important for ensuring that an FSR approach is effective.

Control in agricultural research

If information from farm and village level is to influence the direction of experiment station research, the on-farm and experiment station research must be under the same directorship. Where certain crops or engineering technologies are of major importance to the specified farmer client group, the director of that commodity (technology) programme must spend a significant amount of his or her time both on-farm and on-station. It was found, in a maize improvement programme in India, when the research station introduced its own on-farm programme, that some of the farmers' problems had been wrongly specified and that the yield potential of local

germplasm, and its possible contribution to the maize improvement programme, had been seriously underestimated.[15] Without this type of *direct* linkage between on-farm and on-station research it is unlikely that experiment station programmes will respond quickly, if at all, to the results from village level research.[7]

Recognition of creative conflict

Interdisciplinary and multidisciplinary teams of social and applied natural scientists working together are normally advocated for FSR. Generally, though, there is no reference to the periods of what Rhoades and Booth[25] call 'creative conflict' – those difficult periods during the research process when there are direct disciplinary conflicts. We should not underestimate the difficulty of these periods and the predictable tendency of different disciplines to address this problem by creating for themselves their own protective enclaves or departments. It is difficult to ensure that these conflicts come into the open and are reconciled. Traditionally, each discipline feels it is best able to diagnose problems for itself and justify its own research programme. Agronomists are not familiar with economists arguing the case for using one set of fertilizer levels rather than another. Economists, on the other hand, are generally not used to being told what survey information needs to be collected, analysed and presented by a specific date in order to influence a technology planning decision. Social scientists are often taught to be critical evaluators, standing on the side lines, but are rarely trained to share the responsibility for what technology is generated and disseminated.

Communications and methods of evaluation

Farmer evaluation

There are two types of evaluation. The first is by farmers. It is a very rigorous test, which evaluates a research programme by measuring the diffusion of a new technology amongst the client group for whom it is intended. If this criterion is taken seriously, researchers have systematic methods and procedures for monitoring the extent and the reasons why their technology is spreading or not. The inclusion of local varieties in on-farm trials and the introduction of small monitoring and innovator surveys can, for example, show that local technology and practices may

still be more relevant to the circumstances of small farmers than 'improved' technology. Different types of survey, field trials and field trips may also reveal that farmers' 'informal' R and D is keeping ahead of new extension recommendations and information from the formal research systems.[3,12] It takes a very strong and confident research team not to blame a low spread of their technology on such things as a lack of knowledge by farmers, low prices, inadequate credit facilities, etc. Sometimes these are legitimate reasons, but very often they are excuses for avoiding the implications of the farmer (and extension staff) evaluation – namely, that their technology may be inappropriate.

Scientist evaluation

The second evaluation is the one by other scientists. In normal research programmes this 'evaluation' is often conducted through peer group review by publishing in journals, etc. However, in FSR, peer group review needs to be carried out in the village level situations for which a technology is being generated. For example, field workshops for scientists, centred about a set of field trials, can change the direction of a research programme. In the case of a triticale programme in Northern India, it was discussions amongst national and international scientists in farmers' fields which raised the question whether spring or winter type triticales were a more suitable basis for developing this crop for higher altitudes.[6] Significantly, the field workshop provided the forum for a scientific dialogue which should have taken place throughout the crop improvement programme. Field workshops and field trips for visiting scientists, etc., are ways of encouraging an effective peer group review and discussions between scientists on problems directly confronting the specific client groups of farmers. The participation of farmers in this dialogue also helps to ensure that interesting, but irrelevant, suggestions and research proposals are screened out at an early stage.

Resource flexibility in agricultural research programmes

The fourth point concerns the strengthening of local research capability and the enormous problem of maintaining flexibility in a research programme. The FSR method advocates a dynamic approach to research whereby, as problems change, the structure and content of the research programme changes. This is easier said than done! In scientific programmes, as in any other institutional situation, groups use the

programme to meet their own special interests and establish procedures to protect those interests. The problem of vested interests is certainly not new to agricultural scientists although it seems to come as a surprise to some advocates of FSR methods. Once a programme is launched, it is often difficult to prevent its becoming institutionalized in such a way that it no longer addresses the problem for which it was created. Poorly run experiment stations, poorly conducted field trials and poorly run farm management surveys all indicate to the social or applied natural scientists involved that the programme is not generating useful information. However, these very same researchers do not appear to use even the most elementary principles in their professional training to change or stop the programme. In fact, frequently, such programmes are counter productive, giving the impression that a job is being done, when in fact it is not.

The recurring cost of maintaining programmes which have lost their adaptability to work on the problems of specified client groups is often a major problem in developed and developing countries. For a better understanding of where FSR methods have been effective, we need to know more about the specific agricultural research programmes which have maintained their flexibility, allowing resources to be moved quickly between problems, between disciplines, between on-farm and on-station research, and between different communication methods. Unfortunately, the experiences of externally funded FSR and on-farm research projects may contribute little to this understanding, either because the funds came from external sources, or because the project was an unrepresentative 'special project', or because the work was mainly instigated by outside, rather than local, staff. However, there are examples, such as the adaptive research programme in Tamil Nadu in the early 1960s, where there were major institutional changes in the research and extension system.[29] In some large FSR projects the researchers describe how they had to change their programme completely as they saw that their original diagnosis of technical problems and research approach were wrong.[31] In a recent review of the institutional lessons from government and non-government programmes to generate and diffuse appropriate agricultural technology for poor people, Biggs and Grosvenor-Alsop[8] found one overriding lesson. This was the importance of the programme being able to monitor itself against its declared objective (to work on the problems of poor people) and being able to change rapidly in response to the implications of recently collected field-level information.

Defining specific client groups

The last, and most important, point concerns the commitment by a research programme to work on the problems of a specified client group of farmers. In the case of FSR this is generally small farmers. Without the intended beneficiary group being defined by the research group, researchers do not have the most important criteria for judging the relevance and effectiveness of their research.

CONCLUSIONS

It would appear that the principles of a farming systems approach to research is an important way of proceeding in agricultural research. However, to understand when this approach has been, or might be, used in specific situations in developing countries, requires an analytical framework which encompasses an understanding of the structure and organization of the overall agricultural research and extension system. As discussed elsewhere, political pressures, professional interest groups and sources of internal or external funds are often key determinants in understanding these matters.[5] It is important for social scientists to analyse these issues more carefully, because the multi-disciplinary techniques, manuals, schedules of field investigations, etc., of farming systems research models will be of little use unless local social and natural scientists develop their own institutions, manuals, etc., in the specific political and research resource context in which they are working. In the past, many social science studies have found that 'improved' technologies and extension recommendations have not been adopted by farmers because they were inappropriate to the resource and socio-economic conditions of farmers.

It is ironic to observe now that some of the FSR manuals and methods may not be used in agricultural research systems because social scientists have inadequately analysed and developed viable suggestions for the resource, political and socio-economic environments of researchers in developing countries.

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