

# **Farmer Participation in Research: Implications for Agricultural Development + ERASMUS D MONU \***

## **ABSTRACT**

Recently, there has been a great deal of attention devoted to the notion of farmer participation in agricultural research. In this connection, there has been a challenge to the conventional research model which conceives of the farmer as a passive partner so far as the identification of the problem, the conduct of the research and the development of the solution is concerned.

This paper reviews a number of models suggested for agricultural research, noting the strengths and weaknesses of the models. Based on the author's experiences and other case studies, the implications of farmer participation in the development and dissemination of agricultural technologies are examined.

## **Introduction**

It could be difficult nowadays to find an agricultural researcher who would argue against the involvement of the farmer in the research process. However, it should be remembered that it has only been since the 1970s that an explicit recognition of the role of the farmer in the research process has been made. In fact, despite this recognition, most of the agricultural researchers in Africa, at best, pay only lip service to active farmer involvement in the research process.

Those who have strongly advocated for greater involvement of the farmer in the research process argue that the failure of the 'Green Revolution' to improve the living conditions of the small-scale farmers could be attributed to the incompatibility of the Green Revolution technology with the conditions of the farmers. The argument further points out that had the small-scale farmers been involved in the development of the technology, the scientists would have been made aware of the group specificity of the technology.

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It is not surprising therefore that since the 1970s different models/approaches have been put forward to improve the involvement of the farmer, especially the small-scale farmer in the research process. In this paper an attempt is made to review these approaches and to determine how and when does a particular approach help us to involve the small-scale farmer in the research process. The implications of greater involvement of the small-scale farmer in the research process with respect to technology development and dissemination are examined.

The Consultative Group on International Agricultural Research (CGIAR) has developed the following typology of research:

1. Basic Research – a research designed to generate new understanding.
2. Strategic Research – research aimed at solving specific research problems.
3. Applied Research – research designed to create new technology.
4. Adaptive Research – research designed to adjust technology to the specific needs of a particular set of environmental conditions (ISNAR, 1984).

Although farmer involvement in all the four types of research is desirable, we suggest that farmer involvement in applied and adaptive research is critical.

## **Models in Agricultural Research**

There are different ways in which the suggestions for the involvement of farmers in the research process have been categorised. While some writers have categorised the approaches according to authors (Farrington & Martin, 1988), others have grouped the suggestions under models (Whyte, 1981; Frankenberger, 1992; Acker, 1992; Monu, 1993). In this paper our discussion will be based on the categorisation of models.

### ***The Research, Development and Diffusion Model (RDD)***

This model has been labelled differently as the “*Horizontal Model of Research and Development*” (Whyte, 1981) and the “*Transfer of Technology (TOT) Model*” (Chambers & Jiggins, 1987). The Research, Development and Diffusion model looks at the process of agricultural research and development from the point of view of the originator of an innovation who bases his innovation on a presumed receiver’s needs. The initiative of identifying problem areas is therefore taken by the researcher of the innovation who focuses on the design and development of a potential solution. This is followed by the dissemination of the solution to the receivers. Thus, in this model, the receiver is a passive partner so far as the identification of the problem or the design and development of the solution to the

problem is concerned. In practice, what actually occurs is a chain of activities through which farming ideas and practices are developed and tested in the research plots and then channelled to extension services for dissemination to farmers (Monu, 1982).

The Research, Development and Diffusion model has been credited with the miracles of the 'Green Revolution.' However, it is this very 'success' that generated the criticisms against the RDD model. While the 'Green Revolution' technologies led to dramatic increases in crop yields, most of the beneficiaries were large-scale resource-rich farmers. The small scale resource-poor farmers fell behind further. In addition, these technologies were not sensitive to the environment. It has been argued that the results of the adoption of the 'Green Revolution' technologies reveal the inadequacy of the RDD model especially as it applies to the resource-poor farm families.

Although there have been several criticisms of the RDD model (Roling et al, 1976; Roling, 1985; Sands, 1986; Monu, 1982), perhaps the most thorough and comprehensive review of this model has come from Chambers & Ghildyal (1985) and Chambers & Jiggins (1987).

First, unlike the practice within industry, the RDD model does not differentiate between output-oriented science and client-oriented technology. In industry scientists are trained in market research and user participation in research. In addition, the scientists are encouraged to use methods which would enhance responsiveness to user concerns. On the other hand the RDD model is output-oriented and leads to a situation where scientists develop the technology and then expect the extension service to sell it to the farmers. Thus, in most cases scientists and pressure groups determine what is to be researched. The scientists then design and conduct the experiments under controlled conditions on experimental farms and laboratories and pass on the results to the extension service for transfer to farmers. Since resource-poor farmers are not part of the pressure groups which influence the research agenda, most of what is researched and the recommendations emanating from the research are often inapplicable to their situation.

Agricultural scientists who operate within the RDD model are committed to the model because of the education and training they receive, funding and influence of government and commercial organisations, the research methodology associated with the RDD and the professional and personal rewards and incentives the scientists receive.

The training is modelled on "*learning from above and teaching to below*" and this is reinforced by the curriculum which is concerned with scientific method and detail. The training contains very little about technology development and how to learn from farmers.

*"By the time they leave universities, scientists have been deeply conditioned to believe that they know more than farmers, that their knowledge is superior, and that they should be the people who determine what research should be done and how it should be conducted" (Chambers & Jiggins, 1987: 39-40).*

Other sources of reinforcement for the RDD model are government and commercial funding and influences. Government and commercial organisations are more likely to give support to export cash crops and/or commercial food crops. This emphasis on commercial production directs attention to regions that have the natural resources (irrigation, rainfall, good soil) to support increased yields and focus on resource-rich farmers who could more readily take advantage of the technologies developed.

The research methodology of the RDD model supports the commercial orientation of the resource-rich farmers. The RDD research methodology studies only a few variables which affect the farming system at a time. This type of methodology fits more the simplified cropping patterns of the resource-rich farmers (eg, monocropping). This type of methodology is unlikely to yield a comprehensive knowledge of the resource-poor farming systems (eg, mixed cropping). The scientists' support for the RDD model is also reinforced by the personal and professional rewards received by the scientists. Rewards are based on output and not service. These are calculated in terms of publications in academic journals or how useful the findings are for commercial organisations.

In addition to the above, Chambers & Jiggins (1987) suggest that a comparison of the physical, social and economic conditions which exist on research stations with those of the resource-rich and resource-poor farmers would indicate that the technologies produced by the RDD model are likely to be inappropriate for resource-poor farmers. In most cases the research efforts have been concentrated on the individual (mostly the male head of the family) as the unit of analysis. This ignores the fact that in Africa, women contribute a greater portion of the labour required in agriculture. Indeed, in certain areas women are completely in control of food production.

Furthermore, using the farm family as the unit of analysis (rather than individuals) allows us to examine the distinct roles and multiple goals of individuals within the farm family, in addition to the recognition that farming is only one of several strategies within the farm family economy. It also enables us to analyse how the farm family adjusts to different demands in order to satisfy its multiple goals which may compete with one another at times.

Finally, the RDD model fits well with the principles of bureaucratic organisations which characterise most of the agricultural research institutes/centres in

Africa. Such organisations are normally characterised by close adherence to formal procedures, a centrally-administered control system with a hierarchical structure within which one's authority is a function of his/her position and organisational rank. Organisational procedures are specifically designed to limit varied responses to individual or group demands since such variations are seen as interfering with the rational functioning of the organisation.

### ***Farming Systems Research and Extension Model***

The Farming Systems Research and Extension approach was largely developed in reaction to the RDD model.

*"The concept FSRE explicitly recognises the value of the farmers' experience and their traditional experimentation as inputs into strategies for improving the productivity of existing farming systems" (Gilbert, et al, 1980:14).*

In this approach, there are four successive stages in the research process – description, design, testing and extension. The description or diagnostic stage is undertaken to understand the constraints, flexibility and needs within the farming systems. This information is then fed into designing, testing and extending improved technologies and strategies. Norman & Gilbert (1982) have identified five attributes of the FSRE approach:

1. The objectives of the farm families are incorporated into the research process. This involvement of the farmers ensures the use of evaluation criteria that will be relevant to them.
2. Efforts are made to take into account community and societal needs. For example satisfying the short-run needs of individual farm families could lead, in the long-run, to the degradation of natural resources and increased inequalities in welfare distribution. In addition, by involving farmers, the approach draws on the pool of knowledge in the group and thereby the researcher could start with the strengths of the system, thus minimising the time spent on 'rediscovering the wheel.'
3. The strategy recognises the locational specificity of the technical and human element. This means that for research purposes, the farm population is divided into homogeneous sub-groups. This allows the researcher and indeed the extensionist to deal with a group of farmers with similar farming activities, social customs, access to support systems, comparable marketing opportunities and resource endowment.

4. The process used is dynamic and interactive with links in both directions among farmers, researchers and extensionists.
5. Finally, unlike the Research, Development and Diffusion approach, the FSRE approach is concerned with the entire farming system. Thus, it is able to deal with technical and non-technical or institutional issues.

The FSRE approach is thus more holistic than the RDD model. Through a system analysis three subsystems are delineated. These are the *Research Subsystem* (the information-technology generating subsystem), the *Extension Subsystem* and the *User Subsystem* (farmers). These subsystems are envisaged to be in interaction with each other throughout all the stages – from description or diagnosis stage to the extension stage.

Clearly the FSRE model has a number of advantages over the RDD model. As Collison suggests:

*“The farming systems perspective (FSP) identifies farmers’ most (pressing) problems and best expansion opportunities and the appropriate technology to solve those problems and better exploit those opportunities. By this process it focuses attention on to recommendations most likely to be rapidly absorbed by local farmers, enhancing the cost effectiveness of research and extension efforts” (Acker & Sungusia, 1986:172).*

However, the available evidence indicates that the practitioners of the FSRE model have fallen short of their theoretical model. Although scientists have succeeded in working with farmers in diagnosis and testing, the:

*“...information is extracted from the farmers and their farms and analysed by scientists to diagnose and prescribe for the farmers...The key decisions about what to try and what to do remain with the scientists” (Chambers & Jiggins, 1987: 45).*

Secondly, the FSRE model assumes a multi-disciplinary collaboration. This cooperation between social scientists and agricultural scientists is hard to come by. As Rhoades & Booth (1983:2) have observed:

*“Differences in perception and role definitions between biological and social scientists result in a mutual respect that is miserably low....the upstart of this disciplinary tribalism (is) that social and biological scientists tend to line up on opposite sides of the fence and throw spears.”*

Perhaps this 'tribal warfare' could be partly attributed to the fact that the conventional methods of social investigation have not produced the relevant, useful and timely information required. In the desire of the social scientist to have a comprehensive database, the agricultural scientist could be frustrated with the endless process of socioeconomic data collection.

It is further argued that like the RDD, the FSRE lack "explicit focus on resource-poor farmers" since resource-rich farmers are seen as better informants and better collaborators. These resource-rich farmers who have the resources to experiment with the technology being developed are also seen as the most effective group for diffusion. This means that in most of the on-farm trials that are undertaken most of the collaborators are resource-rich farmers whose conditions are very different from the resource-poor farmers, who form the majority of African farmers.

### ***The Farmer-First and Last Model***

Chambers & Ghildyal (1985) and Chambers & Jiggins (1987) argue that in order to increase farmers' participation in the research process and to make the research more relevant to resource-poor farmers (RPF), a change in the formulation of the FSRE model is required. Their model is referred to as the Farmer-First and Last (FFL) model. The model starts:

*"...not with scientists and their perceptions and priorities, but with RPF families and theirs'. It begins with a systematic process of scientists learning from and understanding RPF families, their resource needs and problems. The main locus of research and learning is the resource-poor farm, rather than the research station and the laboratory. Research problems and priorities are identified by the needs and opportunities of the farm family rather than by the professional preferences of the scientist. The research station and the laboratory have a referral and consultancy role, secondary to, and serving, the RPF family. The criteria of excellence is not the rigour of on-station or in-laboratory research, or yields in research station or resource-rich farmer conditions, but the more rigorous test of whether new practices spread among the resource poor" (Chambers & Ghildyal, 1985).*

According to Chambers & Jiggins (1987), the ecological and social complexity and diversity of resource-poor farmers' farming systems demand two simplifications, namely, large-scale surveys and massive multi-dimensional data analysis and reduction of dependence on multi-disciplinary teams. In order to effect these simplifications the scientist should "...directly encourage and enable RPF families themselves to identify priority research issues" (Chambers & Jiggins, 1987:112).

The eight major elements of the model which together lead to what Chambers and Ghildyal describe as reversals of explanation, learning and location are:

1. Research priorities and conduct are determined mainly by the needs, problems, perceptions and environment of farmers.
2. The crucial learning that takes place is the scientists learning from farmers.
3. The role of the farmer is that of a client and a professional colleague at the same time.
4. The role of the scientist is that of a consultant and a collaborator.
5. The main research and development location is the farmer's fields and conditions.
6. The physical features of research and development are mainly determined by farmers' needs and preferences.
7. The explanation of non-adoption of innovation is sought in farm-level resources, failure of scientists to learn from farmers and research station constraints.
8. The evaluation of the innovation is done through adoption by farmers.

The FFL model has been criticised to be "*extreme farmer-centric*" (Farrington & Martin, 1988: 21). It is argued that scientists and the scientific method have a more important role to play in the technology development process than suggested by the FFL model. However, others would argue that this "*farmer-centric*" view is justified, if only to emphasise the importance of the involvement of resource-poor farmers in the research process.

Despite the fact that the FFL model has provided a number of excellent suggestions to improve farmer participation in the research process, all the recommendations cannot be adopted in a wholesale manner (Baker, 1991). According to Frankenberger (1992), farmer-articulated demands tend to relate to short-term priorities. Thus an exclusive focus on farmer priorities could lead to over-concentration of research on issues related to short-term benefits, to the neglect of those issues that would deal with long-term benefits, hence sustainable option systems.

Secondly, it should be recognised that even among resource-poor farm families there are inter- and intra-differences in household priorities in terms of gender roles, geographical location of villages, etc. These differences must be taken into account in deciding which and how farmers would be involved in the research process. Furthermore, although farmer-conducted and controlled research may provide us with useful results, we can not run away from the fact that in order to convince policy makers and extension workers, 'quantitative' measures are often needed. In other words, some form of 'acceptable scientific method' is required.



Finally, the attempt by the FFL proponents to give greater control of the research process to farmers is likely to be resisted by most national agricultural systems which are used to the RDD model. Thus, an educational programme is needed to convince the researchers in these institutions. In some cases compromises may be needed to gain acceptance of greater farmer involvement in the research process.

## **Implications for Technology Development and Utilisation**

The review of the models for farmer participation in agricultural research presented above indicates that there is a growing recognition of the fact that farmers can contribute to the research process. Below an attempt is made to outline some of the implications the participation of farmers in the research process has for technology development and utilisation.

### ***Reduction in Research Time and Cost***

Farmer involvement in the research process could save scientists time and cost. The development and introduction of improved cotton in Northern Nigeria illustrates this point. The scientists, concerned with low yield of the local variety of cotton, set out to develop an improved cotton variety. The outcome of the research was a very successful one. The improved cotton was highly productive with demonstrated yield increase of 100 percent in the farmers' fields.

The improved cotton was to be planted during the months of June-July. In addition, the improved cotton was recommended for sole cropping. The improved cotton also required spraying and the recommended spraying technology was a water-based method with a hand pump. It was found out that, even at a reduced rate of 135 litres per hectare, 800 kilograms of water per hectare were needed (Norman et al, 1974).

Despite the dramatic increase in yield, farmers rejected the improved cotton. An evaluation (Norman, et al, 1974) indicated a number of reasons for the rejection. First, the improved cotton was to be planted during the months of June-July, exactly during the period when labour requirements for food crops are high. In the traditional system, this constraint is avoided by planting cotton after the food crops have been planted and partially weeded, a clear sign of the family's priority for maximisation of food crop production over cash crops.

Secondly, the improved cotton was recommended for sole cropping while the predominant farming system in the area is mixed cropping. In addition, the adoption of the improved cotton costs a significant amount of money. The farmer must not only use fertiliser but must also spray the cotton. The small-scale farmer is not likely to have the resources to finance such a project from his/her meagre

earnings, especially when the financial demand occurs at a time when the farmer's cash resources are lowest, that is during the rainy season before any crops are harvested. Above all, the average net return from cotton using recommended practices was only 13 percent better than cotton grown in crop mixtures.

The farmers' rejection of the technology forced the scientists to re-examine it and to introduce changes. First, a later planting date was accepted to avoid competition with food crops. The scientists were able to develop a new package with equivalent yield performance. A new spraying technique using an oil-based insecticide and an ultra-low volume sprayer operated with a battery-powered spinning disk was also introduced. Despite these changes most of the farmers rejected the improved cotton because the cost was more than they could afford and the sole spray cotton did not fit their farming system. The cost and time devoted to the development of the sole spray cotton would have been significantly reduced if the farmers had been involved in the research process from the beginning, which would have enabled the scientists to gain an understanding of the traditional farming system. It is also argued that where research budgets are severely limited a transfer of more responsibility for technology design, testing and adaptation would be of great assistance to researchers (Ashby, 1991).

### ***Selection of Relevant Problems***

One of the reasons for advocating farmer involvement in the research process is that farmers are more aware of their problems than outsiders and hence are in a better position to identify the issues to be researched. Although this could be a debatable point, the fact remains that the involvement of farmers would increase the relevance of research outcomes in the field. A supporting evidence comes from the International Potato Centre in Peru (Gamser, 1988). The Centre scientists, on the assumption that some potatoes commonly were stored over a long period before marketing, and since it was known that post-harvest losses occurred, considered that a declining quality of potatoes through storage would be a problem. The Centre scientists therefore devoted much effort to developing potato strains that would endure long periods of storage, but without consulting farmers.

However, when they did bother to consult with the local farmers, they were surprised to find that what to researchers had seemed a critical issue was of little importance to the farmers. The farmers said that their big problem was sprouting during storage and the new strains developed by the scientists were just as bad as the traditional ones in this respect. Sprouting necessitated tedious, time-consuming pruning work before potatoes could be sold or used for re-seeding, and the farmers wondered whether anything could be done about this problem.

### **Farmer Experimental Skills**

Farmer involvement in the research process is likely to improve farmers' own capacity for carrying out experiments. Although it has taken researchers a long time to accept the fact that farmers do carry out their own experiments, there is now a great deal of evidence to support the existence of farmer-designed and conducted experiments. An example from the agro-forestry project in the Eastern Region of Ghana is illustrative of this point (Monu, 1994).

The technicians of the project advised the farmers to establish their hedgerows four metres apart. However, one farmer after establishing four hedgerows realised that the distance between the hedgerows was too short considering the type of crop grown in the area. Cassava, the main crop grown in the area, could have tubers beyond two metres in length. The farmer felt that the short distance between the hedgerows would lead to a situation where the cassava tubers could be entangled with the roots of the hedgerow trees. He therefore decided to experiment with three different distances between the hedgerows, the 4 metres suggested, 6 metres and 8 metres. After harvesting the crops he concluded that the 6 metres was the appropriate distance. While the 4 metres did not provide enough space for the cassava tubers, the 8 metres was too wide and this resulted in inefficient use of the land.

The evidence from the Farmer Innovation and Technology Testing Programme in Gambia has shown that farmers with primary school education can master the principles of experimentation (Ashby, 1991).

### **Use of Indigenous Knowledge**

The integration of farmers' perspectives and knowledge into the research process could enhance the relevance and acceptability of the technology developed. We are aware that farmers' knowledge, especially technical knowledge, has certain limitations but the evidence available clearly indicates that in many cases scientists could have improved their research results and make the technologies recommended more acceptable if farmers' knowledge is seriously incorporated into the research process.

According to Irvine (1987), farmers among the Runa of San Jose obtain their food through gardening, hunting and fishing. These gardens are cultivated under the slash and burn techniques. However, rather than just abandoning the field during the fallow period, the Runa engage in what Irvine refers to as "*resource enhancement*." This enhancement includes weeding naturally occurring new species, protecting and occasionally transplanting desirable fruit trees and other species such as coffee and cacao. The fallows tend to serve as game attractants to enhance hunting success since the fruit trees in the fallow serve as food sources for animals. Thus, in comparison with unmanaged fallow, the managed fallow has

greater diversity of species and greater economic subsistence value. Despite this knowledge the agricultural research in the area is based on a monocropping system. Little attention is paid to the resource-enhancement strategies of the farmers in the area.

On the other hand, the integration of farmers' perspectives and knowledge assisted ICRISAT to more clearly define research priorities (Matlon, et al, 1994). In Burkina Faso scientists designed experiments to maximise productivity of a cowpea-sorghum inter-cropped system through increased planting densities of cowpea. Through participation in the research, the farmers concluded that the increase in productivity and the possible higher financial returns would not compensate for the changes that the technology would bring in the farming system. It was realised that greater cowpea densities increased the risk of animal damage to crops, labour requirements for weeding increased substantially, animal traction for weeding and ridging could not be used and the reduction in yields of sorghum (the staple food crop) was unacceptable. As a result of the above, ICRISAT abandoned the cowpea-sorghum research and concentrated on research to intensify production in sorghum-groundnut systems, an area of more interest to farmers.

## Conclusion

The need to involve farmers in the research process should no longer be contested. The issues at hand should be when and how should farmers be involved. The paper has reviewed a number of ways suggested for farmer involvement in the research process. An attempt has also been made to delineate the possible ways in which farmer involvement in the research process could enhance the relevance and acceptability of technologies in the farmers' fields.

The effectiveness of the models reviewed earlier could be evaluated against the participation categories developed by Farrington & Martin (1988). Farrington & Martin (1988) identified four types of farmer involvement in the research process. The first is "*contacts*." In this case the farmers' land and services are used to provide more agro-ecologically diverse conditions for verification of technologies developed at research stations. The second type of participation is "*consultative*." This is like the doctor-patient relationship: the researchers consult the intended users but they are the ones who make the bulk of decisions regarding content and methodology. "*Collaborative*" participation is the third category. This involves a continuous interaction between farmers and researchers, including how to go about cost-effective village level research. In the last category, "*collegiate*," the scientist not only actively consults farmers on specific technologies/ideas or methods of experimentation, but also actively works to strengthen the local capacity to conduct informal research and development at the individual and community levels.

We suggest that if we are to develop technologies that would be relevant and adaptable to small-scale farmers, farmer involvement in the research process must move closer to the "collegiate" category described above. A meaningful involvement of farmers in the research process must include their involvement in the definition of the problem, in the conduct and evaluation of the research and in the dissemination of research results.

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