IDRC-189e

Coming Full Circle

Farmers' participation in the development of technology

Coming full circle: farmers' participation in the development of technology

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IDRC-189e

Coming full circle: farmers' participation in the development of technology. Ottawa, Ont., IDRC, 1984. 176 p. : ill.

/Cultivation systems/, /on-farm research/, /agricultural engineering/, /farmers/, /communication/, /research workers/, /West Africa/ — /evaluation/, /access to information/, /communication barriers/, /rice/, /conference report/, bibliography.

UDC: 63.001.5(66) ISBN: 0-88936-324-2

Microfiche edition available

Il existe également une édition française de cette publication.

Abstract

Involving farmers in identifying the constraints to rural agriculture and in designing measures to alleviate them is the subject of this publication, which resulted from a meeting, held in Ouagadougou, Upper Volta, 20–25 September 1983. Agronomists, economists, anthropologists, and others seeking to get the most from research efforts discussed the pitfalls of assembling packages that are sound technically but have some essential flaw because the developers have overlooked some crucial constraint at the farm level. The subject is one that is receiving much attention currently as agriculture in developing countries has failed to net major increases in production despite thousands of dollars invested in research and optimistic claims that improved varieties, techniques, equipment, etc. have been developed. The gaps between results on research stations and those on farms in the Third World have prompted some researchers to view the farmers' conditions as the real laboratories. Why, how, where, and when to get farmers involved in research are the focus of this document, and the degree to which researchers and the agencies they represent have been able to listen and work with their new partners varies, as is clear from the 11 papers and the commentary that follows them.

Résumé

La participation des paysans à l'identification des problèmes agronomiques et à la recherche de leurs solutions est le sujet de cette brochure qui rapporte les états d'un séminaire tenu à Ouagadougou (Haute-Volta) du 20 au 25 septembre 1983. Afin de mieux exploiter les résultats des recherches, des agronomes, des économistes, des anthropologues et d'autres personnes intéressées ont discuté du danger de préparer des blocs agronomiques, solides sur le plan technique, mais possédant des vices fondamentaux, les développeurs n'ayant pas pris en compte certains obstacles critiques au niveau des fermes. Ce thème est largement débattu aujourd'hui alors que la production agricole stagne dans les pays moins avancés malgré l'injection de milliers de dollars dans la recherche et les espoirs mis dans la création de variétés, techniques et équipement améliorés. La différence entre les résultats obtenus dans les stations de recherche et ceux recueillis sur les fermes ont conduit des chercheurs à reconnaître que la ferme même constituait le vrai laboratoire. Le thème principal de cet ouvrage qui se dégage des onze communications présentées et des commentaires qui suivent, est donc de déterminer quand, où, comment et pourquoi les fermiers doivent participer à la recherche et aussi, jusqu'à quel point les chercheurs (et les organismes qu'ils représentent) ont su être à l'écoute des paysans et travailler avec eux.

Resumen

La participación de los agricultores en la identificación de las limitaciones a la agricultura rural y en el diseño de medidas para superarlas es el tema de esta publicación que resultó de una reunión celebrada en Ouagadougou, Alto Volta, del 20 al 25 de septiembre de 1983. Agrónomos, economistas, antropólogos y otros interesados en obtener lo mejor de los esfuerzos investigativos, discutieron los problemas de producir paquetes técnicamente válidos que no obstante presentan fallas básicas porque sus diseñadores han perdido de vista alguna limitación crucial a nivel de la finca. El tema recibe actualmente mucha atención debido a que la agricultura de los países en desarrollo no ha podido aumentar la producción pese a los miles de dólares invertidos en la investigación y a las optimistas voces que proclaman haber desarrollado variedades, técnicas, equipo y otros elementos mejorados. La brecha entre los resultados de las estaciones de investigación y aquellos de las fincas del Tercer Mundo han hecho que algunos investigadores consideren las condiciones de los agricultores como los verdaderos laboratorios. Por qué, cómo, dónde y cuándo involucrar a los agricultores en la investigación es el tema central de este documento, y el grado en que los investigadores (y los organismos que representan) han podido escuchar y trabajar con sus nuevos socios varía como lo demuestran los 11 trabajos del libro y el comentario final que los sigue.

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Farmers' participation in the development of technology

COMING FULL CIRCLE

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Experiences from northern Nigeria

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Nigerian agricultural administrators are increasingly concerned that peasant agriculture in the country has developed little over the years and that it is presently incapable of solving the nation's food problems. Although research centres in the country have demonstrated that it is possible to grow high yields by using improved varieties, fertilizers, protection chemicals, and high plant populations (Fisher et al. 1982), most farmers have been unwilling or unable to adopt resulting technologies. Factors responsible for yield gaps between the research station and farmers are technical, economic, and social. The technical factors include differences in soil quality and management ability as well as conflicts of the new practices with other technical elements in the farmers' production systems. The common economic and social factors include higher costs associated with the new inputs, differences in production objectives, lack of complementary resources, inadequate infrastructural and institutional support, taste preferences, and conflicts with social obligations.

These factors do not obtain in every situation, and some are more important than others. The extent to which they limit farmers' adoption of a new technology, and hence the evaluation of it, will vary from one technology to another.

Farming-systems research has promise as a means of achieving technological improvements in peasant farms and thus bridging the gap between on-station and on-farm conditions.

Theoretically, farming-systems research is concerned with the land, the structure of farms and fields, the climate, soil fertility, the labour resource and how it is used, the capital available for farm improvement, and the relationships with input delivery, extension, and marketing services. In practice, however, this is far too vague, and farming-systems researchers increasingly are focusing on the constraints and testing technologies that might alleviate them. The steps suggested by Fisher and Lagoke (1982) are relevant for the Nigerian context:

- Identify the constraints operating to limit output of a particular farming system, usually represented by a target area of a size not greater than a local government area.
- Evaluate, on the basis of existing information, technologies that might overcome the most important constraints, not so much from the viewpoint of their biological or technical efficiency but from the

viewpoint of whether or not they are appropriate for use by the farmers in the target area.

- Test, usually on farmers' fields, the technologies that appear to be appropriate and then either reject them and try something else; modify them and try again; or accept them and propose the necessary institutional action to facilitate their adoption (extension, input, delivery, marketing).
- Monitor adoption, continue to modify the technology as necessary; be prepared to try something else if the technology is not widely adopted; or if the technology is being adopted, identify and propose solutions for the next most important constraint.

The approach differs from conventional crop-improvement strategies in that it begins with and ends with the value system of the farmer. In this way it provides an opportunity for farmers to articulate their felt needs, thus making research and technology development more appropriate.

Evolution of farming-systems research in northern Nigeria

Although farming-systems research has only recently gained widespread interest, it has had a long history in northern Nigeria. As early as 1958, researchers at the Institute for Agricultural Research (IAR) at Samaru had shown concern for farmers' rejection of many of the recommendations that were emanating from the institute's work (Gisborne and King 1958). The researchers argued that the advice being given by the research division at that time on how to produce the highest possible yields per hectare of a particular crop could not and must not be interpreted as defining how best that particular crop may be fitted into the existing pattern of peasant agriculture.

In 1965, a Rural Economy Research Unit (RERU) was set up at the institute to perform the task of finding out what peasant farmers in the area were doing, why they did things the way they did, what they ought to be doing, and the best way to get them to follow appropriate practices. Norman's (1972) pioneer work in this area provided a definitive diagnostic survey of peasant agriculture in the area. It was later followed by a series of feasibility studies that were designed to determine the technical, economic, and social feasibility of improved technological packages under farmers' conditions. The studies were essentially ex-post, on-farm trials of technologies designed by scientists without reference to farm conditions. The results of the tests were passed to the scientists for further refinement of the technologies. Thus, farmer participation was restricted to the evaluation of the technology.

Lately, an attempt is being made in the institute to get farmers involved much earlier in technology development. To this end, two types of research projects involve farmer participation: those being carried out within the commodity-based programs and those carried out under the farming-systems research program.

This setup has two advantages: it ensures that the program leaders of the commodity-based programs have direct control over research on crops of interest to their programs, and it establishes a direct link between the crop-based programs and the farming-systems research program.

The farming-systems research program focuses on immediate solutions for specific local problems and conditions on the basis of an understanding of the farming systems and their constraints. The on-farm studies in the crop-based program emphasize development of prototype crop technologies. These are aimed at major increases in the potential productivity of farming systems within the institute's sphere of influence.

Technology evaluation

There is evidence of selective adoption of new technologies by farmers in northern Nigeria: they have readily adopted improved maize but not improved millet or sorghum. Likewise, farmers in the area have readily accepted the use of fertilizers on sorghum and millet but rejected other elements of the package such as "improved varieties," the practice of sole cropping, and closer spacings.

At IAR, we don't yet know why farmers choose some components and not others, but the selectivity indicates that they apply a set of criteria including:

- Yield performance;
- The quality of output and their preference for it;
- The ease with which they are able to carry out recommended cultural practices;
- The adequacy of recommended amounts of improved inputs;
- The technology's demands (amount and timing) on the resources available to the farmers; and
- The financial and economic returns from new technology compared with other activities competing for farmers' resources.

IAR has developed methods of evaluating new technology under farmers' conditions, which utilize these criteria as applied by farmers.

In the early 1960s, several on-farm fertilizer trials were carried out at IAR (Fisher 1982). The only distinguishing element of these trials was that they were located on farmers' fields or on farm centres controlled by the Ministry of Agriculture. The experiments were located on farms where Ministry staff could regularly visit and control them.

A more recent series of similar trials was carried out between 1973 and 1976 (Fisher 1982) to compare fertilizers used alone and in combination at the recommended rates for maize. There were five treatments replicated five times, with the experimental site being moved to a new location within the same area each year.

Several experiments involving comparisons between improved packages and traditionally grown crops have also been carried out. In 1965 and 1966, about 800 groundnut demonstration plots were grown alongside traditionally grown groundnuts for comparison purposes (Harkness 1970). The experiments were sometimes simultaneously carried out at the institute, incorporating a range of evaluation criteria not possible in the design of the on-farm trials. For example, traditionally grown crop mixtures have been compared with crop mixtures involving improved varieties, seed dressing, different plant spacings, and fertilizer applications. Traditional versus improved packages of cotton, sorghum, maize, and cowpeas have also been

compared to determine the technical, social, and economic feasibility of the improved packages. In a number of cases, attempts were also made to determine the factors responsible for any observed differences and to seek farmers' opinions.

Attention is increasingly being focused on diagnostic surveys aimed at identifying constraints existing in major farming systems in northern Nigeria, understanding these systems, and using the information to shape the design of new technologies appropriate for the system. These new technologies are then taken back to the farmers for evaluation, and the process is repeated until widespread adoption of the technology.

Work has been completed on a diagnostic survey of the millet-dominated cropping systems of the drier northern portions of the country. A World Bank-assisted development project located in the area is already using the results of this diagnostic survey as a basis for its own adaptive research to ensure widespread adoption of its improved packages. This cooperation is quite informal and unique; for political and bureaucratic reasons, coordinated efforts between such projects and national centres are rare.

Statistical designs and plot sizes

No evaluation method can be universally suitable. Rather, goals, targets, and expectations associated with a new technology should shape the design.

If the objectives of the evaluation are purely technical, simple on-farm experiments may suffice. However, researcher-managed trials, especially for inputs, such as herbicides, where dosage is critical or special equipment essential, produce little or no useful information on the appropriateness of the technology (Fisher 1982).

If the objective of evaluation is essentially socioeconomic, then tests that compare traditional and improved techniques are probably more appropriate, especially when they are managed by the farmers. The control is the traditional way of growing the crop or producing the animal, but other comparisons are possible. For example, farmers given inputs and advice on a technology, with the freedom to modify recommended practices, could be compared (on the basis not only of management and production but also of adoption) with farmers who have been compelled to follow the recommended practices.

Ideally, plots are large to reflect farmers' conditions as closely as possible, but such plots are costly to manage. The rule of thumb at IAR is that plots should be large enough to make the treatments realistic for farm conditions and to provide adequate data for statistical analyses. IAR studies sometimes sacrifice replications so that the size of the plots can be increased, although the replications over time are essential to test the stability of a proposed package. For example, in evaluation studies at Zaria, improved cowpea packages worked well on farmers' plots the first year but failed in subsequent years (Hays et al. 1977).

In most of the studies carried out in Zaria, "a package of recommendations" has been at the centre of the statistical design. This is also true of many evaluation studies carried out elsewhere, but farmers often choose to adopt only certain elements of a package. In the four original agricultural-

Consumers in Nigeria prefer large, white cowpeas so farmers may not be interested in producing the hardy, small, brown ones.

development project areas in Nigeria, for example, fertilizer use has been widely adopted but not recommended spacings (Daplyn and Poate 1981). The problem is that, in package technologies, the researchers usually fail to communicate to farmers the benefits of the various components of the package. The impression is often given by package-oriented designs that unless the farmers adopt all elements, they cannot improve output. In fact, scientists often design packages even when they have no evidence that the components interact positively and even when they believe that a single factor is overwhelmingly important (Fisher 1982).

As new techniques are often adopted piecemeal, I believe that researchers should stop packaging technologies unless they can provide analyses of the costs and benefits of each of the components. Researchers in East Africa have taken a step in the right direction with their so-called maize diamonds, utilizing minifactorial demonstrations with 2^n treatments where n is usually 2 but is sometimes more (Fisher 1982). The scope of this design could be enlarged to include two factors, say, an improved variety and improved husbandry (fertilizer, closer spacing, more timely planting, more timely weeding) and four plots, one each for unimproved variety; improved husbandry; improved variety; and improved husbandry and variety. Further evaluation might include socioeconomic factors; for example, the farmers

could be provided with credit to purchase the technology; with input delivery; with extension; with credit and extension; with credit and input delivery; with input-delivery and extension; with credit, extension, and input-delivery.

Securing farmer cooperation

No evaluation can be successful without the active cooperation of farmers, and there are some simple steps that can be taken to avoid the pitfalls of providing a technology that is not viewed by the farmers as promising in some way. Most farmers quite willingly participate in an evaluation exercise when they believe that their efforts will be offset by the potential benefits. However, if they lack conviction that the technique has potential, they are likely to view evaluation more as an opportunity to obtain inputs free than as a partnership.

Because the technologies that are the subject of farmer evaluation are new and often shrouded in some amount of uncertainty, one way to encourage farmers to participate is to provide guarantees and subsidies. However, what effects these incentives have on the results of the evaluation exercise is not certain. If farmers are given all the needed inputs and advice free and are coerced into following the recommended practices, they may achieve performances closer to those obtained at the research centre. But their performance probably couldn't be repeated on a wide scale. Also, the evaluations obtained under such circumstances would likely be distorted. If subsidies are too high and if farmers are not coerced into following the recommended practices, they may waste the inputs or use them for other purposes.

If the final output from the new technology is not likely to be readily sold or consumed, the farmer is unlikely to participate. Recently, for example, a sorghum variety developed at IAR was used in farmers' tests, even though the demand was nil because people did not like its taste.

There must also be an assured supply of inputs. If the needed inputs are available but difficult to obtain, farmer participation will probably only be secured if the efforts expended in procuring the inputs are more than offset by the perceived benefits of the technology.

Finally, the researchers themselves must have confidence in the technology. They should be able to "stick their necks out" to a reasonable extent in establishing its strengths and weaknesses. Also, they must be willing to explain what they are expecting from the technology, and they must have built up enough rapport with the farmers to obtain honest input and opinions. Farmers are often left in the dark about the objectives of evaluation and quite naturally view the studies as outsiders' projects.

Involving farmers in the evaluation of any new technology must be carefully planned, meticulously executed, and constantly monitored if farm testing is to be more than just an extension exercise.