Improving Extension-Research Linkages through On-Farm Adaptive Research (OFAR) Philosophy in Southern African Countries

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Abstract
A huge body of technology information is available at almost all the research stations and universities in Africa. However, the adoption of these technologies has been very slow and selective. In most cases, farmers select only one or two elements from a multi-component package thereby losing the advantages of technical complementarity. This paper proposes that the Research-Extension-Farmer links can be strengthened through the On-Farm Adaptive Research Philosophy (OFAR) comprising of the diagnostic phase, field test phase, and the demonstration phase. The institutional framework for operating the OFAR philosophy, especially in the Southern Africa Developing Countries (SADC) is discussed.

Introduction
The SADC countries as in many developing countries can boast of many research institutes in their various countries. These agricultural institutions together with their universities have developed a huge body of agricultural technology, information and know-how which, when put into practice on the farms of the institutions, will lead to significant increases in agricultural productivity. Creditable as this information may be, only a very insignificant fraction of the millions of peasant farmer population adopt the available technologies. Where they do, the adoption has been slow and selective; the farmer selecting only one or two elements from a multi-component package loses the advantage of technical complementaries. There is also empirical evidence of wide performance gaps between results in station research farms and farmers’ fields under farmer management. It is not known for sure by how much such performance gaps could be reduced if the farmer’s fields were managed (Oputa, 1984).

In any case what is of particular concern is the low rate of adoption of recommendations by peasant farmers. This has spurred the introduction of Farming System Research (FSR) which aims at tackling all the factors involved in farming systems and their inter-relationships. The complexities of such systems are mind-boggling and although the concept has received sophisticated scholarly treatments, it is in practice very vague and unlikely to succeed. Perhaps a more pragmatic approach is one that focuses attention directly on the constraints (and opportunities) of a given ecological niche or a given farming system, and designs appropriate technologies to solve the problems. This approach is described here as On-Farm Adaptive Research (OFAR).

The Basic Importance of Research/Farmers Link
It is a well-known fact that increased agricultural productivity depends largely on the dynamics of technical and organizational changes in farming. (Oputa, 1984). The decisive factors are the generation of innovative knowledge through research, dissemination through extension agencies, and the behaviour of the potential adopters, i.e. the farmers. An adequate reference system for these factors is the agricultural knowledge system, consisting of the sub systems of knowledge generation, knowledge dissemination and knowledge use. The main knowledge-generating agency is the agricultural research organization; the main dissemination agency is the extension service, and the users are the farmers. The total system will work more effectively if communications should not flow only from research through extension to the farmers, but also vice versa. This concept has to be kept in mind in the organizational links between research and extension.

On the whole, the relationship between research and extension has gained increasing attention. Experience in most countries has shown that very often a considerable time-lag exists between the availability of new research findings at the research institutions and their application by the farming community. An extension service, on the other hand, can work...
effectively with farmers only if it can offer them innovative and practicable information. On both sides, research and extension, more efforts have been made recently for them to supplement each other more efficiently and to coordinate their work. (Horton, 1984).

An Overview of Linkage Arrangements in Other Countries

The links between the two subsystems must differ according to the organizational relations between the services. In most countries with a Department of Agriculture, (DA) research and extension are neighbouring divisions. The same is true where no DA exists but where the Ministry of Agriculture has research and extension under its direct control. In countries where intervention of societies prevail and also in the office of Rural Development of Korea, these agencies are both responsible for research in their respective fields and for extension.

Communication flow and mutual stimulation come about through various institutional arrangements. In almost all countries, research trials and demonstrations on farmers’ fields or on experimental plots are arranged by researchers and extension officers. These provide a simple opportunity for exchange of information between the two. Moreover, they facilitate feedback from farmers, which is equally important for research and extension.

In many countries, the written word is used for communication in the form of agricultural journals, circulars, or pamphlets in which research findings are published. Such publications are often produced by Extension Aid Branches or Technical Information Offices, which are either part of the Extension Service or are separately institutionalised in the Ministry of Agriculture or DA. They transform the research findings into messages which can be understood and used by the extension staff or even by farmers. Seminars and training courses are other frequently employed means of communication wherein research and extension officers can meet. Training courses are held by the research institutions mainly for extension subject-matter specialists. Sometimes research officers are present at farmers’ training courses in order to acquire direct contact with the base. In several countries (e.g. India and the Republic of Korea) research and extension agencies evaluate jointly past extension campaigns and assess the suitability of new research results for use in practical farming. (Malton, 1977).

In a number of countries, liaison units have improved relations between research and extension. This is reported especially in Sudan, where a Contact unit was established in the Agricultural Research Corporation mainly to improve contacts between research officers and farmers. The Extension Administration has a contact officer in each regional research station. In the Kenyan Ministry of agriculture an officer as been installed with the task of improving contacts and coordination between research and extension institutions. In Zambia it is planned to appoint a research-extension liaison in each province. At the end of this description of research extension linkages two new models from Southern Asia are worth mentioning. In Sri Lanka, in connection with a new Extension and Adaptive Research Project, the Training and visit system has been introduced and agricultural research at the Department of Agriculture has been reorganized and expanded since 1980. In each of the eight agro-ecological regions a Regional Research Centre and a Regional Training Centre exist or will be established. Moreover, each region will have a Regional Technical Working Group (RTWG). Research, extension and training officers cooperate in the RTWG in order to coordinate the three activities more effectively. In each of the two cultivation seasons of the year, they hold two meetings to prepare training, extension and research work for the season which is about to begin and to evaluate the completed action programmes. The RTWG also decides on the research programme to be adopted in the region and organizes trials in farmers’ fields. In India the organization of the agricultural knowledge system differs from that found in other African and Asian countries in so far as the agricultural universities are in charge of most of agricultural research nationwide and they have also some extension activities of their own. As the majority of extension work is carried out by the State Departments of Agriculture, specific institutional links are needed to safeguard coordination and cooperation. In a few states (Punjab, Haryana) the agricultural universities have their own state-wide network of extension outposts which can contribute effectively to communication between research and extension functions.
An important instrument for linkage is the Agricultural Officers Workshop (AOW). It is organized by the University and the Department of Agriculture and is held once or twice a year for a few days. Research and extension officers together review extension activities and new research results. Lectures and visits to research stations and experimental farms are included. In some states the workshop produces a small handbook entitled “Package of practices”, which contains research findings and recommendations suitable for introduction into farming practice by the extension staff.

Weakness in the system

Although the importance of an efficient agricultural knowledge system which functions efficiently has been recognized everywhere and although a number of institutional solutions for improving relations between research and extension are available, in a number of countries cooperation does not seem to work satisfactory.

It was reported, for instance, from Democratic Yemen, Morocco and the Sudan that linkage, although theoretically available, is not really operational. For Bangladesh it was mentioned that there is no effective linkage at all. In the reports from Malawi and again from Bangladesh and Oman there was a criticism that research is not sufficiently oriented toward the farmer’s problems and needs. The situation may be better in other countries for which no appraisal was given. However, the problem deserves general attention. (Edje, 1990)

Reasons for Slow Adoption of Improved Technologies by Some Farmers

The adoption studies according to Abalu (1984) clearly demonstrated that small-farmers selectively adopt improved technologies and adapt them to their specific environmental and economic conditions. With this foundation, adoption studies now need to proceed a step further to probe below the statistical patterns of behaviour to determine the criteria farmers use when deciding to adopt, adapt, or reject technologies or specific components of recommended technological packages. This type of research which seeks to determine the reasons behind adoption behaviour can be an important aspect of adaptive research. It generates the information necessary to help scientists define relevant research priorities and programs, to target and fine-tune technologies to local conditions, and to develop effective processes of promotion and dissemination of improved technologies. In the vast majority of cases, there are rational, small-farmers improved technologies or components of technology packages. In some cases the introduced technology, may be biologically superior to local technologies, but simply may not be economically superior to local technologies. This is because it may not be economically viable under the management conditions of the small-farmers reflecting the significant variation in the environmental conditions or the resource and factor endowments of individual farms.

Analysis of economic returns to the technology package recommended in the Puebla project also showed that the lower levels of fertilizer application most widely adopted by farmers were more profitable that the recommended levels which were designed to maximize yields, not necessarily returns. The analysis also demonstrated that farmers’ rejection of recommended planting density gave no significant increase in economic returns and in poor years resulted in lower yields due to greater drought stress (Winkelman, 1976).

In other situations, the differential rate of adoption of recommended technology by small-farmers is most easily explained by variations in the environmental conditions under which they are working. Small-farmers often work in marginal environments marked by highly diverse micro-level agro-ecological zones.

Diverse economic conditions among small-farm households in terms of resource endowments and availability of the factors of production is also a factor of critical importance in determining differential rates of adoption of new technologies and recommended practices (Greenwood, 1976; Kluck, 1975; Matlon, 1977; Merrill- Sands, 1983). It is also probably the factor most frequently overlooked in the analysis of differential patterns of adoption of introduced technologies by small-farmers of a given region. However, adoption of other recommended practices which evolved as communication between scientists and farmers developed, was quite high. Two low cost and effective seed management practices were adopted by more than 50 percent of the farmers. These were diffused light storage techniques which were developed in response to farmers’ expressed need for reduced storage losses (Rhoades and
Booth, 1982), and improved methods for selecting healthy seeds. Over half of the farmers also adopted insect control measures which had the highest returns for cash invested (Horton, 1984).

Strengthening Research-Extension Farmers Links through the OFAR Philosophy

The OFAR concept rests on three pillars, namely, full participation by farmers, direct contact between researchers and farmers, and concerted multi-disciplinary investigation of farmers’ situations. By this we mean that the farmers are given the opportunity to articulate their felt needs. Only when technologies are fashioned around the farmers’ needs can they become relevant, appropriate and adoptable. The researchers communicating directly with the farmers, on their farms are likely to have a more holistic perception of the farmers’ circumstances than when they communicate through the intermediary of an extension worker. The adoption of a new technology depends not only on the technical efficiency of an agronomic practice but also on socio-economic factors which call for concerted action of scientists in different fields.

The OFAR Process

The OFAR process consists of four major phases: 1) diagnostic survey phase, 2) research phase (which is by-passed where potential solution exists), 3) field test phase (proceeds simultaneously with evaluation), and 4) demonstration phase.

Diagnostic Survey Phase

Research scientists usually include an agronomist, soil scientist, economist, rural sociologist (and other disciplines depending on the nature of the farming system) together with the farmer identify the constraints which limit output.

At the end of the survey, the constraints are ranked and those considered to be of high priority are chosen. Existing technologies are critically evaluated with a view to selecting those which have potential to solve the problems. These potential solutions are put to test in the field.

Field Test Phase

Simple designs and layout which would not confuse the farmer are used. The essence is for the farmer to easily evaluate the new technology in terms of whether it can, among other things, enhance not only physical productivity but also economic profitability. If the new technology is acceptable, the next logical action is to sell it to a larger farmer audience through field demonstration. If it is unacceptable, it is either rejected outright or modified and tried again.

Demonstration Phase

The OFAR field test phase is in itself extension strategy but the demonstration of an accepted technology in the OFAR scheme represents the very hallmark of extension. This demonstration is affected through the Extension Service network agreement. During the demonstration, the adoption rate is monitored. The monitoring would give the signal whether all is well or whether there is still some need for further refinement of the technology. If there is a need to refine the technology, it should be immediately referred to the Research Institute where solutions to the problem(s) identified could be provided; hence, the cyclic phase of the OFAR.

An Approach to Extension to Extension, Research and End-Users’ Linkages

In this OFAR model, the farmer who is considered as the end-user of research technologies in most cases, should at a point in time meet with the social scientists and the biological scientists as partners in progress. During this meeting, the above three actors should engage in serious dialogue which after some constructive criticism, should lead to a common field of experience and common definitions for the three actors. The common field of experience and common definitions should lead to problem identifications which will meet the objectives of the end-users, taking into consideration during the process of constructive criticisms, their social, economic and cultural capacities and capabilities. These are then referred to the appropriate research stations for potential solutions. After this, farm testing should be done followed by farm evaluation to determine the acceptance of the solutions to the problems. If the solutions are in line with the knowledge, attitude, skills and aspirations of the end-users, then the solution could be demonstrated on a wider perspective. If however the solutions have some inherent
problems as perceived by the end-users, the solutions should be rejected and thrown back into the cyclic nature of the model for refinement.

Institutional Framework for Operating the OFAR Philosophy

Presently in most of the SADC countries, the Research-Extension-Farmer linkages have been characterised by top-down approaches. In top-down approaches, ideas, methods and technologies have been typically conceived and developed centrally in research institutes and then transferred through the extension system to the farmers. This has resulted in lack of farmers’ enthusiasm in adopting the technologies developed because the end-users (farmers) were never consulted in the process before the development of the technologies.

The solution to the problem lies in using the latest system of bottom-up approaches. This includes the involvement of rural farmers in the process of technology generation and development. This process ensures that rural farmers’ community resources, attitudes and skills (etc) are taken into consideration in the research process. This in turn will evoke a more positive response and greater commitment on the part of the farmers. In addition, this approach creates an attitude of “client demand” in which the target audience (farmers) would be highly motivated to adopt the technologies arising from the bottom up approach; as they were the ones who needed the technology.

Strategies for Applying the Bottom-up Approach in Research-Extension-Farmer Links

The application of the bottom-up approach should involve four actors, namely the Researchers, the Extension Staff, the Chiefdom farmers group (i.e a group of farmers within the jurisdiction and control of a chief), and the individual farmers.

The farmers within a chiefdom should be organized to form a group based on the crop they plant. This activity should be performed by the Extension Staff allocated to that chiefdom with the assistance of the local chiefs and local leaders. The extension method to be used should involve “group discussion”. During the group discussion a wide range of problems affecting the farmers within the chiefdom would be identified and prioritised. The extension staff should play the role of a facilitators. After the problems affecting the farmers might have been collated and prioritised, a meeting involving the researchers, the extension workers and the chiefdom farmers’ group should be called by the extension workers. In this meeting, the collated and prioritised list of farmers’ problems would be discussed in detail. The researchers and the extension workers should then invite local ideas from the farmers for improving the problems.

They should also try to identify existing successful technologies geared towards solving the problems. If successful technologies are available for some of the problems, the comments and ideas of the farmers as well as the information from researchers and the experiences of the extension worker would be combined into a number of simple on-farm experiments. The individual farmer within the group would be given the opportunity to conduct the on-farm experiment under the supervision and advice of the extension staff. The results of the experiments by the individual farmers should be assessed at a later meeting to be held by all the actors to discuss the strengths and weaknesses of the on-farm experiment.

Farmers would then be asked to rate the outcome of the experiment and justify their ratings. If the ratings are high and the reasons advanced are genuine, then the innovation can be continued on a larger scale by the farmers. The improved farm output would be enough to convince the laggards to seek information from their colleagues with the aim of achieving a wide spread adoption of the innovation.

If however there are no existing technologies to address some of the problems identified, the researchers and the extension officers, in consultation with the farmers, should work towards the acquisition of appropriate technologies to solve the problems. The role of the farmers and the extension staff would then be to identify local needs, attitudes, knowledge, aspirations and skills levels of the farmers that are relevant to the envisaged technologies, it is hoped that technologies generated by this process would be easily adopted and used by the farmers.

The Uniqueness of OFAR

In most of the previous agricultural extension models, extension workers were to transfer the technology to farmers because the process calls for little or no farmer participation.
except for permission to use his land. However, this did not improve the rate of technology adoption significantly because the profitability of the package was not determined before any recommendation was made. The technology in most cases was inappropriate because no farmer participated actively in its generation. The farmer was a client and not a member of the team, whose interest was at stake. The approach ignored the fact that farmers will adopt a new technology only if they perceive that it is in their economic interest to do so, and if needed support services are adequate. In the last decade or so, a new model of farmers first and farmer last has been introduced. This model, rooted in the OFAR philosophy, seeks active participation of farmers in the identification, planning, implementation, evaluation and feedback. The farmer is an active member of the research team.

Another uniqueness of OFAR is the high level of participation and mutually supportive relationships among the first line extension workers, their rural farmers and the research personnel. Although other approaches also claim this linkage, the OFAR depends on it. Also, according to Axinn (1991), there is a tendency for highly participatory approaches to cost less, because associations of local people facilitate effective communication which makes the whole system more efficient. Technologies developed by OFAR Philosophy is likely to be cheaper because of the full participation of the rural farmers whose economic constraints are addressed in the process, hence many more farmers are likely to adopt the technology. Also, OFAR philosophy has the tendency of stimulating increased confidence, awareness, and activity among farm people.

**Conclusion**

An effective Agricultural Extension System has a significant role to play in attaining self-sufficiency in food production. Agricultural extension has proved effective in several Asian countries for attaining self-sufficiency in food production. The several extension systems that have been tried out in SADC countries have not done much to increase food production by rural farmers who have continued to produce the bulk of the nation’s food. (Hunting, 1983; Subair, 1992; Franzel and Housten, 1992). There is therefore the need to consider the bottom-up approach discussed in this paper as a policy option. It is hoped that if this OFAR philosophy is vigorously pursued, it will go a long way towards increasing food production in SADC countries. The developed countries, such as USA, with the co-operative extension system can still benefit from the OFAR philosophy discussed in this paper. The participatory nature of the OFAR makes it appropriate for the farmers’ organisations, extension agents and researchers who work together in the co-operative extension system practised in the USA.

**References**


Edje, O .T (1990) Bridging the science-farmer gap: Progress with on-farm research with beans in Tanzania , Paper presented at the Bean/ Cowpea principal investigators meeting. East Lansing Michigan, USA


