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OVERVIEW OF AN ISNAR APPROACH TO DEVELOPING GUIDELINES FOR STRENGTHENING THE INTEGRATION OF ON-FARM AND ON-STATION RESEARCH

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In order to present an overview of the approach we are using for the comparative analysis and synthesis of the main findings of the case studies, I intend to give a brief summary of the paper I am in the process of developing to synthesize the relevant lessons from all the case studies on strengthening the link between OFCOR and on-station research.[1] This paper is still very much in the working stage, but I present this overview of the working paper, nevertheless, in order to demonstrate 1) how we intend to analyze the issue of managing the linkage, and 2) how we intend to organize the information in such a way that it will be useful to you as senior research managers.

Our proposal for the ultimate structure of the paper is to:

1) define the nature of the link;
2) draw observations from the case studies on the process of institutionalizing the link;
3) examine the conditions and factors which affect the performance of the link;
4) develop guidelines for management strategies for strengthening collaboration and integration of OFCOR and station-based research.

WHY ARE WE LOOKING AT THE LINK BETWEEN ON-FARM AND EXPERIMENT STATION RESEARCH?

Building an effective link between on-farm client-oriented research and experiment station research is critical for the successful and productive integration of OFCOR within the research system. OFCOR is not effective as an isolated research endeavor; it is a research strategy designed to complement experiment station research, whether disciplinary-, commodity-, or systems-based. The bottom line is that the success of OFCOR depends on the strength of its linkage to on-station research.

Experience has shown, however, that the fact that although the importance of the linkage is recognized in most strategies for institutionalizing OFCOR, the full potential of the collaborative link is seldom actually realized. Our basic argument is that to be effective, the link must be managed -- and usually intensively managed. We cannot expect this collaboration to occur spontaneously. Collaboration must be encouraged and supported. This requires a clear and well-defined management strategy.

WHAT IS THE NATURE OF THE LINK BETWEEN OFCOR AND EXPERIMENT STATION RESEARCH?

The nature of the link can best be understood by looking at the functions that each can perform vis a vis the other partner. The degree to which these functions are performed and the relative balance among them characterizes the nature of the link. Furthermore, the desired emphasis given to specific functions will determine the optimal organizational and managerial arrangements developed to maintain the link.

First we will look at the functions OFCOR can perform in relation to experiment station research. We have identified three principal functions:

1) a service function;
2) an adaptive research function;
3) a feedback function.

OFCOR in its most robust form unites all three functions.

The service function involves on-farm screening, testing, and evaluation of technologies generated by experiment station research. Trials are relatively simple in design, and emphasis is placed on broad-scale coverage, or

multi-locational testing. A demonstration role is often an important secondary objective; the trials are used to expose both extension and farmers to new technologies. The service function has been the dominant role of on-farm research in NARS.

In its service function, on-farm research plays a support role which *supplements* experiment station research. It is a passive role with experiment station research programs determining priorities and "pushing out" selected technologies to be tested on-farm.

The adaptive research function[2] involves the adjustment or adaption of existing technology to a particular set of environmental conditions -- either agro-ecological or socio-economic -- through on-farm research. Through farm-level research, OFCOR identifies problems or opportunities and then "pulls down" technologies or knowledge from experiment station research as the basis for designing potential solutions.[3] In this function, OFCOR has an active research role. OFCOR researchers take the lead in identifying research problems or opportunities, setting priorities, and designing potential solutions.

The feedback function involves providing relevant information from farm-level characterization, diagnosis, and/or adaptive research to the priority-setting, planning, and programming process of station-based research. As the case study experiences demonstrate, this function, although critical, has proved to be the most difficult to institutionalize.

There are two types of feedback.[4] The first -- and most ambitious -- is feedback of information on technical and managerial problems of farmers as an essential input into priority setting within applied experiment station research programs. The objective is to assist these programs to respond to the priority problems and needs of client groups rather than to their specific disciplinary or commondity-determined interests.

A second type of feedback, which is more modest in its objective, focuses on the programming of research, i.e. the annual planning and design of experiments, rather than on priority setting. This type of feedback involves encouraging station-based researchers to systematically take into account the characteristics of farmers' environments in their experimental work. It entails providing information on the farming conditions and management practices of defined groups of farmers so that experiments can be designed to conform more closely to the actual conditions under which farmers operate. This can significantly increase the relevence of applied research and accelerate the process of developing adoptable technology.

We look next at the functions experiment station research can perform in relation to OFCOR. The two principal functions are:

1) an applied research function;
2) a support function.

The applied research function is technology generation. It is the direct complement to OFCOR's adaptive research function. OFCOR is dependent on station-based programs to generate technological alternatives which OFCOR can screen, select and adapt to meet the specific needs and conditions of designated client groups. This interdependence implies the need for a balanced build-up of applied and adaptive research programs within a NARS.

The support function involves experiment station research providing specialized knowledge to OFCOR. Professional input from station-based scientists is potentially valuable to OFCOR at all stages of the research process -- diagnosis, design of possible technological solutions, data analysis and interpretation, redesign, and evaluation. This function is complementary to OFCOR's feedback function; each partner provides specialized knowledge and expertise to the other.

OBSERVATIONS FROM THE CASE STUDIES[4]

At this preliminary stage of the analysis, there are three central observations emerging from the case studies. First, the adaptive research function has been the most successfully implemented. Second, although its relative importance varies among OFCOR situations, the service function is generally perceived to be a responsibility of OFCOR. It is the function of OFCOR which is most desired by OSR, but is not always taken up by OFCOR researchers, who often see it as the least desirable. Third, the feedback and support functions have been the least fully implemented.

It is not suprising that the feedback and support functions have been the most difficult to implement. Both depend heavily on collabration and interactions. Because of this, they bring about changes in researchers' work programs, responsibilities, and decision-making autonomy. Moreover, because these functions entail influencing the research agenda of other scientific programs, they can provoke conflicts of interests, power

and scientific judgement. And, finally, the benefits from collaboration are often greater for the institution than for the individuals, and are somewhat intangible and long-term in nature. In contrast, the additional demands made on researchers' time and scarce resources are often perceived as personal costs which are concrete and immediate in nature.

Research leaders must recognize that collaboration is not without costs, and that these costs will rarely be voluntarily assumed by researchers. The conclusion is that if these functions are to be fully implemented, research managers must develop a management strategy which defines a clear institutional policy and appropriate organizational and managerial mechanisms for collaboration.

DESIGNING A MANAGEMENT STRATEGY

Our job in this study is, therefore, to draw on the case studies to develop guidelines which research managers can use in designing a management strategy for strengthening this link that is appropriate to their particular institutional setting.

As a first step towards developing guidelines for designing a management strategy, we reviewed the case studies, asking the question: Under what conditions is the link most productive? Or, said another way, on what conditions does the effective performance of the link depend?

In analyzing the key factors determining the quality of this link, we have assumed the perspective of a senior research manager striving to strengthen this linkage in his/her research institute. The research manager operates within an institutional environment in which some conditions are inflexible parameters and others are under his/her control. Accordingly, when developing a strategy for managing this link, the two types of conditions which have to be taken into consideration are:

those *conditions which define* the decision-making environment of the senior research manager;

those *conditions which can be developed* by the senior research manager in order to strengthen the collaborative link between OFCOR and experiment station research.

CONDITIONS WHICH DEFINE THE DECISION-MAKING ENVIRONMENT OF THE RESEARCH MANAGER

These conditions determine the institutional environment of the research manager. He/she has little or no ability to change these conditions. They must be recognized as the basic structural constraints and opportunities under which realistic objectives are to be set and a management strategy for strengthening the link devised. They will affect both the nature of the link and the degree of institutionalization that is ultimately feasible.

Let me briefly review the conditions we have identified as important environmental determinants:

- *Institutional stability* of the NARS. Frequent turnover of senior research managers disrupts institutional policy making, priority setting, and planning in NARS, and is particularly problematic for non-traditional research such as OFCOR.

- *Commitment of senior research managers to OFCOR**. Senior research managers can strongly influence the quality of the link through the research policy they formally or informally set within the institution.

- *Financial resource base of the NARS**. The potential for conflicts between OFCOR and station-based research increases substantially in situations of scarce resources and strong competition for funds.

- *Human resource base of the NARS**. The number and type of staff available for deployment in OFCOR is a key factor influencing the options available for introducing or building OFCOR capacity within a NARS, as well as the rational division of responsibilities and labor between OFCOR and station-based research.

- *Current organization of research**. Whether station-based research is organized by commodity programs, disciplinary departments, or regional research stations will have an important bearing on the nature of its link with OFCOR, as well as the organizational and managerial arrangements required for strengthening the link.

- *Maturity and capacity of station-based research.* This affects the amount of "technology on the shelf" available for OFCOR to draw on for adaptive research. It can also affect the degree to which scientists in applied research programs perceive a need

for OFCOR and are receptive to feedback from on-farm research.

- *On-farm research antecedents.* The tradition of on-farm research within the NARS will affect the manner in which OFCOR is perceived by experiment station scientists, both in terms of its validity as a research strategy and its appropriate role within research.

- *Development policy*.* The degree to which national development policy supports the objective of channeling assistance to resource-poor farmers can have an important impact on the priority accorded to this client group in research policy and, hence, the priority given to OFCOR within a NARS.

- *Capacity of extension.* The size and competence of the extention service can significantly influence the degree to which OFCOR emphasizes, or is expected to emphasize, the service function in terms of testing and demonstration of technology.

- *Degree of centralization in research infrastructure.* Highly centralized systems will be more dependent on on-farm research to achieve necessary agro-ecological coverage. This will influence the relative emphasis given to OFCOR functions and the relative weight of OFCOR within the research system. A highly centralized system entails higher communication costs in integrating OFR and station-based research.

- *Agroecological complexity.* The degree of agroecological complexity and diversity is an important factor determining the relative importance of the adaptive research and feedback functions of OFCOR within the research process.

(* Conditions which could potentially be altered by senior research managers over the long term.)

ROOM TO MANEUVER

The environmental conditions outlined above define the parameters of what is potentially feasible for strengthening collaboration. But as you all know well, within any institutional environment there is always room to maneuver. The challange for the research manager is, thus, to identify where she or he has room to maneuver and then to develop a management strategy which is, on the one hand, realistic given the institutional environment of constraints and opportunities, but at the same time goes as far as possible towards developing a positive environment for collaboration. Although the ideal can rarely be achieved, the objective is to exploit to the fullest degree possible the potential that *does* exist for strengthening the link.

In our approach to developing guidelines for designing management strategies, we have synthesized from the case studies those institutional conditions under which the link functions most productively and effectively *and* which can be influenced by the research manager.

We have identified seven basic conditions which need to be developed by the senior research manager in order to strengthen the collaborative link between OFCOR and experiment station research. Achievement of these conditions can be viewed as the central objectives for any management strategy designed to strengthen this link:

1) *Researchers working in OFCOR and experiment station research share an applied, farmer-oriented perspective toward agricultural research.* OSR and OFCOR researchers share a common mission. The objective is to develop technologies appropriate for designated client groups. This involves researchers sharing a common set of objectives, common perceptions of the primary constraints to agricultural development, and a common understanding of the clients of research.

2) *Researchers in OFCOR and experiment station research agree on the functions that each should perform for the purposes of collaboration.* Successful collaboration depends on a clear division of labor and responsibility. Research managers need to work closely with the OFCOR and station-based staff to develop a consensus on the appropriate functions and services that each should provide.

3) *Researchers in OFCOR and experiment station research share a common understanding that OFCOR is a complemetary, not a competing, strategy for research.* It is important that each of the partners is seen to enhance the productivity of the other. The relationships are consultative, not supervisory, and the domains of authority are defined. Potential for conflicts is exacerbated if OFCOR is viewed by station-based researchers as competing for and capturing resources.

4) *OFCOR has scientific credibility among station-based researchers.* This is essential if linkage functions are to be successfully performed, particularly with respect to the adaptive research and feedback functions which depend heavily on collegial interaction. Scientific credibility involves the capacity

of the OFCOR researchers in both absolute and relative terms, as well as the degree to which station-based researchers view OFCOR methodology, modes of analysis, and criteria for evalution as legitimate.

5) *Scientists perceive the benefits from collaboration to outweigh the personal costs.* Because participation in collaborative research requires changes in objectives and activities, it is not without costs for the scientists involved. It must therefore be made attractive to scientists through material, professional, and intellectual incentives and rewards.

6) *Sufficient human and financial resources are available to support cooperative and collaborative activities.* The activities which link OFCOR and experiment station research require money and person hours which are not automatically available. Resources must be formally allocated for collaborative activities.

7) *Adequate opportunities exist for formal and informal interaction.* The exchange of information and specialized advice depends on formal and informal interaction. This requires some combination of institutional, organizational, and locational proximity for potential collaboration.

The next step in our approach is to deliniate the key policy, organizational, and managerial factors determining these conditions. That is, what are the factors which a research manager must take into account when she or he, given the constraints and opportunities established by the environmental factors, goes about designing a strategy for promoting these conditions?

The third step is the identification of mechanisms that can be employed to manipulate those factors, and so to develop the conditions required for effective collaboration. The mechanisms emerging from the case studies which have been effectively employed by research managers for strengthening this link can be divided into three types which are basic to any strategy for managing collaboration:

1) mechanisms to create *incentives* which stimulate and reward collaboration;
2) mechanisms to mobilize *resources* to support communication, coordination, and collaborative activities;
3) mechanisms to provide *opportunities* for formal and informal interaction.

AN EXAMPLE OF THE APPROACH FOR DEVELOPING MANAGEMENT GUIDELINES

Let me close this presentation by illustrating our approach to developing guidelines for effectively managing the link between OFCOR and OSR. Let's look more closely at one of the conditions necessary for a productive link: the scientific credibility of OFCOR with on-station researchers.

As I said earlier, the case studies indicate that it is essential that OFCOR researchers have scientific credibility among station-based reseachers if the linkage functions are to be successfully performed. This is particularly true with respect to the adaptive research and feedback functions, which depend heavily on collegial interaction.

This appears to be common sense, but in reviewing OFCOR-OSR experiences, the issue of poor scientific credibility occurs repeatedly. Moreover, it is a factor which cuts across most of the other conditions we have identified as conducive to successful collaboration. It is undoubtedly a priority management issue in strengthening collaboration between OFCOR and station-based research.

Several key factors are involved in establishing the scientific credibility of OFCOR researchers in the eyes of on-station scientists:

1) *The competence of the OFCOR researchers,* both in absolute and relative terms. OFCOR must be staffed by solid and experienced researchers who can interact with station-based scientists as colleagues of equivalent status.

2) *The scientific quality of OFCOR research.* This obviously depends in part on the general research capacity of the OFCOR staff. But it also depends on the degree to which thay have developed the specialized skills required for OFCOR.

3) *The degree to which station-based researchers view OFCOR methodology, modes of analysis, and criteria for evaluation as legitimate.* This issue refers to the common problem of the high coefficients of variation in on-farm trials as compared with station-based trials. It also relates to the degree to which social science analysis is understood and respected within the research institution, as well as the degree to which OFCOR social scientists understand agricultural

science and research methods and can communicate effectively with station-based scientists.

4) *The degree to which OFCOR scientists can demonstrate complementary expertise as specialists who understand real farming conditions and farmers' priority problems and needs.* If OFCOR is designed as a complementary research strategy, then OFCOR researchers need to demonstrate complementary areas of expertise. Because their principal area of strength should be the development of understanding of farm-level constraints and opportunities for research, OFCOR researchers who remain distant from farmers and rely on technicians to implement the OFR, can lose credibility among station-based scientists.

Some mechanisms for influencing these factors, and therefore for enhancing scientific credibility, have emerged from the case studies:

- *Build the OFCOR effort at a speed which allows OFCOR researchers to consolidate expertise and improve their skills.*

- *Provide specialized training to OFCOR staff.* This will help ensure a higher quality of OFCOR research and will develop expertise which is complementary to on-station research.

- *Create opportunities for OFCOR practitioners to demonstrate their capacity.* For example, encouraging OFCOR researchers to conduct some on-station trials has helped on-station scientists recognize OFCOR scientists as colleagues of equivalent status.

- *Tailor the presentation of OFCOR research results more directly to the needs of on-station scientists.* This has been effective in demonstrating the complementary role of OFCOR, as well as the expertise of OFCOR scientists in agricultural research and development.

- *Promote opportunities for on-station scientists to learn about the OFCOR approach.* Mechanisms such as joint field visits, direct participation of OSR researchers in the OFCOR research process, or workshops on OFCOR methods or research findings have increased the degree to which station-based researchers view the OFCOR approach as legitimate.

- *Ensure strong scientific leadership for OFCOR.* This is essential for maintaining the quality of OFCOR research and for building a sound and well-focused program.

- *Promote good trial management.* Trial clustering, for example, has been used to improve trial management in order to ensure reliable results.

- *Ensure timely analysis and presentation of data.* Making OFCOR data readily available to station-based researchers ensures more opportunity for OFCOR practitioners to demonstrate scientific credibility.

- *Generating opportunities for OFCOR practitioners to keep abreast of OSR* has helped OFCOR researchers design work to take advantage of "technology on the shelf" and available specialized advice, increasing the relevance of the research to OSR.

SUMMARY OF THE CONCEPTUAL FRAMEWORK

Having illustrated the framework we are using to develop guidelines for the design of a management strategy, I will conclude by quickly summarizing that framework.

Conditions

Certain conditions appear to facilitate the effective integration of on-farm and on-station research. These conditions can be seen as the strategic objectives of the research manager.

Factors

Key policy, organizational, and managerial factors determine these conditions. These factors must be taken into account when devising a strategy for fostering these conditions.

Mechanisms

The case studies indicate some of the mechanisms which have been effectively employed by research managers to manipulate the key factors in order to develop the conditions required for effective collaboration. We need to synthesize their experiences in using various management mechanisms.

MANAGEMENT STRATEGY

These are the basic steps we are taking to develop guidelines for advising research managers on designing effective management strategies -- particular to their institutional settings -- which fully exploit their room to maneuver for strengthening the collaboration between OFCOR and experiment station research.

FOOTNOTES

1) Deborah Merrill-Sands and Jean McAllister, "Strengthening the Link Between On-Farm and Experiment Station Research: Lessons Emerging from Nine Country Case Studies.' A draft of this paper was presented to the Second Study Workshop on Organization and Management of On-Farm Research in NARS, 31 August - 4 September 1987, The Hague, Netherlands.

2) In this paper we use the CGIAR definitions for applied and adaptive research:
   - applied research = that designed to create new technology;
   - adaptive research = that designed to adjust technology to the specific needs of a particular set of environmental conditions.

3) This is the definition of OFCOR adaptive research put forth by Collinson. He introduced the idea of OFCOR "pulling down" technologies. Citation: Collinson, M. P., Senior Agricultural Administrators Networkshop on Farm Research, Lesotho, 25-28 November 1985, Briefings for the Program, Tuesday, 26 November. CIMMYT/E.S.A. Regional Programme. September 1985.

4) This is a distinction put forth by Baker and Norman. D.C. Baker and D.W. Norman, "A Framework for Assessing Farming System Activities in National Settings in West Africa: With Special Reference to Senegal and Nigeria." Paper presented at the West African Farming Systems Research Networkshop, Dakar, Senegal, 11-14 March 1986.

OFCOR CASE STUDIES

The analysis is based on the following case studies, all of which are in draft form, but will be published by ISNAR in 1988.

- The Evolution and Significance of On-Farm and Farming Systems Research in BARI
  M.A. Jabbar
  M.D. Zainul Abedin

- The Organization and Management of the Adaptive Research Planning Team: Zambia
  Stuart A. Kean
  Lingston P. Singogo

- Organization and Management of On-Farm Research in Nepal
  Badri Nath Kayastha
  Sudarshan Bhakta Mathema
  Brahma Ram Bhakta Mathema

- Organización y Manejo de Programa de Investigación en Finca de Productores: Panama
  Miguel Cuellar M.

- Organización y Manejo de Programa de Investigación en Finca de Productores: Ecuador
  Romulo Soliz V.
  Patricio Espinosa
  Victor Hugo Cardoso

- The Zimbabwe Case Study : The Organization and Management of Five On-Farm Research Programs in the Department of Research and Specialist Services
  Marcelino Avila
  Ephrim E. Whingwiri
  Bright C. Mombeshora

- Organización y Manejo de la Investigación en Finca en Guatemala
  Sergio Ruano
  Astolfo Fumagalli

- Organisation et Gestion de la Recherche sur les Systèmes de Production au Sénégal
  J. Faye
  J. Bingen

- Study on Management and Organization of On-Farm Research in Indonesia
  The Agency for Agricultural Research & Development
  Ministry of Agriculture