

# Building Institutional Capacity for On-Farm Research: Call System Training Courses

Robert Tripp\* and Ponniah Anandajayasekeram

## ABSTRACT

A training program in on-farm research for national agricultural research and extension institutions is described. The training is carried out in a series of 1- to 2-wk meetings over two agricultural seasons, and concerns the application of research techniques in diagnostic surveying, planning, on-farm experimentation, and analysis. It is argued that this type of long-term, hands-on training is not only effective for transferring research methods, but also serves to develop institutional capacities for planning and managing research and extension directed at well-defined client groups. Implications are discussed regarding the organization of interdisciplinary research, the development of linkages between research and extension institutions, the prospects for training in research planning, and the relative merits of problem-oriented training.

ONE OF THE PRINCIPAL GOALS of national agricultural research services in developing countries is the provision of technology to improve the productivity of small farm agriculture. A major problem in achieving that goal is a lack of experience in planning agricultural research based on an understanding of the conditions and circumstances of client farmers. In response, a wide variety of research methods and procedures has been developed, many under the rubric of "Farming Systems Research" (22). This article discusses a training program for one such set of research methods, referred to as *call system training* in on-farm research. The training program not only attempts to transfer research methods, but also gives attention to assuring that research and extension organizations are able to effectively incorporate those methods in their work.

On-farm research (OFR) is a set of research methods with a farming systems perspective (3) that has been adopted by a number of national agricultural research institutions (6, 13). It includes methods for assessing farmers' circumstances and problems, planning a research program to be carried out on farmers' fields, and developing recommendations consistent with farmers' priorities.

Several characteristics of OFR have important implications for the organization of research and for the development of training strategies. First, OFR is location-specific and presumes the identification of well-defined groups of farmers who are targets of a research

effort. Second, it starts from an understanding of the system of crops, animals, and off-farm labor that characterizes small farm agriculture, and attempts to provide innovations that are consistent with that system. Finally, OFR is necessarily interdisciplinary, integrating the work of biological and social scientists.

## TRAINING OBJECTIVES FOR ON-FARM RESEARCH

Several challenges present themselves to any training program aimed at introducing the methods of OFR to national research and extension institutions. The most immediate challenge is the transfer of an integrated set of research methods, including techniques for observing farmers' fields and discussing production practices and problems with farmers, setting research priorities based on this type of diagnosis, carrying out experimentation on farmers' fields, and analyzing the results of those experiments using criteria important to farmers.

If such training is to succeed, it also requires some changes in the way that research priorities are set. Opportunities and formats need to be established at all levels of research and extension institutions for setting priorities that reflect farmers' conditions and concerns. The process by which agricultural research priorities are currently established is quite complex and often not formally articulated (1).

The establishment of appropriate planning methods for national agricultural research institutions is further complicated by the way in which these institutions are organized. There are often separate commodity programs [e.g., legumes, maize (*Zea mays* L.) pastures] and disciplinary departments (e.g., entomology, soils, economics). In addition, some researchers may be assigned area-specific or project-related duties. The successful introduction of OFR to such an institution must envision a way of encouraging an interdisciplinary approach to priority setting that would be relevant to various units of the research organization.

A further challenge to establishing effective training in OFR is the fact that agricultural research is usually separated from the technology delivery system. The extension service is often part of a different institution, with its own procedures and organization (12). A training program must often find ways of addressing two separate institutions simultaneously.

Finally, any training program must be concerned with questions of efficiency and continuity. Choices must be made regarding the participants and venue for training, the training methods to be used, and the possibilities for establishing local training capacity.

R. Tripp, CIMMYT Economics Program, Apdo. Postal 6-641, 06600 Mexico, D.F., Mexico; and P. Anandajayasekeram, CIMMYT Economics Program, P.O. Box 25171, Nairobi, Kenya. Received 11 Sept. 1989. \*Corresponding author

**Table 1. Call system training courses presented by CIMMYT.**

Country	Institution(s)	Year(s)	Topics†	No. of calls
Ecuador	Instituto Nacional de Investigaciones Agropecuarias (INIAP)	1979, 1981, 1982, 1983	P,E,A	3
Venezuela	Fondo Nacional de Investigaciones Agropecuarias (FONALAP)	1980-1981	D,P,E,A	5
Honduras	Programa Nacional de Investigación Agropecuaria (PNIA)	1982-1983	D,P,E,A	5
Perú	Programa Nacional de Cereales, Instituto Nacional de Investigaciones y Promoción Agropecuaria (INIPA)	1983-1984	P,E,A	4
Zambia	Adaptive Research Planning Teams, Research Branch, Ministry of Agriculture	1983-1984	D,P,E,A	5
Malawi	Adaptive Research Division, Department of Agricultural Research	1983-1984	D,P,A	6
Kenya	Kenya Agricultural Research Institute (KARI)	1984-1986 (Eastern Kenya)	D,P,A	4
		1984-1986 (Western Kenya)	D,P,A	4
Panamá	Instituto de Investigación Agropecuaria de Panamá (IDIAP) Ministerio de Desarrollo Agrícola (MIDA)	1985-1986	D,P,E,A	6
México	Instituto Nacional de Investigación Agrícola (INIA)	1985-1986	D,P,E,A	5
Ethiopia	Institute of Agricultural Research (IAR)	1985-1987	D,P,E,A	5
Haiti	Ministère de l'Agriculture des Ressources Naturelles et du Développement Rural	1986	D,P	3
Colombia	Federación Nacional de Cultivadores de Cereales (FENALCE)	1986 (wheat)‡	D,P,E,A	5
		1986-1987 (maize)	P,E,A	3
Lesotho	Ministry of Agriculture	1989-1990	D,P,E,A	5
Costa Rica	Ministerio de Agricultura y Ganadería (MAG) (and representatives of other Central American research and extension organizations)	1989-1990	D,P,E,A	5
Tanzania	Tanzanian Agricultural Research Organization (TARO)/Ministry of Agriculture	1989-1990	D,P,E,A	4

† D = diagnosis; P = planning; E = experimentation; and A = analysis.  
‡ Wheat = *Triticum aestivum* L.

The training strategy described in the following section has attempted to address these challenges. Although its primary objective has been to train researchers and extension agents in OFR methods, call system training has been organized in such a way as to promote interdisciplinary and interinstitutional communication and to develop planning skills and formats.

### CALL SYSTEM TRAINING IN ON-FARM RESEARCH

Call system training involves carrying out the various phases of OFR (diagnostic surveys, planning, etc.) with a group of researchers and extension agents from one country through a series of meetings, or "calls," of 1 to 2 wk each over a period of two agricultural cycles. The calls take place in one region of the country, selected by the national research program. The participants are researchers and extension agents with responsibility for the selected region, as well as those from other regions of the country where there is a commitment to on-farm research. Other participants include supervisory staff from the research and extension services, as well as members of commodity programs or disciplinary departments of the research organization.

The call system training described here has been developed by the International Maize and Wheat Improvement Center (CIMMYT) (20, 24). CIMMYT has organized one or more call system courses in numerous countries (Table 1). Most of the instructors have been social scientists and agronomists from CIMMYT. The courses have had varying numbers of calls and types of participants, depending on national program requirements and course leadership. What follows is a description of the basic features shared by call system courses organized by the CIMMYT Economics Program.

The site of each course is chosen by the national research program based on its priorities for establishing OFR capacity and after considering the area's accessibility to other participants and the availability of classroom facilities and accommodation. The usual number of participants is between 25 and 30. The research area chosen for the training typically includes 2000 to 6000 farm households.

Although the number and topics of individual calls vary somewhat from course to course, one of the more common formats is shown in Fig. 1. Each call in this type of course is described separately in the following paragraphs.

1. The first call focuses on an informal farm survey (2). The call is carried out during the principal growing season (Fig. 1). After an introduction to the course objectives and a review of secondary data from the area (agricultural statistics, soil surveys, meteorological data, etc.), the time is dedicated to organizing and completing the farm survey. Participants are introduced to the strategy of an informal survey, an ex-

ample of "rapid rural appraisal" (4) in which participants in teams of two or three converse with farmers and observe their fields. The interviewing is done without a questionnaire but using a set of guidelines to structure the conversation. The guidelines are discussed and reformulated each evening before the next day's fieldwork, and progress from the general (e.g., the cropping calendar for the area) to the specific (e.g., the type of maize suitable for late-planted fields). The survey usually takes 5 or 6 d.

The purpose of the survey is to describe the farming system and the principal production practices, to identify problems that limit the productivity of the system, and to identify the causes of these problems. It is not sufficient, for instance, to conclude that a particular disease affects the maize crop. Participants are challenged to identify a causal chain that may lead in this case to the understanding that late-planted maize is most affected by the disease and that late planting is caused by a lack of draft power. Such an analysis opens various possibilities for correcting the problem. The last 2 or 3 d of the call are spent drafting a report of the survey, the final version of which is prepared and distributed to participants before the second call.

2. The second call takes place several months later, usually after harvest. Its purpose is to design, carry out, and analyze a short survey questionnaire that will test and quantify some of the observations and hypotheses derived from the informal survey. (This call may be omitted if it is felt that enough information has been developed during the informal survey.) A review of the informal survey report is followed by a brief introduction to questionnaire design, and the participants divide into groups to draft a questionnaire. The draft is tested with farmers, which always leads to considerable change in the questionnaire and in the way that participants frame their hypotheses. After developing several drafts, participants prepare the final version of the questionnaire. Next, appropriate sampling procedures and interview techniques are discussed and the survey is carried out. With the participants working in pairs, a sample size of 60 to 80 households can be managed in about 3 d of fieldwork. The rest of the second call is dedicated to analysis of the survey and the preparation of a report.

3. The third call, usually 1 wk in duration, is used to develop a research program for the area based on a set of agronomic experiments planted in farmers' fields. Besides course participants, scientists who are specialists in areas relevant to the research may contribute to the planning call. The first part of this call is devoted to identifying the factors to be included in the experiments. A teaching format has been developed (25) in which participants first list and then assign priority to production problems that have been identified in their diagnostic work. The causality and interrelationships of the problems are then analyzed. Finally, experimental factors that will either further an understanding of the problems or provide possible solutions are identified. The possible solutions are assessed for technical soundness, research requirements, compatibility with local farming systems, and extension responsibilities. Implications for long-term research priorities, such as for breeding programs, are discussed with appropriate research personnel.

The second part of the call involves designing the on-farm experiments. The call concludes with a proposal for several types of experiments (each to be planted with various farmers) that are to be the principal responsibility of the local researchers and extension agents during the crop season. They are in charge of identifying farmers to host the experiments, establishing the experiments, taking data, and harvesting. If participants have had little experience in planting on-farm experiments, another call can be carried out at planting.

4. The fourth call of the course is held for 1 wk during the growing season when the on-farm experiments are established. The objective is to review the research program, visit the experiments, talk to the host farmers, and make additional agronomic observations. During this call the local researchers and extension agents begin to take more responsibility for the management of the course, as it focuses on the work they have been doing during the past several months.

5. The fifth call of the course is held after harvest and is dedicated to an analysis of the experimental results. Participants are asked to interpret the results of the experiments in light of both statistical and eco-

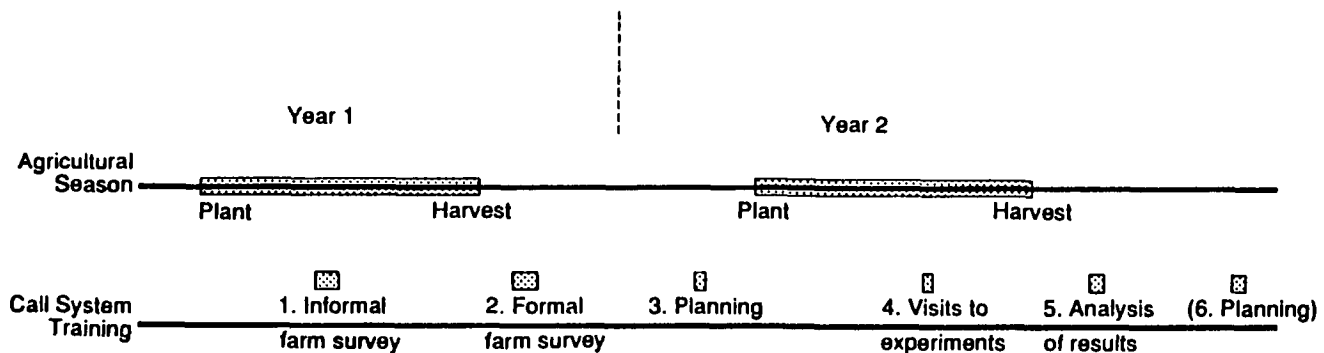


Fig. 1. Call system training and the agricultural cycle.

conomic analyses (5). They are then asked to review the hypotheses used to plan the experiments and to suggest modifications for the next season. If they carry out detailed planning for a second cycle of research, this usually warrants an additional call.

At the end of the call system course, participants have met for a total of 7 wk over a period of almost 2 yr. They have diagnosed the production problems in an area, set research priorities accordingly, carried out an experimental program, analyzed the results and drawn conclusions for further work. Researchers and extension agents from outside the research area have learned skills that they are asked to apply between calls. In many cases they present short reports on their own work as part of each call, and the course thus serves to initiate or strengthen OFR in a number of areas of the country. The participants from the target area are expected to continue with the on-farm experimental program, the first year of which has been designed, executed, and analyzed with help from their colleagues. The accomplishments, potential, and limitations of such call system training are analyzed in the following section.

### LESSONS OF CALL SYSTEM TRAINING

Call system courses have proven to be effective in helping to develop and support the capacity of national agricultural research services to do OFR. But the experience of call system training also points to some additional considerations for training related to research organization. These include the degree to which training can contribute to promoting interdisciplinary teamwork in an agricultural research institute; the scope for training to contribute to strengthening relations between institutions; the prospects for, and limitations to, training in planning and setting priorities; and the value of training under real-world conditions.

#### Interdisciplinary Teamwork

On-farm research requires an interdisciplinary approach. Training in diagnostic techniques in rapid rural appraisal promotes interdisciplinary interchange (7), but more sustained effort is necessary if interdisciplinary links are to be maintained in a research organization.

This highlights an important dilemma for adaptive agricultural research: how to integrate field-level, location-specific research with the overall strategies and priorities of disciplinary and commodity research. Training cannot resolve the dilemma directly, but can be used to support institutional decisions once they have been made. Call system course participants have been drawn from a wide variety of institutional arrangements—experiment station staff with full- or part-time OFR responsibilities (Mexico, Kenya), researchers with regional responsibilities (Panama, Honduras), members of separate adaptive research programs (Ecuador, Zambia, Ethiopia), and adaptive research units

within an extension and rural development organization (Malawi). None of these arrangements is without fault, and the appropriate institutional compromise will depend on the nature of the research organization and the type of agriculture that it addresses (15).

In each case, however, the training focuses on organizations rather than individuals, and includes representatives of various units and supervisory levels within the participating organizations. The course in Panama, for instance, included extension agents and research agronomists assigned to particular locations, economists with regional responsibilities, and regional research coordinators. But the range of personnel that participates in such courses is usually relatively narrow and often reflects the ambiguous position accorded OFR activities in many research organizations. There would seem to be scope for expanding this training strategy to include other members of the research organization. Participation of senior research personnel in a full course may not be feasible, but shorter training activities that promote joint planning and the formulation of research strategies are certainly possible.

#### Interinstitutional Relations

Call system training has been used to provide members of research and extension institutions the opportunity to work together on a project of relevance to both. In several instances the courses have been a decisive factor in fostering a more permanent relationship between research and extension on a nationwide basis. The courses have been offered in a variety of institutional environments—separate research and extension institutions (Ecuador), research and extension institutions organized on a regional basis (Honduras, Panama), commodity programs that include both research and extension (Peru), regional research teams with extension liaison officers (Zambia), and independent extension institutions (Colombia).

If researchers and extension agents are given assignments to be carried out in their own areas between calls of a course, they have the opportunity to develop effective relations. When researchers and extension staff jointly plan and allocate responsibilities, this promotes mutual understanding. This type of activity gives much more responsibility to extension agents than does the hierarchical approach of the Training and Visit system (16).

The call system format has also been used to strengthen linkages in other institutional settings, such as providing common training for the agricultural personnel of several independent rural development projects in Haiti, or in helping to coordinate separate donor agricultural projects in Zambia (11).

There are definite bounds to what training can hope to accomplish in the way of developing collaboration between institutions, however. Any success the call system courses have had in promoting better research-extension linkages has been preceded by considerable

work at the leadership levels of both organizations, in promoting more compatible working arrangements. A prerequisite for selecting participants for such courses is an agreement from their supervisors that they will be allowed to carry out the type of work demonstrated in the course. Course planning also needs to pay attention to the experience and education of potential participants. If local extension agents with only secondary education (but considerable field experience) are paired with researchers who are recent university graduates, for instance, problems can be expected.

### **Training in Planning and Priority Setting**

Planning and reporting mechanisms in national agricultural research institutes are frequently inadequate. They often consist of a yearly institution-wide meeting in which reports and plans are presented in rapid-fire succession to an increasingly inattentive audience, combined with occasional research committee meetings and a struggle to publish some sort of annual report. The call system courses have provided an example of how to organize reporting and planning for adaptive research. In the majority of the countries where the courses have been held, reporting has been significantly modified by the procedures developed in the courses.

The courses have also created a more relevant forum for planning. In most cases regular planning meetings have been established, using course participants as a nucleus. These meetings may be held among OFR projects from one region of the country, or be focused on a particular commodity. The meetings often help to establish institution-wide formats for planning and reporting. More emphasis needs to be placed, however, on using this experience to promote flexible and efficient planning exercises among senior researchers (14).

An important contribution of the call system courses is the provision of a clear framework for problem-oriented planning. Although there are dangers in trying to teach an overly formal method for planning (9, p. 155), the experience of working through the planning and analysis of an entire research cycle gives call system participants a basis for approaching their work in an orderly fashion.

### **Training under Real-World Conditions**

The value of using actual problems and situations as a basis for management training is widely appreciated (19,21). Honadle and Hannah (10) describe how a carefully identified set of issues in an integrated rural development project served as the basis for management workshops for project staff. For agricultural research, courses in particular analytical techniques may best be taught using conventional classroom exercises, but where training is focused on the development of information and its use in planning, hands-on training is preferable.

There are also considerable advantages to carrying

out this type of training on-site, rather than removing participants to another country. Besides the cost savings, training can be tailored to the conditions that the participants must face. In the diagnostic work, for instance, decisions on how to conduct discussions with farmers and with village leaders are often location-specific. In the on-farm experiments, technology testing is naturally limited to those inputs and methods that are potentially available in the country. Analytical work for the course can be done with whatever data processing facilities the participants have available.

Ozgediz (17) points out that management training in developing countries tends to be seen as a discrete activity, separated from the on-going work of the institution. The experience with the call system courses in OFR belies the existence of any neat boundaries between training and practice. The call system has some parallels to experiences in the field of organizational development (8), because the courses promote a focus on group problem solving that is used to establish new organizational patterns for research management. It also has strong similarities to "action training" (18), where an in-service training experience is offered to various levels of a development organization based on group work to identify problems and priorities. In most countries where the call system has been presented, further activities with the same group have been carried out for several years after the completion of the course.

Perhaps most important for agricultural research management, this type of training gets participants in touch with their clients. For people who may be more accustomed to providing prescriptions than to problem solving, the experience of coming face to face with a specific farm population, and being charged with providing useful advice for improving productivity, is a unique opportunity. Because the courses lasts 2 yr, it provides the possibility to follow through on hypotheses. A problem with much training in farming systems research is that, although it promotes a farmer focus and an interdisciplinary approach, it usually provides a single experience in the countryside. In call system training, the neat conclusions of an initial farming systems analysis quickly give way to more complicated survey results, then to the necessity of setting priorities for a limited number of experiments, and finally to the interpretation of experimental results that are often unexpected or equivocal. Call system courses thus provide a good introduction to the iterative nature of adaptive agricultural research (23).

Call system courses, in their complete form, are expensive to organize and carry out. They require a strong commitment from the various institutions involved and a willingness to follow up with complementary training activities. They also require considerable staff time, vehicles for field work, and logistical support. But some of the principles learned from these courses are certainly applicable in other types of training efforts. The support of research planning meetings or diagnostic activities attended by a wide range of staff, with an eye toward the development of effective

management and reporting procedures, are feasible alternatives to long-term call system courses. Such joint activities between experiment station staff and their colleagues working in the field are one of the keys to establishing a client focus in agricultural research (15). These sorts of strategies seem much more promising for many agricultural research organizations than establishment of a separate, formal training capacity in areas such as planning and reporting.

### CONCLUSIONS

Call system training in OFR allows a range of research and extension personnel to work together to develop information about particular sets of farmers, to draw implications for research, and to follow through on the technical and organizational implications of the research priorities identified.

But such training is only effective if it is preceded by discussions and other activities with the leadership and staff of the participating institutions. Training in OFR methods carried out in an organizational vacuum is unlikely to have any long-term impact, especially if lack of a staff development policy leads to a high rate of turnover in the institution.

To the extent that training in OFR or similar client-oriented methods is provided from outside, by donor-supported organizations, there is an urgent need for better coordination of training programs. Once it is acknowledged that these research methods have significant institutional implications, it can be seen that a random offering of disconnected training activities can be counterproductive. Research and extension institutions need to take the initiative to develop their own strategies for personnel and program development and then draw upon the most relevant training opportunities.

### ACKNOWLEDGMENTS

We are grateful to Selcuk Ozgediz for comments on an earlier draft of this paper.

### REFERENCES

1. Busch, L., and W.B. Lacy. 1983. Science, agriculture, and the politics of research. Westview Press, Boulder, CO.
2. Byerlee, D., and M. Collinson. 1980. Planning technologies appropriate to farmers. CIMMYT, El Batan, Mexico.
3. Byerlee, D., L. Harrington, and D. Winkelmann. 1982. Farming systems research: Issues in research strategy and technology design. *Am. J. Agric. Econ.* 64:897-904.
4. Carruthers, I., and R. Chambers. 1981. Rapid appraisal for rural development. *Agric. Admin.* 8:407-422.
5. International Center for Maize and Wheat Improvement (CIMMYT). 1988. From agronomic data to farmer recommendations: An economics training manual. CIMMYT, El Batan, Mexico.
6. Collinson, M.P. 1982. Farming systems research in eastern Africa: The experience of CIMMYT and some national agricultural research services 1976-81. MSU Int. Dev. Pap. 3, Dep. of Agric. Econ., Mich. State Univ., East Lansing, MI.
7. Conway, G.R. 1985. Agroecosystem analysis. *Agric. Admin.* 20:31-55.
8. French, W., and C.H. Bell, Jr. 1978. Organization development: Behavioral science intervention for organization improvement. 2nd ed. Prentice-Hall, Englewood Cliffs, NJ.
9. Harnak, R.V., T.B. Fest, and B.S. Jones. 1977. Group discussion. Prentice-Hall, Englewood Cliffs, NJ.
10. Honadle, G.H., and J.P. Hannah. 1987. Management performance for rural development: Packaged training or capacity building. *Public Admin. Dev.* 2:295-307.
11. Kean, S., and L. Singogo. 1988. Zambia. Organization and management of the Adaptive Research Planning Team (ARPT), Research Branch, Ministry of Agriculture and Water Development. OFCOR Case Study 1. ISNAR, The Hague, the Netherlands.
12. Leonard, D. 1977. Reaching the peasant farmer: Organization theory and practice in Kenya. Univ. of Chicago Press, Chicago, IL.
13. Martinez, J.C., and G. Sain. 1983. The economic returns to institutional innovations in national agricultural research: On-farm research in IDIAP, Panama. CIMMYT Economics Program Working Pap. 04/83. CIMMYT, El Batan, Mexico.
14. Merrill-Sands, D., P. Ewell, S. Biggs, and J. McAllister. 1989. Issues in institutionalizing on-farm client oriented research: A review of experiences from nine national agricultural research systems. *Q. J. Int. Agric.* 28:279-300.
15. Merrill-Sands, D., and J. McAllister. 1988. Strengthening the integration of on-farm client oriented research and experiment station research in national agricultural systems (NARS): Management lessons from nine country case studies. OFCOR Comparative Study 1. ISNAR, The Hague, the Netherlands.
16. Moore, M. 1984. Institutional development, the World Bank, and India's new agricultural extension programme. *J. Dev. Studies* 20:303-317.
17. Ozgediz, S. 1983. Managing the public service in developing countries. World Bank Staff Working Pap. 583. World Bank, Washington, DC.
18. Paul, S. 1983. Training for public administration and management in developing countries. A review. World Bank Staff Working Pap. 584. World Bank, Washington, DC.
19. Pedler, M. (ed.). 1983. Action learning in practice. Gower, Aldershot, UK.
20. Ransom, J.K., P. Anandajayasekeram, and A.F.E. Palmer. 1988. A "call" system approach for teaching on-farm research methodologies. p. 61. *In* Agronomy abstracts. ASA, Madison, WI.
21. Revans, R. 1971. Developing effective managers. Longman, London, England.
22. Simmonds, N. 1986. A short review of farming systems research in the tropics. *Exp. Agric.* 22:1-14.
23. Tripp, R. 1985. Anthropology and on-farm research. *Hum. Organ.* 44:114-124.
24. Tripp, R., P. Anandajayasekeram, and G. Sain. 1990. The design and management of call system training in on-farm research. CIMMYT Economics Program Working Pap. CIMMYT, El Batan, Mexico.
25. Tripp, R. and J. Woolley. 1989. The planning stage of on-farm research: Identifying factors for experimentation. CIMMYT and CIAT, El Batan, Mexico.