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In-Country Training in On-Farm Research: Issues
and Experiences from Venezuela.

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1.0) Introduction

National agricultural research programs are increasingly interested in on-farm research (OFR) techniques, especially those techniques that incorporate a farming systems perspective into research decision making. One major obstacle to more widespread use of OFR techniques is lack of trained researchers. This situation is not improved by high rates of turnover in field research staff.

International agricultural research centers, as a consequence, have given high priority to in-service training programs. CIMMYT, for example, provides in-service training in maize and wheat production agronomy, crop improvement, production economics for OFR, and other themes. Regional workshops and short-courses are frequently conducted by outreach staff.

2.0) In-Country Training

Recently, a new training format was added to CIMMYT's array of training activities: in-country training in on-farm research. Seen as complementary to in-service training and regional workshops, in-country training has the following objectives:

- 1) Conduct training in the integrated process of on-farm research beginning with assessment of farmers' circumstances and proceeding through design, planting and analysis of on-farm experiments. Emphasis is on the implementation of the entire process in one study area.

2) Increase training volume in a cost - effective manner. Such training should leave in each contry a cadre of technicians who understand OFR and are acquainted with the detailed steps in its conduct, achieved at a lower unit cost per trainee than is obtainable through in-service training at center headquarters.

3) Actually initiate an OFR program in the study area chosen in conjunction with the host country. This program can serve as a demonstration of OFR procedures to a wider audience within that country.

4) Feedback to center headquarters. Given that in-country training courses encompass the whole OFR process, they will likely confront novel situations for farm surveys and on-farm experiments. This experience can be used by headquarters staff to develop and adjust procedures and modify training content.

To achieve these objectives, an in-country training strategy has been developed with two salient characteristics: learning-by-doing, and the use of what one may call the "interphase" or "call" system. In the in-country training strategy, course participants do not just learn OFR concepts in a classroom; they are required to personally conduct all OFR steps in one study area. They review secondary data, conduct exploratory and formal farm surveys, use survey results to design new technology through the pre-screening of prospective technological components, and plant, observe, harvest and analyze the resulting set of on-farm experiments. CIMMYT headquarters and regional staff provide the required methodological lectures and seminars, and participate in all of the field

work.

To achieve cost-efficiency for such an ambitious set of research activities, the "call" system is employed. This is a system whereby CIMMYT staff and a substantial number of course participant meet for short periods or "calls" (1 - 2 weeks each) in the selected study area, at key moments in the OFR process. The number of "calls" can vary but a complete course will consist of about six "calls", as follows:

- 1) General overview, exploratory survey (2 weeks).
- 2) Formal survey, analysis (2 weeks).
- 3) Planning of experiments using survey results (1 week).
- 4) Agronomic overview, planting of experiments (2 weeks).
- 5) Field observation, follow-up of farmer collaborators (1 week).
- 6) Harvest of experiments, agronomic, statistical and economic analysis (2 weeks).

A relatively large number of students from one country ^{1/} are thereby enabled to participate in the entire OFR process - at a cost of

^{1/} The optimal number of course participants is an unresolved issue, but will likely be between ten and twenty. This compares favorably with the maximum of two to four trainees per country that can fit into an in-service training course at headquarters.

about ten weeks apiece, distributed over one year.

3.0) Issues in In-Country Training and Experiences from Venezuela ^{2/}

To date, CIMMYT has completed an in-country training course in only one country: Venezuela. A second such course is currently underway in Honduras while a third is scheduled to commence in early 1982, in Zambia. The aim of the remainder of this paper is to present selected issues associated with the in-country training strategy, especially the economics component, and discuss them in light of experience gained in Venezuela.

3.1) Selection of Host Country

In-country training OFR requires a substantial investment on the part of the host country: vehicles and support, trainee per-diem, and frequent follow up on trainee trials between calls. Even when special project funding is available, ^{3/} there are demands on the time and resources of the national program. Consequently, in-country training is best conducted in countries where a commitment to OFR is already present, but where lack of trained personnel frustrates the implementation of OFR at the national level. Stated somewhat differently, in-country training

^{2/} In this section, issues and examples from Venezuela will be offered only for the economics input into the course. It is to be hoped that in a future version of this paper, or in a separate paper, issues and experiences will be shared with respect to the agronomy input.

^{3/} In Honduras, for example, room and board for course participant is being paid by USAID.

is probably not the most efficient way to demonstrate the benefits of OFR to a national program.

In Venezuela, for example, OFR received support from top levels in the national program. However, OFR concepts as proposed in the course tended to conflict with those found in an indigenous, on-going program to "diagnose" farmer needs. This "diagnostic" program, using roughly 10% of the research budget over a five year period, relied heavily on secondary data and a single-shot nation-wide farm survey with standardized questionnaire, in order to formulate computer models of farming systems.

As a consequence, excessive time in the first calls were spent in comparing and contrasting the CIMMYT OFR strategy with Venezuela's own "diagnostic" program. Furthermore, course participants were not wholly free to implement OFR procedures in their respective areas.

3.2 Selection of the Study Area

The selection of the area in which in-country training will be conducted is of prime importance. The ideal study area must meet numerous standards: (a) It should be fairly representative of agricultural conditions found in other parts of the country (b) It should have a reasonably good road system, for efficiency in trainee fieldwork (c) It should have several readily distinguishable recommendation domains, to demonstrate the importance of the concept without discouraging trainees in domain delineation (d) It should offer some room for improving farmer resource productivity (e) It should have a local experiment station or

research office, the staff of which can follow up trainee experiments between calls. (Better yet, these local researchers should have been involved in a previous demonstration of OFR techniques in that same area.) (f) It should have adequate training facilities: housing and food service, photocopy service, seminar and meeting rooms, etc. (g) For CIMMYT to become involved, maize, wheat or barley must be an important crop. In practice, compromises have to be made and decisions must be quickly taken. Clearly, the most important criteria are (e), (f) and (g).

In Venezuela, the Yaracuy Valley was chosen for the course study area. It was a major maize-producing area within Venezuela and the nearby city of Barquisimeto offered ample opportunities for food and lodging. The staff of the Yaritagua experiment station, located within the study area, were enthusiastic about OFR concepts and were able to provide follow-up for trainee trials. ^{4/}

On the negative side, the local farming system was simpler than is usual in Venezuela. Farmers grew one crop of maize or sorghum per year, with a few of them planting a second legume crop. Livestock activities were of little importance. Furthermore, farmer resource productivity was already high and recommendation domains were not as easy to distinguish as would have been desirable. On the whole, however, this target area was an adequate choice.

^{4/} The arrangement in Venezuela was that trainee trials formed the core of the official experimental program of the Yaritagua station. The trials were, then, not so much "trainee trials" as core program activities.

3.3) Number and Selection of Course Participants

There is an obvious trade-off to be considered when choosing the number of participants for in-country training: more trainees means lower unit cost per trainee, but it also increases problems in the coordination of fieldwork, and in arrangements for transport. Most fieldwork is conducted by dividing trainees into small groups. More trainees, then, means larger groups and/or more of them. In farm survey work, large groups tend to inhibit the farmer respondent. Similarly, a larger number of small groups increases the problems in supervising survey fieldwork, in interpreting survey results, and in obtaining sufficient vehicles.

In Venezuela, ten trainees participated in the course. One CIMMYT staff member, working virtually alone, was just able to coordinate the survey fieldwork in the first two calls. (Trainees were divided into 4 groups of 2-3 persons each.) In subsequent calls, two CIMMYT staff were present and problems of supervision were less serious. ^{5/}

With respect to trainee selection, the ideal set of participants would be composed of those researchers and extension specialists who are assigned to work in the field in OFR in the several selected OFR target areas. A case can also be made for including 1 - 2 researchers from national program headquarters. In any event, it is virtually essential that both the OFR team and the head of extension for the course target area be included.

^{5/} In Honduras, fifteen researchers are participating in in-country training. With considerable planning in team organization, 2-3 staff members were able to adequately supervise survey fieldwork.

In Venezuela, no on-farm researchers had been named prior to the commencement of the course. The decision was made to name two technicians from each regional experiment station (regardless of the likelihood of OFR being implemented at that station). There was a tendency to name researchers engaged in the special "diagnostic" program referred to earlier (section 3.1). ^{6/}

3.4) Number and Organization of Calls

When in-country training was first proposed, there was more concern that the six "calls" included in the complete course (described in section 2.0) might be excessive. One proposal was to merge the first three calls (exploratory survey, formal survey, technology design) into one call, in which trainees would use an existent farm survey as a base for taking research decisions. Others felt that this shortcut would suffer from two disadvantages: (a) trainees would not acquire the data collection skills needed to assess farmers' circumstances (b) trainees might face more difficulty with the pre-screening process, because they would be less confident in their ability to relate alternative research opportunities to resource bottlenecks and system interactions.

In Venezuela, all three initial calls were included in the

^{6/} In Honduras, participant selection was more rigid, approaching the ideal case fairly well. Included in the course are the OFR teams and extension specialists from the study area, and from two other areas where OFR is being undertaken.

course. ^{7/} Few disadvantages and several advantages were found. Problems of trainee absenteeism did not occur, probable because the calls were planned for periods with few competing research activities. Trainee acquaintance with the study area through their own survey fieldwork did help in the pre-screening call. This call was sufficiently difficult even with this knowledge - without it, the trainees would have been hard pressed to trace out exactly why prospective treatments would or would not be attractive to area farmers. Finally, in a final evaluation by the trainees of the whole course, there was no proposal to cut the number of calls; on the contrary, most wished to re-instate the (missing) fifth call on field observation.

3.5) Preparation of Teaching Materials

In-country training appears to take only a little time - after all, CIMMYT staff and trainees are only together for a week or two during each call. However, these brief periods are characterized by intense activity, so considerable preparation must be done beforehand. For all calls, lecture notes, hand-outs and readings, and exercises must be prepared. These increase in importance as the number of trainees increases. With large classes (more than 8-10 participants) informal discussion and individual follow-up become unwieldy although these remain important.

^{7/} The course was not complete, however. At the request of a CIMMYT staff agronomist, the fifth call (field observation) was not conducted.

With respect to specific calls the following should be performed re. course materials:

Prior to the first call (exploratory survey) available secondary data on the study area should be collected and reviewed. Plans should be made with respect to which points should be made with which secondary sources. Prior to the second call (formal survey), the trainee draft of the exploratory survey report should be edited, to insure that hypotheses on important interactions and resource bottlenecks are included. Furthermore, an adequate sampling frame must be found or developed before this call gets underway. This may require staff time in-country between calls.

Prior to the third call (technology design), survey conclusions must be written up (there is normally insufficient time in the second call to finish survey analysis and to write up the corresponding conclusions). This report must be carefully drafted because it provides much of the basis for the planning of on-farm trials.

Prior to the final call (harvest and analysis), exercise sets and current prices for economic analysis must be prepared.

In Venezuela, the best secondary data on the study area, especially for agroclimatic variables, was to be found in a draft report of the local "diagnostic" program team. Despite repeated requests, however, it proved to be impossible to obtain the needed data until the end of the second call. Arrangements made with trainees after the first call did,

fortunately, lead to a usable sampling frame ^{8/}. Final analysis and writing up of the formal survey was conducted in Mexico by one of the Venezuelan trainees, under the supervision of CIMMYT headquarters staff.

3.6) The Exploratory Survey

Based on the exploratory surveys conducted in the past calls in Venezuela and Honduras, it appears that trainees tend to be content with mere description of the current farmer practice, crop by crop and operation by operation. Trainers need to insure that hypotheses emerge that explain farmer practice in terms of resource competition, biological interactions, consumption/production links or other system interactions. Two techniques can help here: (a) firm and consistent use of survey guidelines that explicitly include themes on interactions (b) expansion of "integration" sessions in which different survey teams report their findings, and general conclusions are drawn. (As course size increases, longer "integration" sessions are needed more frequently.) During these sessions, trainers should be insistent that course participants trace out interactions and their influence on crop management.

^{8/} However, similar arrangements in Honduras led to an incomplete sampling frame, heavily biased in favor of extension worker collaborators. An adequate replacement frame was hurriedly constructed from Malaria control data during the second call. Better and earlier planning would have been preferable, and is hereby recommended.

3.7 The Formal Survey

Experience in Venezuela and Honduras indicates that an immense amount of work must be performed during the second call (formal survey): questionnaire development and several field tests, sampling, data collection and editing, coding, and a good bit of the statistical analysis of survey results. In order to maintain the work load at a manageable level (and therefore allow trainees to follow and understand what is being done), several techniques can be used. The first is an insistence on a very short questionnaire, measuring 50-60 variables at most. A short questionnaire helps speed along all other steps. Furthermore, it is excellent practice for the trainees to be forced to separate the critical issues from the merely interesting. Second, the use of cluster sampling can provide efficiency in fieldwork. With only two visits, work with a given cluster can usually be finished. During the first visit, the questionnaire can be field tested, second stage sampling performed, and farmer dates arranged with chosen respondents. In the second visit, data can be taken, often with remarkably low rates of nonresponse due to the prior notice given to each farmer.

3.8) Technology Design

The major problem observed in the third call (technology design) in Venezuela was that the trainers moved too quickly and some of the participants never really caught up. To be sure, technology design is a complicated business. Attention must be given to ranking production limiting factors, estimating likely profitability of alternative

treatments, estimating the likely consistency of alternative treatments with the current farming system, identifying likely physical interactions between chosen experimental variables, organizing chosen treatments into efficient experimental designs, and setting recommendations for site selection and levels of fixed factors. The input into this call is the report on survey results; the output is a set of fieldbooks for various on-farm trials.

Perhaps the best way to insure that trainees actively participate in this call (and follow the logic of each step in technology design) is to replace the customary design process (simultaneous consideration of all factors listed above) with an orderly and ordered list of research decisions, together with criteria for taking each one. In other words, more work is needed here on development of training materials.

4.0 Conclusions

In-country training in on-farm research is a new approach to training that appears to reach its main objective: train larger numbers of researchers in OFR methods, in a cost-effective fashion. However, it is complicated and demanding on trainers. This paper is a first attempt at reporting experiences in in-country training, in order to ease the way for future exercises.