CHOICE OF DIAGNOSTIC SURVEY METHOD IN ON-FARM RESEARCH

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INTRODUCTION

One of the most striking features of agricultural research in developing countries over the past decade has been the growth of the farming systems approach. This has led to a wide array of research projects and programs which share a systems perspective, as researchers have come to accept the importance of understanding the complex set of circumstances that affect farmer decision-making. But attention to farming systems has yet to produce a common methodology for doing agricultural research. Although most agricultural research with a systems perspective is organized around a set of stages (e.g., diagnosis, planning, experimentation, evaluation, and recommendation), the exact procedures to be used at each stage are still a matter of debate. This paper examines some of the criteria and options relevant to the selection of procedures for the diagnostic phase.

Because diagnosis is the initial phase of on-farm research [1/] it is particularly important that it be carried out competently. But because the purpose of on-farm research is to provide recommendations for farmers, it is also important that the diagnosis be done as quickly and efficiently as possible, so that researchers can concentrate on the design, management and analysis of the on-farm experiments that will be the principal sources of information for deriving those recommendations.

1/ This paper is based on experiences derived from the development and execution of a class of production research with a farming systems perspective called on-farm research (OFR). An overview of OFR is presented in Byerlee, et al. (1982), and further details will be found in _____.

Choice of diagnostic procedures is thus subject to considerations of both accuracy and efficiency.

DIAGNOSIS

Before examining the various alternatives available for carrying out a diagnosis, it will be best to review the goals of this stage of on-farm research. Whatever techniques are chosen, they must fulfill certain criteria if they are to be of maximum utility to subsequent stages of research. Diagnosis in OFR is carried out in order to: describe key elements of the farming system; identify particular problems and practices which offer opportunities for investigation; understand the constraints that farmers face in relation to these problems and practices; and test the feasibility of possible solutions.

There are two features of these diagnostic goals that are worthy of note. First, they imply a narrowing of focus as the diagnosis proceeds. Although the initial phase of diagnosis may embrace a wide range of topics, attention is soon focused on a limited number of enterprises and problems which merit careful description. The description soon leads to the identification and analysis of a relatively few research opportunities, and these in turn call for a consideration of possible interventions in the context of the system under study. The information provided by a good diagnosis leads to the design and execution of an on-farm experimental program, and a feedback of information to experiment station researchers, aimed at the resolution of high priority problems.

The second feature of these diagnostic goals is their

interrelatedness. The choice of the elements of the system to be described rests in large part on judgements about research opportunities. Designation of research opportunities, in turn, relies both on an understanding of the rationale for farmers' practices and on a familiarity with the types and limitations of new technological solutions that can be brought to bear on a particular problem. Although these elements are closely related to each other, it will be helpful to examine each one separately in a bit more detail, in order to further understand the purpose of a diagnosis.

Description

One of the primary goals of the diagnosis is the description of the relevant aspects of the farming system(s) under consideration. "Relevant aspects" are those that have a bearing on important research opportunities. There is often a temptation to try to describe all the elements of the system, on the theory that they are going to be related, directly or indirectly, to the problems that require investigation. Although this strategy respects the logic of the systems approach, it is not the most efficient way of exploiting the insights which a farming systems perspective brings to agricultural research. What the farming systems perspective does is to tell the researcher that any problem identified cannot be understood in isolation; the challenge is to identify those aspects of the farming system that interact in important ways with the primary production problems and include them in the description.

To illustrate this point we will make reference to an area on the

north coast of Honduras, where shifting cultivation is practiced and where an on-farm research program was initiated. A diagnosis was carried out to orient a research program for rainy season crops. The diagnosis focused on maize and rice (the major rainy season crops), and little effort was spent at describing minor crops (cassava, bananas, coffee) or the major dry season crop (beans) once researchers were certain that there were no significant interactions (such as competition for land or labor) between these and the target crops.

Not only did the description include only two crops, but not all aspects of the production of these crops were included in the description. In the case of maize, for instance, several elements received little attention. Conversations with farmers and observations in their fields indicated that insect damage was not a serious problem, so little effort was spent on looking at insects. Similarly, harvest seemed to present few problems, so there was no need for a detailed description of harvest practices.

On the other hand, land preparation, weed control, and fertility all appeared as possible candidates for improving productivity, so much more attention was given to these aspects of the system.

Identifying Opportunities for Investigation

It is relatively easy to find problems with farmers' production practices, but this is only the first step towards identifying opportunities for investigation. That is, many of the problems that are identified are minor, not amenable to solution over the short run, or

interact strongly with other aspects of the system which themselves may present more important opportunities.

In the Honduras case, for instance, insect control in maize could have been improved, but it caused only minor losses in production. Farmers used no chemical fertilizer, but a consideration of the high costs of the products (and of transport into this isolated area) caused researchers to postpone work on fertilizer. Plant spacing appeared to be inadequate, but it was realized that this was related to methods of weed control and fertility; thus plant spacing by itself was not an opportunity, although it did offer possibilities when combined with other research priorities.

The identification of opportunities during diagnosis also proceeds in conjunction with the delineation of recommendations domains. 2/ A recommendation domain is a group of farmers who share similar circumstances and are eligible for the same recommendation. Opportunities, and hence domains, may vary within a research area. In the Honduras case, a cover crop of velvet beans appeared as a possibility for maintaining fertility, controlling weeds, and intensifying the system by allowing several years of continuous maize cropping. But this was only an opportunity for farmers who owned their land; renters would not be willing to invest in such a long-term improvement unless they had security of tenure. There were thus two recommendation domains with respect to this opportunity.

2/ For further information on recommendation domains, see Harrington and Tripp.

Understanding Farmers' Constraints

A particular problem cannot really be called an opportunity until researchers understand what the causes of the problem are. In Honduras, for example, it was obvious that weed control in maize was inadequate. But improved weed control could not be considered as an opportunity without an analysis of weed control within the farming system. It may be, for instance, that farmers left weeds in their maize fields to be used as fodder, or as a means of erosion control. In this case, experimentation with more efficient weed control methods would be inappropriate, at least until alternative means of dealing with farmers' constraints (need for fodder, erosion control) were devised.

The diagnosis in Honduras, however, showed that most farmers were using both herbicides and hand labor to weed their maize. Their chemical weed control was inadequate, both with respect to products and timing, and they also faced a labor shortage at weeding time. It thus became clear that experimentation with alternative methods of chemical weed control was indeed an opportunity for investigation.

Testing Possible Solutions

Not only is the identification of research opportunities linked to an understanding of the farming system, it also depends on a knowledge of possible technological alternatives. That is, researchers must consider the balance between the severity of a problem and the availability of technology. In the case of insect control, researchers realized that losses due to insects were relatively minor and that inexpensive insecticides were not available; thus insect control was not a priority.

In weed control, it appeared that there were more efficient herbicides available and that these would indeed offer opportunities for investigation. Researchers however looked at both the experience of those farmers who were using different herbicides, and at the availability of back pack sprayers in the countryside, to test the feasibility of their proposed improvements.

Summary and Perspectives

A diagnosis in on-farm research serves several interralated purposes. Because these are interrelated, the diagnosis must take them all into account simultaneously. Choice of topics for description depends on the research opportunities identified, for instance, and these opportunities in turn depend on an assessment of the feasibility of technological alternatives.

A diagnosis must be rigorous, but it also must conform to the resource constraints of national research programs, which have neither the time nor money to wait for elaborate studies to be completed and analyzed. Thus neither a broadbrush survey which provides only a general description (e.g., "The farmers are poor, have no access to credit, and grow maize and beans") or an exercise in detailed description (e.g., "Farmers average 23.6 man-hours per hectare weeding their millet") are appropriate.

A diagnosis is carried out in order to get experimentation started. OFR is an iterative process, and not all issues can be resolved with an initial diagnosis. After experimentation has begun, special studies may

be carried out to examine particularly difficult problems. But in this paper we are simply considering the type of diagnosis necessary to initiate an experimental program.

With these requirements in mind, we now turn to consider alternative procedures for carrying out a diagnosis. The three procedures are the informal survey (or sondeo), the sequence of an informal followed by a formal survey, and a combination of the informal and formal surveys.

THE INFORMAL SURVEY

The use of informal survey techniques in development work has increased rapidly in the last few years, reflecting interest in "rapid rural appraisal" (.....) In on-farm research, much attention has been given to the sondeo, a type of informal survey developed by ICTA, the Guatemalan Institute of Agricultural Research (Hildebrand). ICTA found that the time required to plan and execute formal diagnostic surveys, combined with the expense of analysis, made them of limited utility in on-farm research. For this reason, they turned to more rapid diagnostic techniques, which led to the development of the sondeo. The sondeo is normally the only diagnostic technique used to plan experimentation in Guatemala. When we speak of sondeos, we will thus refer to a type of informal survey which stands on its own.

In CIMMYT's OFR procedures, an informal survey may or may not stand on its own. Experience has shown that although there are instances where an informal survey is sufficient, there are many cases where a formal survey is very useful for doing an adequate job of planning experiments.

This section will discuss informal surveys; it will refer to the CIMMYT-type informal survey, as either the only diagnostic technique for planning experiments, or in combination with a formal survey. In the first instance, we will assume that this is the equivalent of a sondeo.

The value of informal surveying is now generally recognized. Even if researchers wish to carry out a formal survey, they must first spend some time in the area, observing problems first-hand and talking with farmers, in order to get an idea about important topics and variables to be included in a questionnaire. There are several requirements for the execution of a good informal survey. 3/

First, the informal survey should be multidisciplinary. It is an opportunity to explore farmers' problems and practices from many different viewpoints. Relatively senior scientists should participate, and there should be a constant interchange of ideas and observations between disciplines (see Hildebrand for more details).

Second, the informal survey should be carried out according to a set of guidelines. These guidelines may be rather broad to begin with (Collinson, 1982), but they are quickly refined and focused as the informal survey progresses. Researchers should conscientiously reformulate their guidelines before each new day of surveying.

3/ This discussion assumes that researchers have first reviewed the secondary data available for the area and have talked with local extension agents and others in the area.

Third, the survey should be timed so that observations can be taken on the crop. Wherever possible, conversations should be carried out with farmers in their fields. This means that agronomists will have to decide on the optimum time for an informal survey in order to take observations.

Finally, it must be reiterated that the informal survey has several goals. Even if it is to be followed by a formal survey, the object is not mere description. It must provide opportunities for investigation, explanations regarding the compromises that farmers make in their production practices, as well as explore the feasibility of possible solutions.

FORMAL SURVEY

There are times when an informal survey provides sufficient information to begin experimentation. The survey in these cases provides a clear understanding of the problems that farmers face, the opportunities for improving production, and the technological components that are most promising. But in many other instances researchers complete an informal survey still uncertain of the best directions for research. The more complicated the farming system, and the more potential recommendation domains in the area, the more likely this is to be the case.

In such cases one might imagine that a longer period of time spent at the informal survey might be the remedy. If researchers talked to even more farmers, they would get a clearer picture of the research area. But there are limits to the time that can be invested in an informal

survey, and weaknesses in the informal survey for providing a clear description of a complicated system. Two of the principal weaknesses are in sampling and quantification.

Relatively little attention is given to sampling in an informal survey. We are reminded by Chambers (....) of the many possible biases that may characterize the visits of researchers to the countryside, leading to what he calls "development tourism". Researchers must be conscious of these biases, and work to counteract them. Working with maps of the area, researchers can try to visit representative sites, off the beaten path. They may even try to devise some rough sampling scheme for talking to farmers, deciding to visit every tenth farmer encountered along a certain path, for instance. But there are limits to this type of sampling in an informal survey, especially as one of the principal advantages of the informal survey is precisely its flexibility and spontaneity, its ability to allow researchers to follow their instincts and interests. Many times as well, researchers in an informal survey will find it useful to talk to unrepresentative (e.g. particularly knowledgable or articulate) farmers, or to groups of farmers. It is thus difficult to be very precise about sampling in an informal interview.

Related to the problem of sampling is that of quantification. The nature of the interviewing process in the informal survey makes it difficult to quantify results. Again, there are ways of trying to remedy this. More structured interviews might be attempted, with records kept of responses to a set of questions; or a content analysis of the interviews might be carried out (Shaner, et al., p. 284). But these tend

to slow down and limit what should be a set of free-flowing conversations with farmers and observations in their fields. In the methodology used by ICTA (...) it is assumed that farm records, which are begun with the experimentation, will provide quantitative information. This may be true, but this information is obviously not available for the planning of that experimentation. It is also questionable if farm records are the most efficient way of either identifying relevant data or of collecting it. 4/

For these reasons it is often helpful to follow an informal survey with a short, well-focused formal survey, using a questionnaire and a statistical sample. If the informal survey has been done well, researchers should be left with a limited set of issues to be dealt with via a questionnaire. The formal interview should take between 30-60 minutes, and the survey should concentrate on qualitative data. Sample sizes of 30-35 farmers per recommendation domain are usually adequate. Such surveys can be rapidly analyzed, if needs be by hand, and the information ready for planning experiments within a short time.

We shall return to the example of the research program in northern Honduras to provide an example of the uses of a formal survey. Table 1 summarizes selected information from an informal survey done in the area, and compares relevant information from the formal survey.

4/ Footnote re farm records for monitoring and evaluation - there are alternatives - See Martinez and Sain.

Table 1. A Comparison of Informal and Formal Survey Results in Northern Honduras

Informal Survey Result	Formal Survey Result	Contribution of Formal Survey
1. No farmers use fertilizer on their maize	(No questions on fertilizer in formal survey)	Question not required
2. Farmers begin planting maize after planting rice	67% of farmers plant rice before June; 80% of farmers plant maize June or July	Confirm informal survey
3. The principal labor shortage comes at planting time; this restricts the amount of land that can be cultivated	58% of the farmers say they are busiest at weeding time. 39% say that the reason they don't plant more maize is because of scarcity of land; 50% say cash shortage and 11% say shortage of labor	Contradict informal survey
4. The principal maize varieties that farmers plant are: tusa morada, olotillo, and sintetico	Tusa Morada is planted by 56% of the farmers; olotillo is planted by 19%	Give more precise information
5. Some farmers rent their land	52% of the farmers are renting land	''
6. Many farmers use herbicides to control weeds in maize	69% use a post-emergence herbicide; of these, 84% use 2,4-D. Of those who use 2,4-D 63% apply it 22-30 days after planting. This is followed by a hand weeding; in 48% of the cases 11-20 days after applying 2,4-D	Quantify
7. Many farmers use herbicides to control weeds in maize	87% of the farmers who use 2,4-D, but 0% of the farmers who use paraquat, have to do a hand weeding	Test hypotheses
8. Some farmers rent backpack sprayers to apply herbicide	67% of the farmers rent sprayers, but there is no relationship between sprayer rental and time of application	''
9. The exact dose of 2,4-D is quite variable	Impossible to estimate exact dose of 2,4-D	Not appropriate for formal survey

(1) Information not required: If researchers are confident of certain types of information, or feel that it is irrelevant to possible research opportunities, questions on these subjects should not be included on the questionnaire. In the informal survey researchers found no farmers using chemical fertilizer, so they did not include questions on fertilization practices on the questionnaire.

(2-3) Confirm or refute impressions from the informal survey: Often the results of the formal survey simply confirm the results of the informal survey, but at times they contradict them. In the Honduras case, most farmers indicated that they planted their rice before their maize, and a question on planting dates confirmed this. On the other hand, conversations with farmers left researchers with the impression that land preparation was the principal factor limiting an expansion of maize area. But two carefully worded questions on the formal survey showed that the majority of farmers had their highest labor demands at weeding time, and that only a small proportion did not prepare more land because of labor shortage. These results gave extra emphasis to the efort to find more efficient weed control methods.

(4-5) Provide more precise information: Besides simply confirming the information from the informal survey, the formal survey can provide more precise results. This can be important for such things as establishing the set of farmer practices that will be used as non-experimental variables, or for establishing the importance of recommendation domains. In the Honduras case, the informal survey

revealed a number of local maize varieties grown by farmers. The formal survey established one of these as predominant, and this was used as the variety in the experiments. The informal survey also revealed that some farmers were renting land, but it was not clear what proportion were in this position. The sampling procedures of the formal survey allowed researchers a better estimate. As it appeared that about half of the area's farmers were renters, they were established as a separate recommendation domain (for those research opportunities that concerned long-term land management).

(6) Quantify: For aspects of the farming system that are particularly important for designing an experimental program it is sometimes useful to have more detailed information. In Honduras, since weed control had been identified as an opportunity for investigation, it was helpful to have data on the exact timing of various practices.

(7-8) Test Hypotheses: It is very difficult to understand relationships and correlations with an informal survey. The need to test hypotheses arises both in understanding farmers' practices and in exploring the feasibility of possible solutions. An example of the former is the question (3) related to time of labor shortage, which helped explain why weed control was less than adequate. Two examples of the latter occurred in exploring the possibility of chemical weed control. The survey showed that the few farmers who used paraquat did not need to do a hand weeding, which gave credence to researchers plans to include this herbicide in their experiments. Concern that farmers who rented sprayers might be delayed in their

herbicide application was eleminated when it was shown that there was no difference in time of application between sprayer renters and owners.

(9) Items not appropriate for a formal survey: Formal surveys cannot provide all types of information. When researchers in Honduras tried to get more precise information from farmers about the quantities of herbicides that they applied, they found the farmers did not have exact information regarding this aspect of their practice. Information that involves measures unfamiliar to farmers, that challenges farmers' memories (such as labor inputs), or that involves sensitive matters such as farm income is often inappropriate for a formal survey.

There are many advantages to carrying out a formal survey. But even when the survey involves a small sample and a short questionnaire it sometimes involves expenses and time investment beyond the resources of national programs. The following section discusses an alternative procedure that provides many of the advantages of a formal survey without demanding such a high investment.

HYBRID SURVEY CHARACTERISTICS (M. Yates)

"Informal" - no questionnaire. May or may not write

Set of variables - but reduced

Sample - this takes time - rough ready ways?

Flexible - open ended as well - but not too much - too confusing

Enumerators - should be senior scientists

Pre-set tables; analysis as you go along

Requires some informal work beforehand

When do it, when not?

EXAMPLE FROM HAITI (M. Yates)