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COMPARING THE RESULTS OF AN INFORMAL SURVEY WITH THOSE OF A FORMAL SURVEY: A CASE STUDY OF FARMING SYSTEMS RESEARCH/EXTENSION (FSR/E) IN MIDDLE KIRINYAGA, KENYA

Introduction: Overview of Farming Systems Research/Extension (FSR/E)

FSR/E aims at improving the effectiveness of national research and extension services in the generation and dissemination of technologies appropriate to farmers. The approach has evolved simultaneously in several developing countries over the past 10 years [1] and is now being advocated by a growing number of donor agencies, international research organizations, and national agricultural research programs. The Agency for International Development (AID) now administers approximately 18 FSR/E projects, or projects with FSR/E components, in Africa, the continent with the most acute food deficits.

A farming system may be broadly defined as the way in which a farm family manages the resources it controls to meet its objectives within a particular ecological, social, and economic setting. In the FSR/E approach, researchers collaborate with extension agents and farmers to develop an understanding of how the farming system functions, to identify system constraints and opportunities, and to plan and conduct experiments to generate technologies that will increase the farm family's productivity and welfare and be acceptable and feasible.

Conventional approaches to agricultural research in many research institutions in the third world are often reductionist in nature, commodity based and exclusively yield-oriented. [2] The FSR/E approach is different from, yet complementary to, the conventional approach. FSR/E has the following distinguishing characteristics (Gilbert, Norman, and Winch, 1980; Shaner, Philipp, and Schmehl, 1982):

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[1] The FSR/E approach incorporates many aspects of work done by previous researchers in rural development. Johnson (1981) and Caldwell (1983) discuss the evolution of FSR/E in the context of other post-World War II development approaches.

[2] See Dillon, 1976, Collinson, 1980, and Shaner, 1982 for a discussion of conventional research approaches in Third World countries.

1. Potential technologies are evaluated from the farmers' point of view, taking into consideration their environment, objectives and priorities, resource endowment and constraints, and present management strategies.

2. The researcher must consider the farm system as a whole. When focussing on a single commodity or operation they must consider how the facet under study relates to other system components.

3. Research is location/farmer-group specific. Experiments are planned, taking into account the circumstances and problems of specific, roughly homogeneous groups of farmers, called recommendation domains.

4. The research team is inter-disciplinary, including both social and biological/physical scientists, and team members work together on a commonly defined research agenda.

5. Much of the experimentation is carried out on farmers' fields, in order to develop technologies relevant to the farmers' environment and to facilitate farmer participation and evaluation.

6. FSR/E crosses the research/extension division. Extension staff play an active role in technology generation and researchers participate in dissemination activities.

7. An FSR/E program is consistent with societal objectives; farmer welfare is enhanced in accordance with national policy guidelines and the long-term interests of society.

The research reported in this paper concerns the survey methods used in developing an understanding of farming systems and planning technologies appropriate for farmers. First, we discuss the use of informal and formal surveys in FSR/E investigations and present the research problem addressed in this article. Next, we present the research design and describe the results of the FSR/E investigation. Finally, we compare the results of the informal and formal surveys and draw conclusions.

Informal and Formal Surveys

Farming systems practitioners generally make use of two types of surveys -- informal and formal. The objectives of informal surveys, also called sondeos, rapid reconnaisance surveys, or exploratory surveys, are to develop a rapid understanding of farmer circumstances through direct, informal interaction between researchers and farmers. Informal surveys have four distinguishing characteristics. First, farmer interviews are conducted by researchers themselves, not by enumerators, as in formal surveys. Second, interviews are essentially unstructured and semi-directed, with emphasis on dialogue and probing for information. Questionnaires are never

used; however some researchers use topic guidelines so as to ensure that they cover all relevant topics on a given subject (Collinson, 1982). Third, informal random and purposive sampling procedures are used instead of formal random sampling from a sample frame. Fourth, in an informal survey, the data collection process is dynamic, that is , researchers evaluate the data collected and reformulate data needs on a daily basis (Honadle, 1982). In a formal survey, reformulating data needs requires changing the questionnaire or adding a new questionnaire; this cannot be done on a frequent basis. Informal surveys are generally conducted over a period of one week to two months during the growing season.

The objectives of a formal survey may be quite diverse -- to verify hypotheses developed during an informal survey, to quantify parameters critical to developing the understanding of the system, or to measure resource stocks and flows. In a formal survey, a questionnaire is administered by enumerators to a random sample of farmers. Formal surveys may involve single visits to farmers or frequent visits over a period of a growing season, a calendar year, or longer. Since questioning is standardized and sampling is random, data are subject to statistical testing procedures.

Most farming systems researchers use a combination of the two types of surveys; a few use one type exclusively. What appears clear, however, is that the role of the informal survey in farming systems and farm management investigations in developing countries has increased in importance in recent years, relative to the formal survey. In the past, the informal survey was generally considered to be a "pre-survey", that is , a preliminary task to complete before starting a formal survey. In fact, its primary function was to contribute to a more effective planning and execution of the formal surveys. In recent years, however, some farming systems researchers have begun to place greater emphasis on the informal survey. For example, Collinson (1982)calls the informal survey the "pivotal" procedure in the diagnosis of farming systems. Hildebrand (1981) claims that well-managed informal surveys can generate the information necessary for identifying principal farmer problems, and planning experimentation to solve these problems.

Indeed, many FSR/E practitioners have found the informal survey to be an extremely useful tool for diagnosing farming systems (Hildebrand, 1981; Rhoades, 1982; Byerlee and Collinson, 1980). The principal advantages are (1)its low cost and rapid turnaround, (2)the emphasis placed on direct researcher-farmer teamwork (3)its sequential, iterative data collection procedure in which data are evaluated and data needs are reformulated on a daily basis, (4) it facilitates interdisciplinary interaction and (5) its conduciveness to collection of data concerning farmers' values, opinions and objectives.

However, informal surveys have important disadvantages as well which may render data inaccurate. First, the sample of

farmers interviewed may not be representative of the group researchers wish to characterize. Second, since questioning is not standardized, it may not be possible to generalize across the farmers interviewed. Thus Shaner, Philipp, and Schmehl, 1982 warn that in analysis of results from informal surveys, statistical testing is not possible, summarization is difficult, and the reliability of conclusions is subject to question.

Research Problem

Because both informal and formal surveys have particular strengths and weaknesses, many researchers use both approaches in their investigations. For example, CIMMYT advocates a two-stage procedure -- an informal survey followed by a formal survey . The principal objective of the formal survey is to verify, using appropriate statistical tests, the impressions developed during the formal survey.

However, given the acute scarcity of research resources in developing countries, the formal survey is too expensive and time-consuming an exercise if it serves only to confirm informal survey findings. Little work has been done to formally compare the information and implications for research from informal surveys with those of the ensuing formal survey for the same group of farmers. Indeed, if the formal survey exercise does not lead to significant improvements in the accuracy of information and the design of experiments appropriate for farmers, one can argue that it is superfluous.

In this article, we examine the utility of conducting a formal survey by comparing the data and the proposed experimental program developed in an informal survey with those developed from an ensuing formal survey in the same area. The utility of carrying out a formal survey, in addition to an informal survey, is evaluated by

(1) comparing the data obtained with those obtained in the informal survey, using a systematic rating system to measure the degree of closeness, and

(2) assessing the implications which the formal survey results have on changing or refining the proposed research and extension program planned following the informal survey.

In addition, we examine some of the sources of inaccuracy in the informal survey findings in order to make recommendations for conducting more effective informal surveys in future exercises.

Research Design

The principal data collection method used in this research is the CIMMYT diagnostic survey. The approach includes the following three steps (Collinson, 1982):

1. Identification of recommendation domains, via a rapid survey of local agricultural extension agents and informal interviews with persons knowledgeable about the area. This task was carried out by the author over a two-week period.

2. An informal survey, undertaken by the author and the Senior Maize Research Agronomist, Ministry of Agriculture, Kenya over a five week period, during May-June, 1981. Others participating in the survey included a bean agronomist, a sunflower agronomist, and a maize breeder. Approximately 60 farmers were interviewed in the informal survey; farmers were selected at random using informal methods, such as deciding to interview the fourth household on a selected path and making sure that farmers from all areas of the zone were selected. A detailed topic list was used to guide the interviews, but interviews were essentially unstructured. Interviews were carried out in Kikuyu, and translated into English for the researchers. Following the exercise, the researchers prepared a written report summarizing the findings and proposing experiments to address farmers' problems.

3. A formal survey, administered to a random sample of 90 farmers. A multi-staged sampling method was employed, and 45 farmers were selected from each of the two recommendation domains in Middle Kirinyaga -- high income farmers and low income farmers. The existence of a relatively complete sample frame for the study area facilitated the sampling process.

The formal survey was carried out over a five week period, which was preceded by three weeks of enumerator training and questionnaire pretesting. The questionnaire was printed in Kikuyu, the native language of all interviewees, and the language in which interviews were conducted. Data tabulation begun while the survey was still underway and most farmers were revisited to check or clarify some of their responses. A written report was completed about five months following the completion of the survey.

In addition to the CIMMYT methods, two additional methods were used to develop an understanding of farming systems. Repertory grid, a tool used primarily by psychologists, was used (1) to elicit from farmers the criteria they use in evaluating alternative trechnologies, and (2) to obtain farmers' evaluations on the performance of each technology (Franzel, 1983). Hierarchical Decision-tree Modeling, used primarily by anthropologists, was used to depict the decision process farmers use when considering alternative actions, and to focus interviewing on those criteria and issues important for understanding their actions (Franzel, 1984).

Principal Survey Findings

This section summarizes the results of the survey exercise

and outlines the production research program developed for Middle Kirinyaga farmers.

Middle Kirinyaga is characterized by small farms of two to six hectares, flat to mildly sloping terrain, and an adequate transportation network. Rainfall averages about 1,000 mm. per year and is distributed over two brief, somewhat unreliable, seasons.

There are two recommendation domains in Middle Kirinyaga: high income farm families and low income farm families. The two are characterized by different farming systems and hence have somewhat different researchable problems and opportunities. Farm size averages two to four hectares for a family of six members and nearly all of the cultivated land of both domains is under intercropped maize and beans. Low income farmers earn most of their income from the farm, whereas high imcome farmers derive most of their earnings from off-farm sources. Most farmers use oxen for plowing and plant maize and beans at the same time plowing is done; maize is planted in rows and beans are broadcast. Few if any purchased inputs are used, with the exception of hybrid maize seed which is used by about one-third of the high income farmers. Yields of both maize and beans are extremely low. Most farmers in both groups keep cattle, mostly Zebu cows, and about one-third of the high income farmers keep exotic-breed cows for a cash dairy enterprise. Farmers of both recommendation domains frequently exhaust their supplies of maize and beans; hence, maintaining adequate food supplies for home consumption is an important problem for most farmers.

The most important constraints limiting farm productivity are lack of cash for purchasing inputs, lack of access to draught power when required, and poor soil fertility. The cash constraint is especially important for low income farmers who may not have cash for even the most basic inputs: purchasing seed and hiring ox-plows. High income farmers may have cash available for investment but they prefer to invest in off-farm enterprises. Access to draught power is also a particularly important constraint for low income farmers. They are often forced to plant late because they do not own oxen or have the cash necessary for hiring them. Soil fertility and structure is becoming an increasingly important problem for both groups as fields are continuously cropped, twice per year, in maize and beans. Few farmers apply fertilizer or rotate their crops and manure applications are too small to have much effect.

The proposals for priority research areas focus on the introduction of new technologies and modifications in the system. These must offer the potential to increase productivity and be both acceptable and feasible for them to adopt. Emphasis is placed on maize and beans, the area's two most important crops. Separate experiments are planned for each income group in instances where their problems differ or where solutions appropriate for one group are not appropriate for the other group.

The two most important research priorities are:

1. Improving soil fertility and structure. The principal activity in this area is an on-farm experimental program to test the effectiveness of readily available coffee husks as manure and to compare them with chemical fertilizer.

2. Reducing the draught power bottleneck. Several means are suggested for accomplishing this objective. First, dry planting must be made more attractive to farmers. A selection program is proposed to select bean cultivars with superior ability to withstand dry planting. Dry planting can also be encouraged by two further steps: treatment of maize and bean seeds against ant damage, and deeper planting of maize seeds. Other means of reducing the draught power bottleneck include the development of infrequent and zero-tillage systems, especially for low income farmers, and the improvement of oxen efficiency through improved plowing equipment.

Several research priorities of lesser importance also merit attention. Researchers can help low income farmers by selecting a palatable bean variety which gives a high return per cost of seeds per hectare to replace Mexican 142. Research work on maize storage, particularly the relationship between hardness of grain and resistance to weevils among available varieties, can assist breeders in the selection of varities which store well. Low income farmers would benefit from a medium-maturing maize composite which stores well and out-yields Katumani and Local at relatively low input levels. A 100-day maize composite would be useful to farmers, particularly low income farmers, by providing a small quantity of much needed early maize. Finally, comments are offered on sunflower production which offers potential for improving the welfare of both high and low income farmers in Middle Kirinyaga.

Evaluating the Utility of Carrying Out the Formal Survey

The purpose of this section is to compare the results of the informal survey with those of the formal survey so as to evaluate the utility of the formal survey. First, the biases involved in the informal survey are reviewed. Next, the effectiveness of the informal survey and utility of the formal survey are evaluated. Two criteria are used to make this assessment. First, data presented in the informal survey report are compared to data obtained in the formal survey. Second, we compare the proposed research program based on formal survey results with the program based only on informal survey results. Thus, we are able to assess the utility of the formal survey for: (1) refining available information on farmers, and (2) formulating a research program which is more relevant to the farmers concerned.

The objective of this section is not to provide a definitive

solution to the issue of whether a formal survey is necessary. As Shaner, Philipp and Schmehl (1982) point out, the issue concerning which methods to use depends on the particular circumstances encountered. However, by examining the performance of different methods in different sets of circumstances, generalizations can be made about which methods to use in which circumstances.

In this section, we assume that our formal survey data set the standards by which the accuracy of our informal survey data are evaluated. Thus the degree of closeness of informal survey data to formal survey data is a proxy for the accuracy of the informal survey data. We make this assumption because the formal survey is (1) administered to a random sample of farmers, (2) uses a questionnaire, thus a set of standardized questions for all respondents, and (3) was preceded by a comprehensive informal survey, which was important for developing an understanding of the local terms of reference critical for questionnaire development.

Before comparing data from the two surveys, we detail the sources of inaccuracy in the informal survey. All sources presented are researcher-based. This is not to say, of course, that there are no farmer-based sources of inaccuracy in either the formal or informal surveys. Rather, we do not discuss farmer-based biases because it is likely that these biases did not vary much between our informal and formal surveys. Thus, they do not influence our comparison. The researcher-based sources of inaccuracy in estimating parameters in the informal survey are listed below:

1. Little Emphasis in Data Collection.

The researchers' estimate of a parameter is incorrect because this parameter is given relatively little emphasis in the informal survey. For example, in our informal survey, we incorrectly estimated the maize plant density because we based our estimates on observation without taking even token measurements.

2. Progressive Farmer Bias.

Here, the researchers' estimate is biased towards the practice of "progressive" farmers that is, he/she overestimates the use of purchased inputs such as improved seed, or recommended practices, such as row planting. This may occur for several reasons: because the researcher is exposed more to progressive farmers in interviews, (b) because most of the researcher's non-farmer contacts -- government officials, marketing agents, extension workers, etc. -- are biased towards progressive farmers, or (c) because the researcher has preconceptions that farmers in particular RD's -- i.e., the high income RD -- should behave as progressive farmers.

3. Compensating for Perceived Progressive Farmer Bias

In this case the researcher perceives a progressive farmer bias and seeks to compensate for the perceived bias. However, his estimate is actually less correct than the original estimate. For example, in the informal survey, we estimated, based on observation alone, that 60 percent of the farmers were low income and 40 percent were high income. However, we assumed our estimate was slightly biased towards high income farmers because their farms were more prominent. Thus, we revised our breakdown of the two groups from 60/40 to 70/30. However, the original estimate turned out to be correct.

4. Lack of Knowledge

This category is a residual classification; it includes all incorrect estimates for which no particular bias or source of inaccuracy was noted.

Evaluation of Data from the Informal Survey

Appendix 1 shows the estimates of 36 parameters made following the informal survey and data for the same parameters from the formal survey results. Each parameter was estimated for both recommendation domains: high income farmers and low income farmers. Appendix 2 shows the direction of bias, the accuracy rating, and the source of inaccuracy for each parameter estimated in the informal survey. Table 1 summarizes the data in Appendices 1 and 2, presenting the accuracy ratings and sources of accuracy across the sample of parameter estimates.

The system of accuracy ratings for parameter estimates was developed based on how close an estimate in the informal survey was to sample data from the formal survey. "Closeness" was measured in three different ways, depending on the type of parameter estimated. If the parameter estimated in the informal survey was the percentage of farmers with a particular characteristic, say percentage of farmers treating their maize against stalk borer, then the following system was used: a margin less than 10 percentage points away from the sample percentage in the formal survey was considered to be highly accurate, a margin of between 10 and 20 percentage points was considered to be moderately accurate, and a margin of greater than 20% was considered to be of low accuracy.

The particular boundaries between the ratings are arbitrary but broadly reflect the degree of closeness and the effects which an error would have on our understanding of the farming system and the planning of experiments. For example, the formal survey indicated that 27% of high income farmers treated their maize against stalk borer. If our informal survey estimate had been off by less than ten percentage points it would have made little or no difference in our understanding of the farming system or experimental plans. But if our informal survey estimate had been off by 30 percentage points -- i.e., if we had estimated that

Table 1

Accuracy of Estimates from Informal Survey, Compared to Formal Survey, and Principal Sources of Inaccuracy, Middle Kirinyaga, 1981

	High Income Farmers		Low Income Farmers	
	Estimates	Percent	Estimates	Percent
Accuracy[a]				
High	18	50	22	61
Moderate	13	36	10	28
Low	5	14	4	11
Total	36	100	36	100
Sources of Inaccuracy[b]				
Lack of knowledge	4	23	6	46
Information not emphasized	5	29	4	31
Progressive farmer bias	11	65	3	23
Countering perceived progressive farmer bias	2	12	5	38
Total	17	100[c]	13	100[c]

[a]This table is derived from App. 1. Accuracy means degree of correspondence with results from formal survey. Accuracy categories are defined as follows: 1 = high, 2 = moderate, and 3 = low. Three different kinds of parameters were estimated:

1. Percentages of the group with a particular characteristic: Here, 1 means estimate was within ± 10% of sample statistics, 2 = within ± 20% and 3 means estimate was beyond this range.
2. Numerical parameters: 1 means estimate was within ± 20% of sample parameter, 2 within ± 40% and 3 outside this range.
3. Non-numerical parameters: 1 = estimate is the same as formal survey estimates, 2 = estimate overlaps with formal survey estimate, 3 = estimate is completely different.

[b]Sources of inaccuracy are discussed in detail in the text. All are researcher-based. They include:

1. Information not emphasized. Parameter given little emphasis in informal survey.
2. Progressive farmer bias: Researchers' estimate biased towards practices of progressive farmers.
3. Compensating for perceived progressive farmer bias.
4. Lack of knowledge: residual classification. Includes all other incorrect estimates.

[c]Sources do not sum to 100, since more than one type of bias may be encountered for a particular estimate.

Source: From. Appendix 1,2

57%, or most farmers, used chemicals against stalk borer -- we would have recommended that all treatments of all maize experiments include chemical applications against stalk borer. This would have been a fundamental error, thus we would label the estimate of 57% to be highly inaccurate.

For parameter estimates of quantities, such as plant population per hectare, an estimate within 10% of the sample estimate was considered to be accurate, 10 to 20% of moderate accuracy, and off by more than 20%, of low accuracy. For nominal data, such as the two principal months in which farmers experience cash shortages, a correct estimate was considered to be highly accurate. A partially correct estimate, say estimating March and April to be the principal months of cash shortage when the formal survey indicates that April and May are the principal months, is considered to be moderately accurate. Estimates which are not even partially correct are considered to be highly inaccurate.

Table 1 shows that over half of the parameter estimates in the informal survey were highly accurate, and that high or moderate ratings were obtained for over 87 percent of the estimates overall. Moreover, there was little difference in the breakdown of accuracy ratings by RD's, that is, income groups.

However, the table shows that there were important differences in the sources of inaccuracy bearing on the two RD's. The most important bias affecting information on the high income group was the progressive farmer bias, which accounted for over half of the errors on estimates concerning high income farmers. It appears that the major reason for this bias was the researcher's expectation that high income farmers should behave like progressive farmers: use purchased inputs, follow recommended practices, etc. Fortunately, the effect of this bias on overall accuracy was limited, affecting less than one-third of all estimates and in most cases, causing "moderate", not "low", ratings. Other causes of inaccuracy included lack of emphasis and lack of knowledge. Compensating for a perceived progressive farmer bias resulted in only two errors.

For low income farmers, lack of knowledge and compensating for a perceived progressive farmer bias were the most important causes of inaccuracy. Indeed, compensating for a perceived progressive farmer bias caused more inaccuracy than the progressive farmer bias itself. Thus, the researchers' own "corrected" impressions turned out to be less valid than the initial impressions in the first place.

Two major implications arise from this discussion. First, the data in this section show that in Middle Kirinyaga the formal survey contributed relatively little to the accuracy of estimates compared to estimates made during the informal survey. Second, the data show a tendency for the researcher, during the informal survey, to try to force high income farmers to be more progressive than they really were and low income farmers to be

less progressive. Indeed, compensating for perceived biases may be a more important source of inaccuracy than the perceived bias itself.

It is likely that the sources of inaccuracy identified in this exercise are common to most farming systems investigations in developing countries. Therefore, some discussion of measures to minimize their effects is warranted

A greater awareness of the progressive farmer bias and its roots, as discussed above, would have assisted this researcher in minimizing its effects. It is interesting to note that the bias had little effect on data concerning low income farmers because we were aware that researchers often mistake small farmers to be more progressive than they actually are. However, we were less aware that the progressive farmer bias was as potentially great for high income farmers as low income farmers; hence, our error in trying to force high income farmers to be more progressive than they really are.

Our efforts to compensate for perceived progressive farmer bias were subject to similar weaknesses. Among low income farmers, we made more mistakes compensating for the progressive farmer bias than were caused by the progressive farmer bias itself! Our overzealousness was due, perhaps, to an unsubstantiated fear that our efforts in the data collection exercise were not sufficient to do away with this bias. However, it appears that they were indeed sufficient; it only proved harmful to make adjustments in the data because of perceived biases. The data thus show that is may be better to accept one's own data rather than modifying it to account for perceived researcher-based biases.

A further proposal for counterbalancing biases in an informal survey is to actively seek interviews with farmer "outliers," farmers who are considered to be somehow eccentric or different from their peers (Honadle, 1982). Interviews with these farmers provide valuable cross-checks and reveal useful insights that do not normally result from interviews with randomly selected farmers.

Contribution of Formal Survey to Experimental Program

The experimental program formulated following the informal survey may be evaluated by comparing it to the program developed after the formal survey. The principal issue posed is whether the formal survey made an important contribution to the development of an experimental program or whether the same research priorities and experiments were formulated following the informal survey. Four areas of information are examined in comparing the two experimental programs. First, we examine the principal constraints and their ranking in importance in the two programs. Second, we compare the principal research areas identified in the two programs. Third, we examine the levels of

non-experimental variables to see if they were fixed at the same levels in each program. Non-experimental variables form the context in which potential technological changes are tested, and modifying their levels can significantly affect the results of the experiments. Fourth, we compare the experimental variables to see if there were important changes made following the formal survey.

Principal Constraints

The principal resource and other constraints to farm development identified in the informal and formal surveys are shown in Table 2. For high income farmers, the two most important constraints identified in the informal survey are also the most important following the formal survey. These constraints are, (1) the low profitability of farm investments relative to off-farm investments, and (2) poor soil fertility and structure. The only important change in constraints for high income farmers between the two surveys concerns access to oxen. Following the informal survey, access to oxen was not considered an important bottleneck for high income farmers since they either owned oxen or had cash available for hiring them. However, in the informal survey, we underestimated the number of high income farmers planting late, after the first ten days of rainfall, and also overestimated the number of high income farmers owning oxen. Thus, formal survey results showed that access to oxen was a more important problem for high income farmers than had previously been thought.

For low income farmers, the ranking of constraints from the two surveys were identical. Cash is the most important constraint, followed by access to oxen and soil fertility/ structure. Labor and land were relatively less important.

Principal Research Priorities

The principal research priorities identified after the informal survey and then modified after the formal survey are shown in Table 3. For low income farmers, improving soil fertility usurped easing the draught power bottleneck as the most important research priority following the formal survey. This did not occur because of any change in the data or in our understanding of the two problems. Rather, the priorities were modified because researchers made an almost incidental discovery of a potential solution to the soil fertility and structure problem while the formal survey was being conducted. Several months before the informal survey began, a coffee processing factory was opened in Middle Kirinyaga to process coffee from neighboring upland areas. During the formal survey, we discovered that the by-products, a mixture of coffee husks and pulp, were being dumped as waste at a nearby site. We contacted the Coffee Research Station and were told that on-station experimentation had demonstrated that the husks were a proven,

Table 2

Researchers' Perceptions of the Most Important Constraints Facing Farmers, from the Informal Survey and from the Formal Survey, Middle Kirinyaga, 1981

Ranking	Constraints of High Income Farmers		Constraints of Low Income Farmers	
	Informal Survey	Formal Survey	Informal Survey	Formal Survey
1	Low Profitability of Crops	Low Profitability of Crops	Cash	Cash
2	Soil Fertility/ Structure	Soil Fertility/ Structure	Access to Oxen	Access to Oxen
3	Cash	Access to Oxen	Soil Fertility/ Structure	Soil Fertility/ Structure
4	Land	Cash	Labor	Labor
5	Access to Oxen	Land	Land	Land
6	Labor	Labor		

Source: Franzel and Njeru, 1981; informal survey notes; Franzel, 1983

Table 3

Researchers' Perceptions of the Most Important Research Priorities for Farmers in Middle Kirinyaga: After the Informal Survey and After the Formal Survey, 1981

Ranking	Research Priorities from Informal Survey		Research Priorities From Formal Survey:
	High Income Farmers	Low Income Farmers	Both Income Groups
1	Soil Fertility/Structure	Draught Power Bottleneck	Soil Fertility/Structure
2	Maize Varieties	Soil Fertility/Structure	Draught Power Bottleneck
3	Draught Power Bottleneck	Maize Varieties	Maize Variety
4	Bean Cultivars	Bean Cultivars	Bean Cultivars
5	Weeding Efficiency	Maize Storage	Maize Storage
6		Weeding Efficiency	

Source: Franzel and Njeru, 1981; Informal Survey Notes; Franzel, 1983

effective manure for coffee and that they were also likely to be effective as a manure for maize and beans. Previously, our solution to the soil problem was fertilizer, which was expensive and which in any case had been tried and rejected by many farmers. Identification of a new and potentially more effective solution to the soil problem elevated soil fertility and structure to the primary research priority for low income farmers in Middle Kirinyaga.

Easing the draught power bottleneck is the second most important research priority and improved maize vareties, bean cultivars, and maize storage retained their ranking as research priorities following the formal survey. There was only one further, fairly minor, change in research priorities for low income farmers. A proposal to increase weeding efficiency was dropped because the formal survey confirmed that weeding labor was not an important system bottleneck.

For high income farmers, soil fertility and structure was already the highest priority research area, even before coffee by-products were identified as a possible solution. This area took on an added importance following the formal survey because coffee by-products appeared to be a useful innovation for high income farmers as well. However, three changes were made in the ranking of research priorities for high income farmers. First, since the draught power bottleneck was found to be of greater importance for high income farmes than had been previously expected, this area was elevated to second in importance, passing maize variety improvement. Second, improving weeding efficiency was excluded from the list for the same reasons noted for low income farmers. Third, maize storage improvement was added to the list. Prior to the formal survey, this had been considered primarily a problem for low income farmers.

Non-Experimental Variables

Table 4 shows that relatively few changes were made in the levels of non-experimental variables between the two surveys. For high income farmers, eight variables remained the same, marginal changes were made for three variables, and important changes were made in two cases. Marginal changes were made in maize variety for main stock, maize variety for early maize and number of weedings. Important adjustments were made in maize and bean plant populations, which had been underestimated. The primary reason for underestimating plant populations was that the importance of these parameters was not given sufficient emphasis, thus a haphazard sampling and estimation procedure was used.

For low income farmers, the results obtained in the informal survey were also fairly accurate, compared to the formal survey. Nine variables were unchanged, one was changed marginally and three important changes were made due to the formal survey results. Important changes concerned maize population, bean population, and time of planting. A marginal change was made in

Table 4

Levels of Non-Experimental Variables in Maize/Bean Experiments Based on Informal and Formal Surveys, Middle Kirinyaga, 1981

Practice/Operation	High Income Farmers		Low Income Farmers	
	Informal Survey	Formal Survey[a]	Informal Survey	Formal Survey[a]
Time of Planting	Five days after rains begin	Same	Two to three weeks after rain begins	Ten days after rain begins
Seed Treatment	None	None	None	None
Method of Land Preparation/Planting	Oxplow, maize in rows, beans broadcast before plowing	Same	Same	Same
Maize Plant Population	15,000	29,700	14,300	24,900
Row Width (cm.)	125	111	130	110
Between Plants (cm.)	40	30	45	40
Bean Plant Density	100,000	160,000	100,000	160,000
Maize Variety for Main Stock	H-511	Local/H-511	Local	Same
Maize Variety for Early Maize	Katumani	Katumani/None	Katumani	Same
Bean Cultivar	Canadian Wonder	Same	Canadian Wonder	Same
Weeding	Two Times; Effective	One to Two Times; Effective	One time; Effective	One to Two Times; Effective
Plant Protection	None	None	None	None
Fertilizer	None	None	None	None
Manure Application	None in Last Year	Same	None in Last Year	Same
Fallow or Rotation	None	None	None	None

[a]"Same" means level is same as in informal survey.

Source: Franzel and Njeru, 1981; Informal Survey notes; Survey data.

the weeding regime. The causes of poor estimates of plant populations were the same for low income farmers as were noted for high income farmers. The cause of the poor estimate of times of planting is unclear, since much emphasis was given to this parameter during the survey. Since the informal survey was conducted just after planting season and the formal survey two months later, it is possible that informal survey responses were accurate in reporting late planting and that farmers' responses in the formal survey were biased towards planting early, the time when most farmers prefer to plant.

Experimental Program

Table 5 presents experimental programs developed following the informal and formal surveys. The two programs are quite similar but there are a few important differences. For research on soil fertility, the coffee husks experiment was included in the experimental program following the formal survey.

The program to ease the draught power bottleneck did not undergo any modification based on the formal survey. The maize variety program, on the other hand, underwent substantial modifications. One variety x fertilizer x population experiment planned for both income groups following the informal survey was omitted following the formal survey. Three research proposals were added, two involving a medium maturity composite and an early maturing composite for low income farmers, and a variety x storage aspects trial for all farmers. However, none of these proposals developed out of new information in the formal survey.

The research plans for bean cultivars underwent two important modifications. First, the problem of bean flowers being destroyed by heavy rain was found to be more severe than had been thought during the informal survey. Thus later flowering became a desired characteristic in bean cultivars and particularly for dry planted ones. Second, high returns to planting costs was recognized as an important criterion for choice of bean variety following the formal survey. Thus, a priority for bean research is to select vigorous, palatable, small seeded varieties to replace Mexican 142. Both additions to the research agenda on beans came about because data collected in the formal survey modified the researchers' understanding of the farming system.

Three other research proposals, all of relatively low priority, changed significantly from one survey to the next. Two proposed weeding improvements, using a new hoe and spacing maize on the square to improve oxen weeding, were excluded from the informal survey because low weeding efficiency was not found to be an important enough problem. Similarly, promotion of small livestock for manure and other purposes was also not found to be important.

Table 5

List of Proposed Experiments and Demonstrations Formulated After the Informal and Formal Surveys, Middle Kirinyaga, 1981[a]

Informal Survey Experimental Program	Formal Survey Experimental Program
1. Soil Fertility	1. Soil Fertility
a. Fertilizer	a. Coffee Husks/Fertilizer
b. Conservation/Use of Manure	b. Same
c. Fertilizer application H	c. Same
2. Ease Draught Power Bottleneck	2. Ease Drought Power Bottleneck
a. Dry Planting	a. Same
1. bean cultivar	1. same
2. seed treatment	2. same
3. deep planting maize	3. same
b. No-Till L	b. Same
c. Stagger Land Preparation	c. Same
d. Improve Equipment	d. Same
3. Maize varieties	3. Maize Varieties
a. Variety x Fertilizer x Plant Population	a.
	b. Medium-Maturity Composite L
	c. Dryland Composite L
	d. Variety x Storage Characteristics
4. Bean Cultivars	4. Bean Cultivars
a. Select for Dry Planting	a. Same
1. deep planting	1. same
2. temperature tolerance	2. same
3. germination	3. same
4. drought resistance	4. same
	5. late flowering
	b. High Returns to Planting Cost
5. Maize Storage Management	5. Maize Storage Management
a. Storage Demonstration L	a. Same H, L
6. Other	6. Other
a. Small Livestock for Manure	a. Sunflower Improvement
b. Dutch Hoe	
c. Maize Spacing on the Square	

[a]"H" or "L" indicates that an experiment is designed with high or low income farmers in mind. Where no H or L is shown, the experiment is designed for both income groups. However, the experiment is not necessarily the same for each group as non-experimental variables and levels of experimental variables are likely to be different for the two groups (see Chapter 6).

"Same" means experiment after formal survey is the same as that planned in the informal survey.

Source: Franzel and Njeru, 1981, Franzel, 1983

Maize storage demonstrations were considered important for farmers experiencing problems storing maize in both programs. Some considerations concerning sunflower development are included in the program following the formal survey but do not reflect any new information gained in the formal survey.

Conclusions

In summary, it appears that the contribution of the formal survey to developing an understanding of the farming systems and an experimental program for Middle Kirinyaga were rather marginal, relative to its costs. The formal survey involved approximately four months of the researchers' time and substantial costs in transport, hiring and training of enumerators, computer and manual data analysis, paper and photocopying. However, there were relatively few refinements made in the experimental program following the formal survey and, in fact, most of the changes were not due to information gained in the formal survey. Rather, they were due to:

1. Incidental refinements and additions which researchers informally discovered, such as the potential of coffee husks. This lends support to conducting a more thorough informal survey, or carrying out more frequent informal surveys in the same area, rather than mounting a formal survey.

2. A deliberate acceptance of lower accuracy in some aspects of informal survey method and analysis, likely due to the fact that the researchers knew that a formal survey would be carried out and thus more precise information would be obtained. The effort to measure plant population reflects this.

It is important to emphasize the danger in over-generalizing from our conclusion that a formal survey was not really worthwhile. Certainly, different methods are appropriate for different sets of circumstances. For example, Middle Kirinyaga has several features which make it relatively easy for researchers to develop an understanding of farming systems without a formal survey. First, the cropping system, composed almost exclusively of maize and beans, is less complex in many senses than cropping systems in other areas. Second, farmers and local officials were exceptionally cooperative. Third, farmers' fields are generally all located at their homestead, making it fairly easy to estimate farm size and generalize about field characteristics.

On the other hand, one can also argue that Middle Kirinyaga has several features which make it more difficult than other areas to study. This lends support to the position that if a formal survey is not useful in Middle Kirinyaga, it will not be useful in most other areas. First, farmers have two cropping seasons per year. This, in effect, doubles the quantity of information needed about cropping practices. Second, two RD's co-

exist in the area and it is often difficult to ascertain the relative numbers in each and the characteristics which distinguish them. Third, there appears to be much variation in how certain operations are performed, e.g., land preparation and planting. Furthermore, it should also be noted that the inclusion of the repertory grid and hierarchical decision tree methods for developing the understanding of farmer decisions in the informal survey made the survey more effective than it otherwise would have been.

Overall, the data in this paper support the hypothesis that the informal survey is an effective and sufficient method for developing an understanding of farming systems and planning experimental programs for farmers. It also suggests that a formal survey may be replaced by (1) a slightly longer and more carefully managed informal survey than would otherwise be conducted, or (2) two or more informal surveys. However, it could also be argued that even if this is so, a very brief, focussed formal survey may be important for verifying selected findings of the informal survey, quantifying a few important variables, providing a cross-check for the informal survey, and lending greater credibility to the diagnostic exercise.

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APPENDIX 1

COMPARISON OF ESTIMATES OF PARAMETERS FROM INFORMAL SURVEY REPORT AND FROM FORMAL SURVEY REPORT
MIDDLE KIRINYAGA, 1981

	High Income Farmers		Low Income Farmers	
	Informal Survey Report	Formal Survey Report	Informal Survey Report	Formal Survey Report
Land				
Farm Size (ha.)	3	3.8	2.5	2.4
Area Cultivated Long Rains (ha.)	2.0	2.2	2.2	1.4
Farmers Who Have Purchased Their Land	30%	23%	0%	2%
Crops				
Food Crops	Maize-Beans	Maize-Beans	Maize-Beans	Maize-Beans
Cash Crops	1) Maize 2) Beans	1) Beans 2) Maize	1) Maize 2) Beans	1) Beans 2) Maize
Percent of Farmers Intercropping Maize/Beans	80%	90%	88%	85%
Percent of Farmers Growing Coffee	40%	51%	15%	25%
Percent of Farmers Growing Sunflower	5%	3%	< 5%	0
Percent of Farmers Growing Cotton	5%	3%	< 5%	4%
Percent of Cultivated Area Under Maize	80%	80%	90%	91%
Percent of Cultivated Area Under Beans	80%	71%	90%	78%
Land Preparation/Planting				
Method of Land Preparation	Own Ox 50%; Rent Ox 41%	Own Ox 43%; Hire Ox 41%; Access to Ox 13%	Hire Ox 50%; Own Ox 30%; Access to Ox 20%; Tractor < 5%	Access to Ox 33%; Own Ox 27%; Hire Ox 27%; No-Till 21%
Percent of Farmers Not Preparing Soil Before Planting	0%	0%	20%	21%
Percent of Area Planted After First Ten Days	20%	20%	60%	36%
Maize/Bean Husbandry				
Long Rain Maize Varieties	Katumani 60% Hybrid 40% 2nd Gen. Hyb. 30% Local 30%	Local 59% Katumani 49% Hybrid 36% 2nd Gen. Hyb. 28%	Local 80% Katumani 67% Hybrid 10% 2nd Gen. Hyb. 10%	Local 77% Katumani 69% 2nd Gen. Hyb. 21% Hybrid 3%
Short Rains Maize Varieties	Katumani 70% Hybrid 30% 2nd Gen. Hyb. 30% Local 30%	Katumani 51% Local 51% 2nd Gen. Hyb. 38% Hybrid 26%	Local 67% Katumani 57% 2nd Gen. Hyb. 10% Hybrid 0%	Local 71% Katumani 60% 2nd Gen. Hyb. 29% Hybrid 6%
Long Rain Bean Varieties	Can. Wonder 80% Mwezi Moja 55% Rose. Oval 22% Mexican 142 22%	Can. Wonder 80% Rose. Oval 41% Mwezi Moja 26% Mexican 142 23%	Can. Wonder 80% Mwezi Moja 45% Rose. Oval 45% Mexican 142 36%	Can. Wonder 73% Mexican 142 31% Rose. Oval 31% Mwezi Moja 12%
Plant Spacing (Maize)	125 x 40	108 x 31	130 cm. x 45 cm.	110 cm. x 37
Plant Population (Maize)	17,000	29,700	14,300	24,900
Stalk Borer Treatment	20%	27%	0	0
Number of Weedings	2	1-2	1	1-2

APPENDIX 1 -- CONTINUED

	High Income Farmers		Low Income Farmers	
	Informal Survey Report	Formal Survey Report	Informal Survey Report	Formal Survey Report
Percent of Farmers Using Fertilizer	10%	18%	< 5%	2%
Percent of Farmers Using Manure	90%	82%	30%	49%
Percent of Farmers Using Maize Storage Insecticide	80%	67%	25%	14%
Average Maize Yield (kg./Ha. in Good Season)	2,500	1,200	1,900	1,100
Livestock				
Percent of Farmers With Zebu Cattle	80%	69%	50%	56%
Percent of Farmers With Exotic-breed Cattle	75%	56%	15%	2%
Percent of Farmers With Cattle	95%	92%	50%	62%
INCOME				
Percent Getting Income From Relatives	0	0	8%	11%
Percent Having Regular Jobs (Salary/Business)	75%	69%	10%	21%
Most Difficult Months for Cash	January, March-May	January, April-May	March-May	March-May
Cash Sources	1) Off-Farm 2) Maize/Beans 3) Milk	Off-farm 2) Maize/Beans 3) Milk	1) Maize/Beans 2) Casual labor	1) Maize/Beans 2) Casual labor
Labor				
Busiest Months	April-May	April-May	May	April-May
Activity at Busiest Time	Weeding	Weeding	Weeding	Weeding
Percent Using Hired Labor (Not including for Plows)	90%	74%	10%	17%
Other				
Ranking of Resource Constraints (Short Run)	1) Soil Fertility 2) Land 3) Cash 4) Ox-Plow 5) Labor	1) Soil Fertility 2) Ox-Plow 3) Cash 4) Land 5) Labor	1) Cash 2) Ox-Plow 3) Soil Fertility 4) Labor 5) Land	1) Cash 2) Ox-plow 3) Soil Fertility 4) Labor 5) Land
Percent Who Have Run Out of Maize During Past Year	20%	64%	60%	53%
Percent Who Have Run Out of Beans Since 1981 Short Rains Harvest	20%	55%	60%	55%
Percent With Zinc Roofs	100%	97%	50%	72%
Principal Distinguishing Factor Between RD's	High-Income	High-Income	Low-Income	Low-Income
Percent of Farmers in this RD	30%	40%	70%	80%

Source: Survey data, as reported in Franzel, 1983.

Appendix 2

Evaluation of Data from Informal Survey Report by Comparing Them with Data from Formal Survey, Middle Kirinyaga, 1981

	High Income Farmers			Low Income Farmers		
	Direction of Bias	Accuracy Rating[a] (1 = high)	Source of Inaccuracy[b]	Direction of Bias	Accuracy Rating[a] (1 = high)	Source of Inaccuracy[b]
Land						
Farm Size	Under	2	Knowledge	-	1	-
Area Cultivated	-	1	-	Over	3	Knowledge, Emphasis
Percent Who have Purchased Land	-	1	-	-	1	-
Crops						
Principal Food Crops	-	1	-	-	1	-
Percent of Farmers Intercropping	-	1	-	-	1	-

[a]This table is derived from Table 1. Accuracy means degree of correspondence with results from formal survey. Accuracy categories are defined as follows: 1 = high, 2 = moderate, and 3 = low. Three different kinds of parameters were estimated:

1. Percentages of the group with a particular characteristic: Here, 1 means RD estimate was within ± 10% of sample statistic, 2 = within ± 20%, and 3 means estimate was beyond this range
2. Numerical parameters: 1 means RD estimate was within ± 10% of sample parameter, 2 within ± 20% and 3 outside this range.
3. Non-numerical parameters: 1 = estimate is the same as formal survey estimates, 2 = estimate overlaps with formal survey estimate, 3 = estimate is completely different.

[b]All sources of inaccuracy are researcher-based.

1. Knowledge = lack of knowledge, no perceived bias
2. Emphasis = information category given little emphasis during informal survey
3. Progressive = progressive farmer bias
4. Compensate = compensating for perceived progressive farmer bias

These sources are discussed in detail in the text.

Appendix 2

-Continued

	High Income Farmers			Low Income Farmers		
	Direction of Bias	Accuracy Rating[a] (1 = high)	Source of Inaccuracy[b]	Direction of Bias	Accuracy Rating[a] (1 = high)	Source of Inaccuracy[b]
Primary Cash Crops	-	2	Knowledge	-	2	Knowledge
Percent of Farmers Growing Coffee	Under	2	Compensate	Under	2	Compensate
Percent of Farmers Growing Sunflower	-	1	-	-	1	-
Percent of Farmers Growing Cotton	-	1	-	-	1	-
Percent of Area Under Maize	-	1	-	-	1	-
Percent of Area Under Beans	-	1	-	Over	2	Knowledge
Land Preparation/Planting						
Means of Preparing Land	-	2	Knowledge	-	2	Knowledge, Progressive
Farmers not Preparing Land	-	1	-	-	1	-
Percent of Area Planted After First Ten Days	-	1	-	Over	3	Knowledge
Maize/Bean Husbandry						
Long Rains Maize Varieties	-	2	Progressive	-	1	-
Short Rains Maize Varieties	-	2	Progressive, Emphasis	-	1	-
Long Rains Bean Varieties	-	2	Knowledge	-	2	Knowledge
Plant Population (Maize)	Under	3	Emphasis, Compensate	Under	3	Emphasis, Compensate

Appendix 2 --Continued

	High Income Farmers			Low Income Farmers		
	Direction of Bias	Accuracy Rating[a] (1 = high)	Source of Inaccuracy[b]	Direction of Bias	Accuracy Rating[a] (1 = high)	Source of Inaccuracy[b]
Treating Against Stalk Borer	-	1	-	-	1	-
Number of Weedings	Over	2	Emphasis, Progressive	Under	2	Emphasis, Compensate
Percent Using Fertilizer	-	1	-	-	1	-
Percent Using Manure	-	1	-	Under	2	Emphasis, Compensate
Percent Using Maize Storage Insecticide	Over	2	Progressive	Over	2	Progressive
Average Maize Yield (Good Season)	Over	3	Progressive	Over	3	Progressive
Livestock						
Percent with Zebu Cattle	Over	2	Progressive	-	1	-
Percent with Exotic-breed Cattle	Over	2	Progressive	-	1	-
Income						
Percent Getting Income from Relatives	-	1	-	-	1	-
Percent Having Regular Jobs (Salary/Business)	-	1	-	Under	2	Compensate
Most Difficult Months for Cash	-	1	-	-	1	-
Principal Cash Sources	-	1	-	-	1	-
Labor						
Busiest Months and Activities	-	1	-	-	1	-
Percent Using Hired Labor	-	2	Progressive	-	1	-
Other						
Ranking of Resource Constraints	-	2	Progressive	-	1	-
Percent who have Run out of Maize During Last Year	Under	3	Progressive, Emphasis	-	1	-
Percent who have Run out of Beans During Last Year	Under	3	Progressive, Emphasis	-	1	-
Percent of Farmers in RD	-	1	-	-	1	-