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SOME METHODOLOGICAL ISSUES IN PREINTERVENTION FARMING SYSTEMS RESEARCH: SELECTING APPROPRIATE TECHNIQUES FOR DATA COLLECTION*

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I

OVERVIEW

The development of an effective and economical methodology for farming systems research has been a principal objective of the collaborative relationship between Cornell University and the Instituto Nacional de Investigaciones Agropecuarias (INIAP). Fieldwork in Ecuador has been conducted using two interview procedures, and these experiences suggest guidelines for farming systems research methodologies.

The strategy we recommend is to begin with regional analysis using structured interviews with informants. This should identify researchable problems and locate districts which are particularly suitable for specific research and extension activities. In regions which will actually receive services, socioeconomic variation should be studied using survey research techniques.

The research design proposed here was not formulated prior to initiating field research. Rather, it emerged and evolved as work continued. During the first phase of research, it appeared that one could obtain valid information about subregions by using structured interviews with informants. During the second phase, therefore, this perception was evaluated by restudying one zone using survey research techniques. Initially, concern was to determine if informant interviews provided reliable information. Subsequently, however, concern with reliability broadened. It became clear that structured interviews and questionnaires had specific strengths and weaknesses.

During the first phase of our work, we learned that regional variation can be tapped by the analysis of secondary data and the judicious use of informant interviewing. The term "secondary data" refers to information which is available in archives or in published sources. It includes maps (e.g. soil types and land use), censuses (e.g. agricultural), and annual reports (e.g. precipitation by reporting station). Secondary data reflect patterns within administrative districts. Field research can build on this knowledge by delineating subregions. Those interviewed are treated as "informants" because they are asked to report on how people like themselves organize farming and relate to outside institutions.

Informant interviews can tap regional variation, provided that major subzones are identified by prior analysis of secondary data and that informants are interviewed with respect to practices in subzones. Research can identify problems or constraints which are directly and immediately relevant to smallholders. The agenda of smallholders can then be considered by researchers and extensionists who serve these regions. Informant interviewing can, therefore, provide valuable information to commodity research programs.

Socioeconomic variation can be measured by probabilistic sampling and appropriate questionnaire design. Typically, the most serious problem with survey research techniques is securing an appropriate list from which to sample. If individuals are to be interviewed about their personal practices and if their responses are to be mathematically manipulated, individuals must be statistically representative of some "universe."

If the problem of random sampling can be resolved, questionnaire design itself is relatively easy. Regional analysis suggests how farms vary, and this provides the information necessary to write questionnaires.

Our experiences suggest that questionnaires should be developed for major landowning strata, including large, medium, and small scale producers. The purpose of developing multiple questionnaires is to learn how different social groups organize agricultural production and how they relate to each other. Such information allows one to put farming systems in their social and institutional contexts.

The general conclusion we draw from our initial Ecuadorian experiences is that different methodologies should be used for different units of analysis. Data collection procedures should vary according to concern with regional or socioeconomic variation. An adequate design for farming systems research should combine informant and survey research techniques.

GENERAL METHODOLOGICAL PRINCIPLES

The story is sometimes told about the child who receives a hammer--and discovers that everything needs hammering. Selecting an appropriate methodology poses analogous problems. Researchers can become so attached to techniques that they use the same methodology whether or not it is appropriate. They can even become so prejudiced that they deliberately reject appropriate and choose inadequate data collection procedures. In both cases, methodology ceases to be a tool which facilitates research, and the scientist becomes like the child with the hammer.

There are serious methodological issues in farming systems research. Nevertheless, there seems to be little concern to develop appropriate techniques and to evaluate their strengths and weaknesses. Two basic positions coexist. One favors rapid diagnostic research. This procedure is defended on pragmatic grounds, but it has little intellectual justification. The second position emphasizes sample surveys. This is defended as a rigorous methodology, but it is difficult to implement

correct procedures in most Third World countries. Consequently, the literature recommends two undesirable alternatives--pragamatic but unprincipled or principled but unrealistic.

The purpose of this paper is to suggest another alternative. Different methodologies should be used for different units of analysis. Specifically, data collection procedures should vary according to concern with regional or socioeconomic variation. An adequate design for farming systems research combines informant and survey research techniques.

Regional variation can be tapped by the analysis of secondary data and the judicious use of informant interviewing. This is compatible with rapid rural reconnaissance or sondeo techniques, provided that major subzones are identified by prior analysis of secondary data and that informants are interviewed with respect to the practices in the subzone.

Socioeconomic variation can be measured by probabilistic sampling and appropriate questionnaire design. Typically, the most serious problem with survey research techniques is securing an appropriate list from which a sample can be drawn. Questionnaire design itself is relatively straightforward. Regional analysis suggests how farms vary, and this provides information necessary to structure questionnaires.

Individual variation exists, but it cannot become a research focus. Dialogue can help technicians understand what people know and why they do things, but these commentaries enrich regional or group level analyses. Even the most sensitive and competent agronomist will never displace farmers as those who tailor recommendations to specific fields.

Underlying the preceeding discussion is the assumption that there are levels of determination in the organization of agricultural production. Regional characteristics limit social variation, which in turn limits

individual variation. By making these assumptions explicit, one can defend on both intellectual and pragmatic grounds a research design which is relatively economical.

ORGANIZATION OF THIS WORKING PAPER

Preliminary research has demonstrated to our satisfaction that much of the information needed to orient research to smallholders' problems can be elicited using the economical technique of structured interviewing. Preparatory analysis of secondary data and the treatment of respondents as informants are central to this recommendation. Follow up research is appropriate in communities which will receive research or extension services. These zones should be studied with survey research techniques, specifically interviewing a random sample drawn from some appropriate universe and using questionnnaires tailored both to the region and to social strata. This is an economical but intellectually defensable sequence for preintervention farming systems research.

Both data collection procedures are reviewed in this working paper. The first section considers the identification of regional variations in farming systems. Discussion proceeds in the sequence that field work should be conducted, beginning with preparation for field research and concluding with the conduct of structured interviews in subzones.

The second major section considers the application of survey research techniques. Discussion begins with a consideration of the universe from which one might sample and proceeds to the design of questionnaires for specific social strata. The thesis of this section is that survey research allows one to identify with precision which social strata exist in a subregion.

The conclusion addresses general methodological issues. The initial section summarizes the strengths and weaknesses of informant interviewing and survey research. The final section identifies some implications for staffing and multidisciplinary collaboration.

II

REGIONAL ANALYSIS

If a farming systems approach is to become an economical research strategy, it is necessary to develop criteria for regional analysis. One hypothesis is that ecological and socioeconomic conditions vary together. This covariation is systematic and observable. The working hypothesis is, therefore, falsifiable.

Techniques for regional analysis exist within both social and agronomic science disciplines. One can perform several discipline-derived analyses and then combine the results. How one combines such results and how one resolves contradictions provide the basis for developing a farming systems research methodology.

Our work in Ecuador became entwined with the concept of "recommendation domains." This concept has a history.[1] Initially a "recommendation domain" was a region which had similar requirements for chemical fertilizers. Thereafter, the term came to include general ecological and socioeconomic conditions. Through accretion, "recommendation domain" came to connote a zone with sufficient ecological and socioeconomic homogeneity that a technology could be recommended as appropriate throughout the region (Shaner, et al., 1982:44). The concept ceased being input-specific (e.g. fertilizers); it became a region within which different kinds of technologies could be diffused.

The concept is simple but fatally flawed. The homogeneity of ecological and socioeconomic conditions must be demonstrated and not merely asserted. One must identify relevant variables and specify how they shall be measured if the concept is to have a meaning. Unfortunately, measurement issues have been systematically ignored. The methodological appendices to Shaner et al. (1982:243-251) illustrate the absence of criteria for conducting regional analysis and delineating homogeneous zones. Espinosa's review (1982) illustrates the absence of explicit criteria in the initial delineation of "recommendation domains" in Imbabura. This lack of specificity encouraged the belief that factors had been considered when they had actually been ignored.

CIMMYT transferred to the smallholder program (PIP) of INIAP an attractive concept which was never adequately operationalized or specified. The notion that zones were ecologically and socioeconomically homogeneous simplified the complexity of the province; it also made managable the task of developing and evaluating appropriate technology. Precisely because of these expectations for homogeneity, PIP technicians became aware that "recommendation domains" were actually heterogeneous. It was this observation which set the INIAP/Cornell team to work on the problem of regional analysis, specifically to develop criteria for the regional analysis farming systems.

PREPARATION AS A PHASE OF RESEARCH

Preparation for field research is critically important. If it is done properly, it can take as long as fieldwork and write up combined. Nevertheless, most discussions of farming systems methodologies place little effective emphasis on preliminary research and data analysis. This omission reflects several biases, none of which is conducive to the

systematic study of agricultural production. Typical objections to preparatory research do not withstand scrutiny.

A fashionable assertion is that nothing meaningful is known about farming in specific regions. This claim is occasionally true, but it usually reflects ignorance. Concerted bibliographic research is necessary to determine that specialized governmental and/or academic studies exist. It is unfortunately true that literature relevant to farming systems research is fugitive and difficult to obtain. Consequently, the perception that nothing is known frequently reflects limitations in the dissemination rather than the accumulation of knowledge.

Preparatory research must review materials directly relevant to the research site, notably publicly financed studies or project proposals. More general materials are also relevant. There is a rich research tradition in sociology and especially anthropology which focuses on agricultural production and the social organization of rural communities. This literature is largely inaccessible to those engaged in agricultural research (Garrett, 1984), except if anthropologists are staff members or consultants to international centers (Rhoades, 1983). Applied research must build on this academic research, and agronomic scientists must be sensitized to basic social scientific understandings about the orgnization of agricultural production and communities.

It is customary to declare that numerical data, especially census data, are worthless. Occasionally, this is true. More frequently, however, it reflects a lack of sophistication in interpreting numbers. Biases in reported census data are both systematic and known. For example, data are typically more reliable for larger versus smaller farms, for commodities monocropped versus intercropped, for permanent versus seasonal

labor. Problematic data can be interpreted, but analysis must be judicious not mechanical. This is a general rule. Sensitive researchers always reflect in manipulations and interpretations the confidence they have in their data.

Finally, the folklore of international agriculture holds that there is no substitute for the "educated eyeball." Belief is that experienced individuals can enter situations without prior preparation and make interesting observations. This may be correct, but such notions provide few suggestions for developing field skills in young researchers. Novice researchers need to articulate criteria they will use in fieldwork, because these ideas constitute the basis from which they develop new ideas.

The same logic applies with greater force to multidisciplinary teams. An ideological preference for intuition undermines multidisciplinary work. Teams need to study available materials, to develop criteria for making judgments, and to modify opinions by contrasting impressions from preparatory and field research. Multidisciplinary research requires self conscious efforts to develop, apply, and modify criteria which are explicit and intelligible. Such clarity also allows incorrect notions to be recognized and rejected as a normal part of the research enterprise.

Research cannot be focused except in terms of what is presumed to be known about a region or process. Consider the fact that neither informant interviewing nor survey research elicited the fact that nematodes were a problem in Pimampiro. Field workers would have pursued this topic had they realized that a nematode problem was likely given the rotation pattern in the area, especially under irrigated conditions. This illustrates a general principle--perception is an active not a passive process (Hammersley and Atkinson, 1983). This is precisely what makes research

problematic and vulnerable to systematic error (Mulkay, 1979). It is important to proceed self consciously, to develop questions, and to sharpen them in the field.

As much work as possible should be completed prior to initiating field research. Moreover, preparatory research should be incorporated as fully as possible into normal activities. It is more efficient that national staff work where infrastrcuture and support services are better. That usually means their own offices rather than a new field site. It is also more economical if staff need not claim per diem and other expenses. Finally, two very different types of people may perform better in their normal environments--retiring individuals who are covered by the social demands of field research and lazy individuals who need discipline and supervision. Under field conditions, both may develop few research/ interview skills. Under office conditions, however, the contributions of each can be maximized.

Preparatory research should make the field team familiar with studies conducted by private individuals and government institutions. Ideally, this information should be collected, analysed, and written up as a pre informe. This initial work permits one to focus structured interviews and to adapt them to a zone.

SELECTING RESEARCH AREAS

One objective of preparatory reserch is to select districts in which to interview. The analysis of agricultural census data is particularly useful. The mechanics of this activity are discussed in two other manuscripts. The general guide (Palacios y Garrett, 1983) explains which variables should be selected for analysis, which frequency distributions should be calcuated, and which tables should be run. The companion

manuscript (Palacios y Garrett, 1984) demonstrates an analysis using the Apple II Plus computer, the Apple Interactive Data Analysis (AIDA) program, and parrochia level data from the Province of Imbabura.

Data from Imbabura illustrate how agricultural censuses can help one select counties in which to interview. A common measure of inequality is the Gini coefficient which can be easily calculated using Golden's program (Palacios y Garrett, 1983). The statistic summarizes the distribution of two variables in comparison to each other. For Imbabura, the proportion of farms was compared with the proportion of area in each farm size category. The Gini coefficient has a possible range of zero (perfect equality) to one (perfect inequality). For Imbabura, the Gini coefficient was calculated to be 0.86, which indicates considerable inequality in landholding patterns.

Within Imbabura there was a range. The most inequitable land holding patterns were in Imantag (0.96), Aconchagua (0.95), and Urcuqui (0.92) (Palacios y Garrett, 1984). Gini coefficients of this magnitude indicate that land is monopolized by large landowners and that there are many landless and near landless households. These social strata do not have sufficient resources to benefit greatly from a farming systems program (Garrett, 1984). Consequently, one can postpone interviews in districts which are predominantly proletarian or semiproletarian until areas with more equitable distributions of land have been served.

The most equitable patterns were observed in San Francisco de Natabuela (0.48), Dr. Miguel Egas Cabezas (0.48), San Francisco de Sigsipamba (0.50), Chuga (0.51), and San Rafael (0.52) (Palacios y Garrett, 1984). In comparison to other districts, small and medium scale producers in these parrochias have relatively good access to productive resources.

Consequently, farming systems programs which seek to meet the needs of small and medium scale producers might choose to interview in these regions.

Census data also provide information directly relevant to commodity improvement programs. Analysis of the 1974 Agricultural Census (Palacios y Garrett, 1984) demonstrated that of farms (UPAs) producing legumes, 75 percent were four hectares or less. Urququi and Pimampiro had the highest levels of commercial bean production, and Cotacachi had the highest incidence of subsistence bean production.

These trends are often known to technicians who work in a zone. This is as it should be, because one presumes that both census data and technicians' perceptions reflect the same reality. The numerical data have the advantage of being more accessible to those who are just beginning to work in a district. Nevertheless, technicians with experience are in the best position to interpret statistics. The recommendation, consequently, is to involve staff from both the national and regional levels in the analysis of agricultural census data.

IDENTIFYING ECOLOGICAL REGIONS

Agricultural census data can identify appropriate administrative districts for field research. The actual conduct of field work, however, requires more detailed information. The principal subregions need to be defined, and interviews need to be conducted in each. Maps, notably soil type and land use maps, are invaluable.

The Cornell/INIAP team has some experience in using maps to orient field work. During Summer, 1982, the team worked in Imbabura and used maps developed by the Programa Nacional de Regionalización (PRONARGE) of the Ministry of Agriculture. These maps were drawn on a scale of 1:50.000. Consequently, they were quite large and contained considerable detail.

One task was to simplify this information. Charles Staver, the Cornell agronomist working with the INIAP team, created new maps by summarizing the principal characteristics of a zone on transparent overlays. The highland zone of Imbabura is dominated by two mountain peaks, one on either side of a valley. The basic topography of the province was outlined, indicating the altitude of the major geographic markers.

The soils map was then summarized. Each principal soil type was color coded and transferred to an overlay. The land use map was also simplified. The predominant land use pattern in a zone was color coded, and the region so occupied was hatched in on another overlay. Finally, the "recommendation domains" that INIAP was currently using were drawn on an overlay.

By superimposing different overlays, it is possible to see how soil type varies by altitude and how land use varies by both. This suggests how major subzones are delineated. This, in turn, provides a standard against which existing "recommendation domains" can be compared (Espinosa, 1982).

The new maps contain specific and selected characteristics of ecological regions. To develop them the team had to specify criteria for including and excluding variables; the team also had to present information in a way which is usable by field researchers. The procedure is deliberately exploratory, and it should improve with further use and elaboration.

Statistical data, such as agricultural censuses, permit one to select administrative districts within which to work. Administrative units are typically small, but they can be quite heterogeneous. To capture this heterogeneity, it is desirable to identify different ecological subregions through the analysis of soil type and land use maps. This exercise

suggests the major dimensions along which ecological variation exists; furthermore, it specifies the number of zones within which informant interviews must be conducted. Interviewing will capture the heterogeneity or homogeneity of social orgnaization within that ecological region. This, in turn, should be reflected in the organization of agricultural production or the farming systems within the zone.

REGIONAL VARIATION OF FARMING SYSTEMS

A principal objective of exploratory farming systems activities is to identify researchable problems for agronomic scientists, who realize that technologies must be adapted to and developed for specific conditions. What is appropriate technology varies according to the ecological characteristics of the zone and the socioeconomic characteristics of its inhabitants (Garrett, 1984).

Exploratory farming systems research should determine whether ecological and socioeconomic conditions vary together. Covariation makes intuitive good sense. The characteristics of a particular piece of land limit what can be raised, and the location of that land in relation to infrastructure influences what can be marketed. The size of the allotment and the tenancy under which it is exploited also affect production decisions. These have direct consequences for standard of living. Depending on theoretical orientation, this relationship can be conceptualized as differentiar rent (Guerrero, 1978) or comparative advantage (de Datta et al., 1978).

Farming systems researchers often that assume ecological and socioeconomic conditions are intimately interrelated, (Shaner et al., 1982:44). This approach is highly problematic. What should be an observable phenomenon has been transformed into a definition.

It is a simple task to transform a nominal definition into a working hypothesis. Techniques of regional analysis already discussed permit the selection of administrative districts and the identification of subzones. Geography presumably limits agricultural practices, so interviews plus observation can suggest the main lines of variation in farming systems. Similarly, direct questioning and observation can ascertain the degree of socioeconomic differentiation within an ecological zone. These two dimensions of variation establish the parameters for research and development work.

Precisely because the issue is regional variation, questions should be posed about the zone and the community. Interviews concerning cropping practices, for example, can make the reasonable assumption that planting dates are systematically related to rainfall patterns. "When do people usually plant maize?" is a reasonable question. Follow up questions concerning typical cultural practices, including the division of labor by age and sex, are also reasonable. Farmers are likely to know these things. They can, therefore, be treated as "informants," capable of reporting on what people like themselves usually do.

There is no reason to assume homogeneity. One can ask explicitly whether some people do things differently. This is a direct question; "no" and "I don't know" are legitimate answers. One expects to find variation in zones with a diversity of ethnic groups and cultural traditions. Furthermore, one expects variation by social strata. Farmers probably know whether practices of others are different from their own, even if they are not familiar with the details. Once the team has a sense of how much diversity exists in a region, informants from major social groups can be interviewed.

Farmers are also likely to know something about changes in farming practices. It may take some effort, however, to locate the region's "historian." Sometimes a straightforward question is sufficient: "Is there anyone in the community who knows a lot about the history of agriculture?" Sometimes it is more difficult to identify a good informant. In Pimampiro, for example, Goldstein was able to locate two excellent local historians. She also found a monogrpah (Martinez, 1956). The agricultural history of Pimampiro can, therefore, be recounted with considerable confidence.

How land use patterns have changed during the last twenty years (or longer if possible) is critically important information to agricultural researchers. In many regions, the limited land base controlled by smallholders and demographic growth have caused the intensification of production. This has sometimes meant the spread of annual cropping into marginal lands formerly in pasture or forest. This can result in the severe degredation of the environment, with its concommitant consequences for livestock enterprises and access to fuel and other forest products. Cotocachi (INIAP/Cornell, 1982; Garrett, 1983) epitomizes this problem in Imbabura.

Land use patterns in communities of smallholders are influenced by their relationship to medium and large scale farms. Throughout Latin America, <u>haciendas</u> have dominated regions, limiting both the amount of land available to small and medium scale producers and determining the nature of agricultural employment in the zone. The latifundio/minifundio complex is real. Indeed the single biggest "constraint" on production by smallholders in many areas is the near monopoly of resources by large landowners. This realization can put farming systems research into a realistic perspective.

INTERVIEWING IN TOWNS

A comprehensive study of farming systems in a region requires an analysis of links between urban and rural areas. One should, therefore, interview in the towns. Several themes should be explored.

The availability and quality of governmental services have important consequences for the organization of agricultural production. This institutional network may be complex. Some services (e.g. extension) may have offices in villages; others (e.g. credit) may work out of the provincial capital; others (e.g. irrigation) may be effectively centralized at the national level. Government agencies may have uneven impacts in particular districts.

Government employees who are familiar with the zone should be interviewed. This demonstrates courtesy. Furthermore, it allows the team to determine if the employees are ignorant or well informed. A knowledgable informant could be querried about problems with agricultural production, storage, marketing, credit, etc. These perceptions can be contrasted with reports on these same topics by producers and other involved parties.

The availability of agricultural inputs, notably seed and chemicals, can be evaluated. Shopkeepers can be interviewed about their inventory and their terms of sale. They are likely to know and advise their own customers, so they can describe the farming practices of that group. Vendors, especially in zones of commercial production, are likely to be the functional extensionists in a region. Consequently, they usually know when specific production technologies became available and how they diffused.

Marketing is typically centered in towns and integrated into a regional and national economy. Throughout Latin America (Smith, 1976)

smaller commercial centers are subordinated to larger regional centers in a "dendridic" pattern (i.e. like the fingers on a hand). The nature of marketing networks suggests whether producers or merchants will be the primary beneficiaries of increased production from new technologies. This is the reason that marketing must be included in regional analysis.

Agricultural wage labor is part of the organization of many farming systems, and labor recruitment is usually centered in towns. Landowners seeking workers to employ come to town. Owners of small plots of land come to villages when they need employment; landless households, the true rural proletariat, live in town. Towns are, therefore, intimately related to the organization of agricultural production through the wage labor nexus. One can interview both in towns and on farms about the customary wages, especially in relation to hiring practices by task and gender and the seasonality of demand.

Interviewing in towns provides valuable information to farming systems researchers on a range of issues, including the availability of government services, the nature of agricultural inputs, the structure of marketing channels, and characteristics of wage labor. These dimensions frame the institutional context within which attempts will proceed to develop appropriate technology for producers in a zone. Institutional analysis will not develop appropriate technology, but it can anticipate the likely consequences of success. This, in turn, may influence decisions on technological developments.

CONCLUSION

The regional perspective advocated here is quite different from methodologies typically recommended for farming systems research. Other approaches ask individuals about their personal practices. Formal surveys

and less formal sondeos typically question the respondent about the last agricultural year, and farm records typically record practices during the current agricultural cycle. In all cases, individual responses are aggregated to suggest typical practices in a region. These methodologies raise questions about random sampling which will be considered in the next section of this paper.

The thrust of this argument is that the variation of central concern is not individual but regional. This can be captured through structured interviewing, provided preliminary research has been conducted using existing information on the socioeconomic and geographic characteristics of the region. The quality of research is directly dependent on the understandings that team members bring to field research. It is precisely prior knowledge which allows the team to select administrative districts, identify subzones, and explore socioeconomic variation within those zones. It is sensitivity to what Malinowski (1922) called "foreshadowed problems" which should allow a multidisciplinary team to identify major, researchable problems for agronomic scientists.

The thrust of our argument is that the region, not the individual, is the proper unit of analysis for preintervention farming systems research. Farms and farming practices are not atomized units, and they should not be studied as if they were. Farms exist in a regional network, which is itself a product of specific historical developments. A realistic approach to farming systems research will study the regional context and adopt a methodology which facilitates such analysis.

III

SOCIOECONOMIC ANALYSIS

Survey research is a well developed set of techniques generally favored (and also abused) by North American sociologists. This methodology depends on the ability to pull a random sample which is statistically representative of a known universe. Because sampling requirements are strict, this is extremely difficult to implement in rural areas of most Third World countries. Survey research further depends on questionnaires which are appropriate to a zone and capable of eliciting relevant information. Good questionnaire design necessarily depends on familiarity with the area. Finally, like any other data collection procedure, survey research assumes competency in interviewing, reporting, and data analysis. Like other research skills, these too are learned (Casley and Lury, 1981).

If survey research can be properly designed, data can be analyzed and interpreted with a simplicity sometimes described as "elegant." Even if one chooses not to generalize statistically from the sample to the universe, interpretation need not be encumbered by constant commentaries about limited generalizability. This is the logical and aesthetic defense of the methodology.

In the case of farming systems research projects, there is a practical complement to the aesthetic argument. Our experience in Pimampiro suggests that survey research can locate the borderline between adjacent social strata. This has immediate and important consequences. Agricultural technologies must be adapted to the ecological and socioeconomic characteristics of farming households, so site specific research must allow those engaged in outreach to recognize different social strata. This is a compelling reason to conduct survey research in zones which will actually receive agricultural development and extension services.

SAMPLING FROM THE UNIVERSE

It is usually quite difficult to obtain a list of the universe from which to draw a probabalistic sample. Researchers find different recommendations and the range of opinions is reflected in the short selections in Kearl (1976). This paper will briefly consider alternatives for random sampling, because non-random techniques are appropriate only for regional analysis.

Some countries have area probability sampling frames developed to monitor agricultural production between censuses. Such a frame was available for Ecuador, but it was not feasible to use it. Proper use presumes some understanding of area probability sampling and very close supervision of the team by its leader. Careful map reading and disciplined enumeration are essential skills. Researchers, be they trained in the social or agronomic sciences, may not have learned these techniques. Area probability sampling may, therefore, be too demanding of methodological skills to be used correctly by farming systems research teams.

Where sampling frames do not exist or where the team is not able to use them effectively, researchers can begin with a census. They can enumerate all households or farming units in a zone, thereby generating a list of the universe. This may be problematic. A team would certainly call attention to itself by taking a census. This might either suggest questions about the underlying purpose of the visits or raise expectations about services to be provided in the future. Individuals who are resident in communities, however, might unobtrusively generate a list of households by combining observation with informant interviewing. Once the list is complete, a sample can be pulled using single or multiple stage techniques (Sudman, 1976).

Another alternative is to obtain from public authorities a list of all households or farms within an administrative district. In Latin America, certain records, notably property registers, are open to the public. Other sources, like manuscript censuses, are almost always confidential. Bureaucrats typically enjoy great discretion, and they may have arbitrary interpretations of "public access" and "confidential." Successful access may, therefore, be a function of how tactfully one approaches the gatekeeper and how clearly one indicates that appreciation will be demonstrated.

Information available in public records varies according to agency, and researchers are sometimes able to select the most appropriate list from which to sample. For example, during the second stage of research in Imbabura, the sample for the administrative district (parrochia) of Pimampiro was pulled from public records. The register of landowners in the study region was obtained from the Dirección Nacional de Avaluos y Cadastros (DINAC). This information had been collected during two years of field work by agronomists, and it was the basis on which property was taxed. Several kinds of data were available for each farming unit, including owners(s), location, and descriptions of soil quality, land use, and implements of production. The information was quite current, compiled only two years before CRSP research began.

The value of lands for tax purposes was used as a measure of the relative productivity of farms. Data available by parcel were reorganized by owner. There were 1192 taxable parcels in the county, belonging to 833 farmers. It was possible to identify owners of multiple parcels and to calculate total assessed value because dual surnames allow one to identify repetitions.

Data on total assessed value were entered into the computer, and a frequency distribution of assessed value was obtained. This distribution was examined, and ten strata were created. The range and variance of each stratum were calculated, and a five percent confidence interval was established. With these parameters established, necessary sample size was calculated for each stratum. The distribution of the universe and necessary sample size appear in Table 1.

(Table 1 about here.)

EXAMINING THE UNIVERSE

Much can be learned about a region by examining information such as that available in property appraisals. In the DINAC materials, appraised value seemed to reflect farm size controlled for soil quality, land use, and productive infrastructure, including irrigation. Farms with similar assessment were compared. In general, smaller farms had better lands and/or higher value crops, and larger farms had lands of poorer quality and/or less intensive cropping. In other cases, the presence of irrigation seemed to determine the taxable value of the farm, independent of soil quality or land use patterns.

These findings are not surprising, but they are important. Strata were defined using socioeconomic criteria, but the systematic variation observed across strata had direct agronomic relevance. This illustrates the potential complementarity of socioeconomic and agronomic concerns, a relationship more frequently assumed than demonstrated by farming systems researchers.

Analysis also revealed that variables like soil quality, land use, and irrigation were strongly related to geographic location within the _parrochia_ Pimampiro. This demonstrates the importance of prior regional

analysis, thereby providing additional intellectual justification for the research design suggested in this paper.

The importance of subregional variations may not be apparent until after survey research has been initiated. As sensitivities change, new relationships are perceived and new questions arise. In Pimampiro, the relationship of geography, ethnicity, and social strata membership illustrates a general problem.

Ethnicity has a spatial organization in Pimampiro, and this is apparent as soon as one enters the region. The town and surrounding irrigated _mesas_ are predominantly _mestizo_; the steeper, more remote regions are predominantly Indian; the valley of the River Choata is predominantly Black. Contemporary diffferences in geographic residency are consequences of the history of major _haciendas_ which incorporated ethnic groups differently (Martinez, 1956).

Research in the _parrochia_ Pimampiro reinforces the impression that the River Choata should be considered a special subzone. The _comuna_ of Chalguayacu is located at 1700 meters, considerably below the town of Pimampiro at 2130 meters. The valley is warmer than the town, with a mean annual temperature in Chalguayacu of 19.0° C in comparison to 17.5° C in Pimampiro (Martinez, 1956). Chalguayacu is also the drier region, although both zones depend on irrigation for commercial crop production.

Cultural differences are equally pronounced. The _comuna_ of Chalguayacu was formed by _huasipungeros_ who purchased a large _hacienda_ in 1954. These Blacks organized the _hacienda_ as a cooperative, and they adopted policies of land sales and labor use which minimized the accumulation of capital in agriculture at the expense of other _comuna_ members. These social policies limited the development affluence.

A countervailing tendency was created by the interaction of a limited natural resource base with rapid population growth. Tax records demonstrated that Blacks were concentrated at the bottom of the landowning distribution. Approximately one third of the landowners in Pimampiro had farms assessed at less than S 20,000. Half were located in Chalguayacu, indicating that Black landowners were over-represented in the poorest landowning strata.

Some implications of this pattern emerged only during field research. Ethnic groups in Pimampiro were quite segregated. One might assume that nearlandless workers from Chalgualyacu/Juncal would travel five kilometers to Pimampiro in order to work as day laborers. They did not. The men of Chalguayacu worked their own lands and preferentially hired men and women from their own community. The women of Chalguayacu engaged in trade, "importing" industrial products from Colombia and selling agricultural products in markets nearby. Mestizo landowners around the town of Pimampiro rarely employed their poorer Black neighbors. Rather, they developed elaborate sharecropping arrangements and imported workers from neighboring provinces. The relative lack of contact between adjacent sub-zones reinforced ethnic differences.

There were indications of ethnic segregation in the earliest informant interviews. There was also information in the list of the universe from which the sample was drawn.[2] These clues remained ambiguous, however, until interviews specified problems. The extent of ethnic segregation became clear when the relative poverty in the Black zone was contrasted with the relative absence of Black day laborers in Pimampiro.

Although it is not usually done, it is possible to "interview the universe," by analyzing data contained in the list from which the sample is

drawn. Such analyses identify imperfections in research design, thereby suggesting modifications for future work. This, in turn, disciplines interpretation primarily by tempering inspired but immoderate explanations.

The case of blacks in Pimampiro illustrates a general methodological problem. Insights developed during advanced stages of research are necessary to exploit fully information available during initial stages. One can bemoan ignorance, or one can confront the dialectical nature of research (Morgan, 1983; Hammersley and Atkinkson, 1983).

An explicit research objective can be to maximize learning, using what one has recently, learned to reinterpret prior knowledge. To permit this, field notes should be maintained conscientiously, and essays appraising progress should be written periodically. These documents constitute an intellectual history of the research enterprise (Mills, 1959), and they can permit the reinterpretation of initial field research and the analysis of the universe from which a sample was drawn.

DESIGNING QUESTIONNAIRES

Project experience suggests that questionnaires used in farming systems projects must be tailored not only to regions but also to social strata. This contrasts dramatically with the dominant position in the literature, which advocates a single instrument to elicit "comparable" information. Standardized questionnaires serve administrative purposes, because they can be processed routinely and used to chart overall trends. Such information is too limited for farming systems programs, which must consider variation between and within regions.

Standardized questionnaires present several serious problems which deserve mention. They are all illustrated by a questionnaire (RD, 1976)

which was a translation into Spanish of the USDA Census of Agriculture. This was actually administered to smallholders in the Dominican Republic, and its analysis was funded by AID/DR. Standardized questionnaires are usually cumbersome, with many sections which are used only when applicable. Frequently, respondents are intimidated by a fat questionnaire. Interviewers also find it difficult to search gracefully for the next relevant section. Both factors strain rapport.

Data sets which contain many variables with "not applicable" or "missing data" also tax computer and data analytic capacities of Third World countries. Time and money are wasted on data which cannot be interpreted because there is no variation to analyze. Furthermore, problems are exacerbated when sections relevant for specific regions or farmers are too sketchy to provide the details required to develop plans for research and intervention.

In summary, standardized questionnaires about agricultural production usually combine two unattractive features--too much poor data and too little good data. Experience in Pimampiro suggests an alternative, namely that questionnaires be tailored to particular social strata and that research be framed to reveal how social strata figure into the theme under investigation.

Socioeconomic interest in Pimampiro focused on the process of capital accumulation, specifically the relationship between growing a high value crop such as beans and purchasing land. The questionnaire was designed accordingly, and it was appropriate for only four of the initial ten strata identified with tax records. It was meaningful to inquire about sharecropping and the accumulation of capital among the four intermediate strata. They represented one-third of landowners in the region, and share

relations were important historically and currently. This suggests that the four intermediate strata were different from more and less affluent landowners.

In the two most affluent strata, inheritance exercised a predominant influence over landowning history. Landowners who were interviewed had not themselves accumulated resources; rather, they had benefitted from accumulation which occurred during the preceding generations(s).

For the four poorest strata, it was inappropriate to pose the question of accumulation because this was not the process which was occurring. This was not intuitively obvious. The four lowest strata represented the majority (64.5 percent) of landowners in the area and enjoyed resources superior to landless households. Nevertheless, these households were either barely maintaining themselves or experiencing decomposition.

How one accumulates enough cash in sharecropping in order to buy land, how one inherits property through a kin network, and how one retains a modest parcel, thereby avoiding complete proletarianization--these are very different processes. To capture the richness of each experience requires specialized instruments. A single questionnaire, even in a zone in which commercial production predominates, is not enough.

MIDDLE SOCIAL STRATA

Middle social strata were effectively interviewed by Goldstein and Arevalo using the questionnaire designed for project research. The immediate objective of this work was the further specification of constraints to agricultural production, especially bean production, by smallholders in Pimampiro. The expectation was that this information would allow researchers to direct their efforts at issues which, once resolved, would make an important difference to small scale bean producers.

Critically important was the relationship between agronomic practices and socioeconomic status.

Those interviewed represented approximately one-third (34.2 percent) of all landowners in Pimampiro. This was a dramatic departure from our intentions, which were to interview a stratified, random sample of all landowners in the region. It was precisely our inability to implement the original research design which focused attention on methodological issues. This re-evaluation raised two questions: Why was the questionnaire inappropriate for certain strata? How do these insights inform future research?

The original stratified random sample required a total of 142 interviews, 37 of whom owned farms with assessed values of S 50,000 or more (See Table 1). This number of interviews was actually taken, but the team needed to make some modifications in the sample. The sample pulled was the necessary sample size for each strata plus two extra. All individuals in this group were regarded as being in the sample, and interviews proceeded until the necessary number were interviewed. These changes did not alter the distribution of respondents by strata, but they did violate strict sampling rules.

One learns from what failed and from what worked. The project questionnaire was appropriate for intermediate strata. Initial data analysis suggested that there were no meaningful differences across the five intermediate strata which were interviewed. Indeed, Arevalo (1983) demonstrated that there was important uniformity in the technology of bean production across tax assessment strata within Pimampiro. This was consistent with the impression of the INIAP/Cornell team (1982) that regional variation of cropping patterns existed, but crop specific technology was relatively homogeneous across zones.

Socioeconomic analysis revealed surprisingly few differences across strata (Goldstein, 1984). One of the eight farmers in the highest appeared considerably more affluent than the rest. This raises general questions about fraud in public property and tax listings and the use of problematic records in research.[3] Further analysis of the sample, however, revealed that one could meaningfully reorganize the five intermediate strata by combining the two high strata and the three low strata. The more affluent strata had been able to purchase lands when one of the large haciendas first sold lands to individuals. These lands were generally in the Buenos Aires/Yucatan area. These lands had not been consistently farmed by the hacienda, and they currently enjoyed the best of the irrigation systems in the zone (INIAP/Cornell team, 1982). Length of land ownership, quality of the land, and dependability of irrigation are the factors which distinguished within the intermediate strata. This finding suggests the importance of including a comprehensive history of land tenure relations as a companion to occupational histories.

AFFLUENT SOCIAL STRATA

Research in the zone of Pimampiro was to focus on small scale, commercial producers of beans and other high value, labor intensive crops. Accordingly, the eleven largest landowners, with farms assessed at more than S 750,000, were eliminated from the universe of landowners to be interviewed. (See Table 1.) Much had been learned about these individuals during the first phase of field research, and more was learned during the second stage.

Landowners in the two most affluent strata could have been interviewed. One could have focused on production practices to compare technologies on large and small farms, but this would have been

inappropriate. This problematic derives from the diffusion of innovation, and it is either irrelevant to or competitive with a farming systems focus.

If one rejects the assumption that technology for large farms is necessarily appropriate for small farms, one would not document production practices on estates in order to evaluate practices on smallholdings. If one wishes to learn about the availability of technology, it is preferable to conduct structured interviews with extensionists and merchants of agrochemicals. Overall, experience in Pimampiro strongly suggests that informant interviews are preferable to sample interviews when one wishes to determine when innovations became available.

Given a farming systems perspective, it is not appropriate to question large landowners extensively about technology. Nevertheless, the related issue of employment is appropriate. Large farms, by definition, control a disproportionate amount of land. Consequently, land use patterns and concommitant labor requirements have regional economic consequences. Absolute and seasonal levels of labor demand and wage rates are critically important for landless and nearlandless households, not only in the immediate area but also in adjacent regions. Commercial production in Pimampiro, for example, influences employment within a wide geographic radius because cultivation practices are labor intensive and workers are recruited from two provinces. This was observed during field work, but systematic interviews with large landowners might provide special insights for future research into labor force recruitment.

Credit is another appropriate focus for questionnaires designed for the affluent. The principal commercial crops of Pimampiro required intensive agrochemical and labor inputs. Landowners who managed their own farms needed operating capital, available through formal and informal

channels. Landowners who rented out lands to sharecroppers needed to pay their portion of the costs and to extend credit to their sharecroppers (Goldstein, 1984). Consequently, the viability of agriculture in Pimampiro depended on credit. This was the subject of a special project paper (Barril, 1983), but such studies in the future would be improved if large landowners were systematically interviewed about the credit they provide.

Marketing of agricultural products is another appropriate focus. Large landowners frequently market their own production, plus that of their sharecroppers and other small scale producers. The scale of their transactions may give them leverage over wholesalers. Nevertheless, their involvement in both production and marketing may work against the interests of small scale producers. These issues were addressed in a special project paper (Barsky, 1983), but systematic interviews with affluent landowners would have complemented other available sources of information.

Questionnaires could have been designed for the most affluent strata by focusing on employment, credit, and/or marketing. All foci would have tapped the socioeconomic impact of large farms, thereby defining the context within which medium and small scale producers operated. This would have provided additional information for special project studies and complemented insights gained during field research.

In the future, we suggest that affluent social strata be interviewed with a special questionnaire. One might interview individuals who fall into a stratified random sample. Alternatively, one might interview the universe of large landowners. This would have been feasible in Pimampiro, because only nineteen landowners had farms assessed at S 500,000 or more. To design appropriate questionnaires and to interview affluent landowners

is relatively easy. Consequently, their inclusion has relatively low costs and relatively high returns. On the basis of our experience in Pimampiro, this is the procedure we recommend for future project research.

POOR SOCIAL STRATA

The poorest social strata pose serious problems for farming systems researchers. One can make a very strong case that near landless households benefit more from integrated rural development programs than from farming systems projects. This interpretation derives from a rather cold blooded consideration of three issues: politically and economically viable objectives for agricultural policy, technologies currently available from existing national and international centers, and the relative importance of wage labor in the total income of semiproletarian households (Garrett, 1984).

These factors make it difficult for farming systems programs to meet the needs of semiproletarian households. Other factors actually make it difficult to determine what their needs are. The near landless and landless rarely figure in lists from which probabalistic samples are drawn (Casley and Lury, 1981). Furthermore, these strata are very difficult to interview. There are palpable barriers to effective communication between professionals and semiproletarians. These derive from differences in social class membership, residency patterns, ethnicity, life style, and simple conceptual and verbal fluency in the dominant language. To overcome these barriers is a major challenge.

Project experience suggests that regional analyses using structured interviews can illuminate the situation of landless and nearlandless strata. These strata are difficult to locate and interview. Consequently, concerted efforts must be made to conduct structured interviews in subzones where semiproletarian and proletarians are likely to reside. Special

attention must be accorded ecologically marginal regions of rural areas, agricultural areas adjacent to urban areas, and proletarian neighborhoods of towns or cities. Efforts to include these areas in regional analyses are especially important because semiproletarian and proletarian households are likely to escape all but the most disciplined and well financed of survey research endeavors.

Rural households with limited resources are likely to be missing from lists maintained for administrative purposes. By definition, landless households will not figure in registries of landowners. Ordinarily, information is less complete for small than for medium and large farms. Under-representation of landless and near landless households is also likely in the lists that Bernstein suggests as sampling frames (cited in Shaner et al., 1982:304). Even if owners of very small parcels are listed, the same instrument is not appropriate for them as for their more affluent neighbors.

Experience in Pimampiro demonstrates the general problem. Landowning information was virtually complete, and even very small parcels (0.1 hectare) figured in the tax listings. Using standard statistical criteria to calculate necessary sample size, one would interview 64 of the 100 smallholders in the lowest stratum. (See Table 1.) This represented nearly half (45 percent) of the lowest landowning strata, and it included farms far too marginal to be engaged in the kind of small scale, commercial production which was the focus of our study. Using Bayesian criteria (cf Sudman, 1976), one could justify a decision to exclude this stratum. Accordingly, farms assessed below S 500 were excluded from the universe because the costs of securing the information exceeded its value.

Subsequently, this pragmatic decision was supported by substantive findings. The field team attempted to administer the questionnaire to landowners in three strata with assessed values below $ 50,000. They represented approximately half (52.5 percent) of landowning households and constituted nearly one third (28.9 percent) of the original sample. (See Table 1.) The four poorest strata represented fully two thirds (64.5 percent) of all holdings and the majority (73.9 percent) of the original sample to be interviewed. Despite their landowning status and numerical importance, respondents were unable to answer questions. The questionnaire was largely inappropriate for semiproletarian households.

Inadvertently, this finding identified the threshold between petty commodity producers and semiproletarians in Pimampiro. This has important mehthodological implications. When an instrument becomes inappropriate, this reflects the border between two social strata. Interviewers should, therefore, carry three questionnaires--one designed for the social stratum that one expects to interview and two for adjacent strata. Interviewers should switch instruments if the modal response is "not applicable," and they should select the more appropriate questionnaire based on what they now know about the respondent.

This is definitely not a standard recommendation to interviewers. It is specific to the purpose of farming systems research, which is to learn about the organization of agricultural production. What technology is appropriate varies by social strata, but it is unlikely that informant interviews can be sufficiently sensitive to identify social strata thresholds. Probabilistic sampling and good questionnaires can identify thresholds, so that development and extension work in specific zones can be directed at social strata which can benefit. Research must therefore, be designed so that this discovery is possible.

IV

CONCLUSION

Regional analysis, if it is well done, should provide the basic information to orient experiment station research in terms of the priorities of smallholders. This is probably as much information as commodity programs need to evaluate priorities for medium and long range research. Furthermore, it may be all that programs can realistically absorb, given limitations of human and other resources.

The regional analysis of farming systems may also identify zones in which short term development/extension activities seem viable. Zones could be targeted because an integrated rural development project had been initiated and/or because a commodity program realized that existing technologies could be readily modified to meet producers' needs. Under these circumstances, agricultural scientists contemplate intervention during the short run. Survey research is, therefore, appropriate.

APPROPRIATE DATA COLLECTION PROCEDURES

This paper has argued that preintervention farming systems research should begin with regional analysis and proceed, in some cases, to socioeconomic analysis. The technique of choice for regional analysis is structured interviewing with informants; for socioeconomic analysis, survey research techniques are more appropriate.

The discussion of regional analysis insisted that the unit of analysis was the subregion and the objective was to describe regional variation in farming systems. The research design recommended was, therefore, structured interviews with informants who reported on common practices in a zone. The discussion emphasized the importance of adequate preparation, especially the analysis of secondary data. Special importance was assigned

to the use of maps during field work so that ecological subregions could be identified. Within each subregion, the team was to determine if ecological and socioeconomic conditions varied together. This information would be made available to researchers and it could modify research strategies to address the constraints of smallholders.

The regional analysis of farming systems can inform medium and long term priorities for commodity research work. If intervention is actually contemplated in a region, however, survey research is appropriate. The discussion of this activity outlined the mechanics of random sampling and questionnaire design. Thereafter, it emphasized the importance of tailoring questionnaires to both regions and social strata. It made several unorthodox suggestions. Affluent social strata should be interviewed not about farming practices but about credit, employment, and/or marketing. Structured interviewing during the first phase of field work should be designed to locate landless and near landless households so that their relationship to farming systems can be understood. If these recommendations are followed intermediate strata would be studied by two techniques--informant interviewing and survey research. The relative merits of each procedure will now be considered.

There are several specific advantages to random sampling which derive from its representativeness. The process of drawing a sample addresses the question of how many people must be interviewed. It is a limited and discrete number which is determined by the characteristics of the universe. When all the sample is interviewed, data collection can stop. When informant interviewing should end is not as clear. Consequently, it is easy for administrative criteria (e.g. one week per district) to determine when field work should end. If the methodology is to work,

however, the team leader must make a judgment that each subregion has been adequately covered and that reports are sufficiently consistent that interviwing can end.

Random sampling can also compel interviewers to get well off the roads and interview in remote areas. One person interviewed in Pimampiro lived at the top of a mountain in a house that could not be seen from the road. Interviewers had to abandon the jeep and hike for two hours to reach the respondent. This would simply not have been done this had one been conducting informant interviews. Nevertheless, it must be acknowledged that the arrival of the research team was intrusive. The farmer chose to live in a remote area precisely because he did not want casual visitors. This farmer agreed to be interviewed, but his reluctance identifies another potential problem. Researchers may put themselves in danger when they enter remote areas that they cannot leave rapidly. This possibility must be evaluated, especially if agriculturalists have reason to fear representatives of the state.

In Pimampiro, most farmers actually lived in town which made locating people relatively simple. Neighbors readily identified the house, but farmers were frequently working out in the fields. If researchers did not find respondents immediately, farmers learned from their neighbors that two people were looking for them by name. This made several respondents suspicious; a few went to elaborate efforts to avoid being found. All respondents knew that they had been selected, which put many on guard.

These experiences suggest that it is easier to talk with someone about sensitive issues during what all consider a chance meeting. It further suggests that sensitive questions should be phrased as general issues and posed to people in what they consider a less threatening manner.

Structured interviews with informants lend themselves to these kinds of issues.

In informant interviewing, one almost always speaks with the more sociable and verbal members of a community. Asocial and taciturn individuals are, almost by definition, poor informants. This limitation in the methodology can scarcely be overcome. Survey research, by contrast, allows more retiring farmers to fall into a sample. Interviewers must, therefore, try to establish rapport and elicit an interview. Some people give such poor interviews that it seems a waste of time to talk to them. Nevertheless, it is only the discipline imposed by sampling which allows one to learn whether more and less sociable people organize agricultural production differently.

Each data collection technique has its strengths and weaknesses. It is important, therefore, that the overall research design combine procedures in a complementary fashion. It is true that a research design must be feasible. This may require compromise and deviations from what is desirable. Nevertheless, it is also true that research design must be intellectually defensible. The basis of this paper has been the argument that there are meaningful levels of analysis in farming systems research. One important level is regional, and another is socioeconomic. If distinctions between these levels of analysis can be maintained, research can be conducted effectively and economically.

IMPLICATIONS

Social scientists should be incorporated not as tokens but as contributing members of a farming systems team. Comprehensive socio-economic analysis is critical if agronomic scientists are to develop technologies which are appropriate for the intended beneficiaries. Much of the analysis recommended in this working paper cannot be done well by agronomic scientists. It can be done by social scientists, provided they have extensive research experience and the authority to design field work.

There is considerable discussion in the literature about the importance of "multidisciplinary" teams. Multidisciplinary must mean more than agronomic scientists pretending to be social scientists and social scientists pretending to be agronomists. Only when the value of discipline based contributions is recognized can farming systems researchers address important questions of research design.

One implication of the general analysis is that the quality of regional analysis is critically important to farming systems programs. Currently, there are no written guidelines for the integration of the ecological and socioeconomic aspects of regional analysis. This is a major methodological weakness, which must be recognized and addressed. Until this is done, farming systems research is a slogan not a strategy.

V

FOOTNOTES

1. Hubert Zandstra, who has had considerable experience in international agriculture (Zandstra et al., 1979) spoke at the Farming Systems Conference at Kansas State University (November, 1982). He stated that the concept of recommendation domains was originally employed by technicians at CIMMYT who were determining fertilizer recommendations. Thereafter, the connotations of the term became much broader (Shaner et al., 1982:44). The problem however, is that the procedure to identify regions and the criteria to apply are not specified.

2. This became apparent only after field research had ended. We returned to the universe which listed taxable values, and asked ourselves if we had overlooked some clue. The answer was "yes." In most regions, the farms of smallholders were assigned the name of the former hacienda or the nearest population center. Either procedure could easily have been followed in the case of landowners in Chalguayacu. In this zone, however, smallholders were recorded as owners of farms with no names.

   Careful examination of the tax roles suggested that all farms in Chalguayacu were listed as "nameless." Some properties outside this zone were also not identified by the name of the former hacienda or the nearest population center. These properties are few in number, but they prevent analysis of Black landholdings based on tax records alone.

3. Folklore in Ecuador holds that the least talented and most poorly qualified agronomists work for the tax agency. Their lack of competence is matched only by their slavish responsiveness to bribes. Our experience provides no evidence of technical incompetence, and there was only one notably suspicious case of low assessment in Pimampiro. This suggests that tax information is valuable and should be utilized by public agencies with proper regard for confidentiality. One must expect biases in all data, but to assert rather than demonstrate that specific data sources are unreliable is simply indefensible. It is research rather than folklore which must determine reliability.

I

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Table 1

CHARACTERISTICS OF THE UNIVERSE

AND NECESSARY SAMPLE SIZE

STRATA DEFINED BY ASSESSED VALUE OF FARM(S) SUCRES (1982)	FREQUENCY IN UNIVERSE	NECESSARY SAMPLE SIZE
0 to 5,000	100	64
5,000 10,000	87	11
10,000 20,000	126	11
20,000 50,000	224	19
50,000 80,000	99	6
80,000 150,000	82	10
150,000 300,000	78	11
300,000 500,000	18	6
500,000 750,000	8	4
> 750,000	11	NA