

FRANK W. YOUNG, FERNANDO BERTOLI, AND SANDRA BERTOLI

## DESIGN FOR A MICROCOMPUTER-BASED RURAL DEVELOPMENT INFORMATION SYSTEM\*

(Received 21 October, 1980)

**ABSTRACT.** A new type of rural development information system is described. It is based on two recently introduced low-cost technologies; microcomputers and the informant survey. When the informant data from the universe of subdistricts in a region are analyzed with modern multivariate techniques, it is possible to derive comprehensive measures of institutional structure as well as five measures of rural progress. The latter are: a level of living scale based on housing characteristics, a measure of inequality derived from the difference between the housing of irrigated and dryland farmers, an estimate of agricultural productivity, a score of ecological problems, and a measure of status group restrictions, specifically restrictions on females. These and similar measures of social structure constitute the 'macrosocial accounting' file. In addition this information system includes project monitoring and administrative accounting files. The uses of this system are familiar -- comparative description, monitoring and evaluation -- but in this integrated and upgraded form, the potential problem solving capacity of rural development agencies should be significantly enhanced.

### I. INTRODUCTION

The term 'information system' is a contemporary phrase that has many meanings and is realized in a variety of forms. It refers to the computerized storage, processing and display of information needed by complex organizations. Thus, the airline reservation system is an information system, as is corporate cost-accounting, the computerized retrieval and analysis of library books, student records in universities or data files for research, to name a few.

What is new is the call for an information system that is relevant to rural development.<sup>1</sup> The system should be pertinent to rural development, simple to maintain, inexpensive, and it should be relatively independent of the specialists and equipment in the capital city. Developing a rural development information system, then, is a matter of adapting a known technology to the special problems of work in the hinterland. In this context, information systems may also be defined as the organization of data relevant to understanding, planning for, monitoring and evaluating a rural development effort, usually a large one. This definition introduces several substantive emphases, and they turn out to be central to the concerns of this paper.

### 1. *Rationale for Rural Development Information Systems*

The drive for codifying the information of rural projects has several motivations. Technical assistance agencies are now demanding more objective and analytical evaluations. The qualitative reviews produced by short-term teams on the basis of hurried interviews and rapidly-read reports are inappropriate to the expenditure of millions of dollars. Something more is required and assistance agencies are hoping that comprehensive information systems will facilitate the evaluation and cumulative improvements that are everywhere demanded.

A second pressure for information systems is the quest for a more effective link between research and implementation. In the typical case, a project will have a stack of consultants' reports that review specific problem areas and make proposals. Often these proposals provide a satisfactory basis for initiating work. But what happens if a problem is not covered by a consultant report? And what if the host country agency wants an independent basis for assessing the consultants' reports or, better, for generating its own initiatives? In that case, which is increasingly the norm in developing countries, the host country agency needs its own information system. Such a system is no substitute for trained people and the experience of experts, but it at least provides an alternative basis for discussions.

The third motivation for information systems is general but quite important. Some way of handling the sheer quantity and complexity of information must be found. Even small rural development projects accumulate an astonishing number of reports, and the daily work involves a bewildering variety of information, including but not limited to costs and personnel. These data quickly get out of control and are often lost or scattered. And yet a project cannot function without it nor is the donor agency satisfied after the project has run its course to have to depend on tedious archival research in an attempt to find out what happened.

The further question is why these new pressures for rural development 'efficiency' have appeared only recently. Why is it not now possible to let rural development programs operate as they did in the past? The situation is precisely analogous to current developments in automobile manufacturing. Under new pressure to reduce fuel consumption and pollution, automobile manufacturers have been forced to turn to electronic sensors and controls — using the very same chips that the new microcomputers use — because mechanical devices are simply not up to the job.

Very likely the new facts of life are well-known to most readers so they may be briefly listed:

(a) Money for rural development projects is increasingly scarce. The major donor countries have reduced their contributions, high oil prices have reduced national allocations for rural development and an increasing number of countries are clamoring for assistance. Shifts in foreign aid assistance from urban/industrial projects to the rural sector have not compensated for the tight money situation.

(b) Donor agencies have had too many unpleasant surprises in the foreign assistance field and are searching for an 'early warning system'. There is the general recognition that despite good intentions and specific strategies, technical assistance designated for the rural poor rarely reaches them or if it does, only in greatly reduced amounts. Information systems are proposed as one component in a system of controls on the technical assistance process.

(c) Even those projects that approximate their goals involve processes and outcomes that are not completely understood, so there is increasing interest and demand for monitoring and evaluation. Information systems are a crucial component of this organizational feedback system, and it is hoped that the lessons of experience will begin to cumulate instead of evaporate.

(d) Rural development projects are more difficult to mount, on the average, than urban-industrial interventions. The populations are less educated, they are dispersed, there is less infrastructure to build on, and there are few models. In contrast to the fairly well-known characteristics of factories and electric power grids, the best designs for the kinds of agricultural enterprises that are feasible in rural areas are unknown or disputed. For that matter, even the techniques for making rural surveys are relatively primitive in contrast to the many more refined information sources for cities and industry.

(e) Finally, many rural development projects are being initiated in semi-arid regions, and these pose special problems of scattered or scarce resources, fragility of the environment, and overpopulation. Increasingly, rural means marginal. Thus, rural development is often a rescue operation for stagnant or threatened areas. These semi-arid regions are usually on the remote frontiers of a country, perhaps adjacent to a hostile nation. Under these conditions, the old patterns of sporadic government subsidies and patron-client relations are inadequate and are being replaced by centrally directed

bureaucracies. These bureaucracies are familiar with information systems and willing to experiment with them even in the hinterlands.

## *2 The Regional Authority Context*

The problem of designing an information system may be made concrete by describing the agency for which this system was devised. The Central Tunisia Development Authority is located in the provincial capital of Kasserine, Tunisia, has federal status (like the American Tennessee Valley Authority or Appalachia Commission), spans five states, and employs about 250 people. It has absorbed a number of agencies already working in the area and is mandated to coordinate all activities for the purpose of general regional development. To this end the United States Agency for International Development has contributed about 30 million dollars in loans and grants for the first three years of operation. However the authority was conceived and organized by the Tunisians and will undoubtedly continue after American aid ceases.

The Authority is responsible for a wide gamut of projects: initiating or extending irrigation perimeters, assisting farmers in well-digging and general agricultural improvement, extending agricultural credit, constructing rural roads, bridges and erosion control, small business development, potable water, health clinics and other services, as well as general coordination with the five governors, 25 district officials, and about 200 subdistrict leaders. In addition to the administrative staff who devote a large amount of their time to getting out the payroll and maintaining personnel records, the Authority has a planning staff who are being trained to pull together sources of information and formulate plans for rural projects. They are responsible, along with an American university planning team, for formulating 'innovative projects' that will open new paths to rural progress.

It takes no imagination to know that there is a tremendous flow of information in the Authority, especially across the desk of the Director. Indeed, it is somewhat surprising that the flow of information is not more evident, but of course documentation is slow, photocopy machines rare and respect for information is (mercifully) lower than one finds in the bureaucracies in the capital. Nonetheless there is already a problem of information storage and it will be more acute if the demands of the donor agency are even partially met. So the question is: What kind of a data system does an organization like this need? Note also that this organization may be a prototype for integrated

rural development programs elsewhere. The organizational innovation that goes by the name 'authority' was conceived for the management of water, but it is quite likely that the same instrument can be used in semi-arid regions that are increasingly a matter of concern in countries around the world.

For an organization like this we can make a number of reasonable assumptions: there are sufficient funds for purchasing a computer and appropriate software. Staff for managing an information system can be found, but such staff is in short supply and may leave for other jobs after one or two years. The Authority is interested in and tolerant of the information demands of AID, but there are clear limits which cannot be exceeded. Funds are available for bringing in a development and training team, but they must be able to complete their task and 'work themselves out of a job' within three or four years (of part-time work). Finally, if the system is appropriate and well designed, and if the training is successful, one can assume a certain continuity of an information system, but it is unlikely that all parts will survive.

### *3. Special Features of the Proposed System*

Against this background a team of three faculty members based at Cornell University proposed the scheme that is outlined in this paper. It is called a 'design' because it describes work that is not yet completed. On the other hand the main elements have been developed and introduced, so we can describe a functioning reality up to a point. At a later date we will produce another report that tells how the system was used.

We are proposing an entirely new kind of system which has been labelled 'macrosocial accounting'. It is based on the combination of two low-cost technologies: microcomputers and an 'informant survey' of the region. The data from the informant survey can be used to produce a description of the socioeconomic structure of the region that is quite different from the results of sample survey data or from the official census statistics. It is relatively rapid, low cost, and it generates a profile of the region that is impossible to obtain any other way. It expands the conventional system that concentrates on project monitoring and administration.

There is more to this proposal however, than a simple increment to the available information-processing capacity. It turns out that the mode of evaluation that is possible with the informant survey is different in kind from the standard emphasis on project evaluation that is built into most

information systems. The nature of this contrast will be clarified in the final sections of this paper, after the informant survey, project monitoring and the supporting microcomputer system have been described. Sufficient to say at this point that the proposed information system sets a high priority on the already existing social structure, and considers discrete project interventions within this larger context.

## II. STRUCTURE OF THE INFORMATION SYSTEM

### 1. *Three Types of Information*

It is easy to imagine a rural development project that is guided entirely by traditional and particularistic knowledge. The director responds to a legal mandate, he follows various administrative directives at the federal level and he converses with the prime minister, the governors and the local elites. These actors tell the director, if he does not already know, what political pressures impinge on him, what the local elites expect, what development projects are suggested by traditional concerns, and very likely a great deal about how to proceed. Patron-client relations are involved here, as are national political shifts.

Many projects around the world are guided solely by traditional-particularistic information. Furthermore, many projects that claim to be informed by technical knowledge, as described below, are really determined by this first kind of traditional interpretation. In fact, hood-winking the technocrat is a standard routine, and in some cases he is even persuaded to cooperate in the self-deception process. The number of public wells located on private property, the worldwide tendency for large farmers to capture small farmer credit, and the many road projects that are rationalized as increments of human capital all testify to the continuing vitality of traditional knowledge and strategies.

There comes a point, however, where technical knowledge is necessary. It is difficult to put in a paved road, an irrigation system, a fruit processing plant, or even an agricultural extension system without technical specification, estimates of cost, comparison of alternatives, and even legal justification. All this information is project-specific and oriented to efficiency or productivity criteria. Much of the work of professional planners consists of weaving together the disparate facts and arguments in order to make the case for one project and method as opposed to another.

A third type of knowledge is rarely used in rural development projects, but there is reason to believe that it will assume increasing importance. Such information may be labelled 'comparative'. It consists of facts and figures on enough 'cases' (projects, communities, businesses, irrigated perimeters, etc.) to permit at least simple statistical treatment. The information takes the form of variables such as the number of workers employed, the number of households involved, the average income of the households, the number of primary schools in the communities, etc. Development projects have utilized comparative information from time to time but usually in a rather indirect and tenuous way. A planner will undoubtedly consult the national census if one exists. If a household or farm survey is available, he will certainly read the report. Unfortunately, there are a number of problems with both these types of comparative data so it is not surprising that they are little used. The census, for example, is often out-of-date. When it is available for the correct years it may be difficult or impossible to obtain data at the subdistrict level which is the level that many rural development projects must work at. Finally, census data in less developed countries are rather sketchy and rarely go beyond the basic demographic facts. Agricultural censuses such as those in Mexico or the Philippines are the exception. If a household survey is available, it is unlikely that it is extensive enough to cover a region. Either one must use the results from a national survey, which rarely allows disaggregation to the state or district, or one attempts to extrapolate generalizations from a survey of one or two subdistricts — with all the attendant risks.

Census and household surveys are conducted for purposes other than those that the planner has in mind; it is rare that the planner can commission a survey. But even if he does, the survey may be inherently defective if planning is aimed at regional institutions rather than individuals or households. Of course, it may be possible to aggregate a sample survey to the district level. But the typical experience is that neither the census nor available household surveys contains the needed information.

Unfortunately, there is still another reason for the lack of comparative information in planning. The fact is that the utility of such information is not at all obvious and has not been spelled out. If a rich landowner tells the director that his district needs electric power, or if the planners make a case that only public water supplies will reach the poor, then an implementer knows what to do -- or what not to do. But if a report based on comparative data finds that privately owned water points are more frequent in the more

affluent subdistricts, it is not immediately obvious how that fact bears on planning and implementation. Even simple comparative facts, such as the location of the poor and the rich subregions, may or may not suggest planning initiatives. Should one pursue a 'worst first' policy? Or is it not more reasonable to reinforce the growth centers so as to energize the whole region?

## 2. *A Diagram of a Complete System*

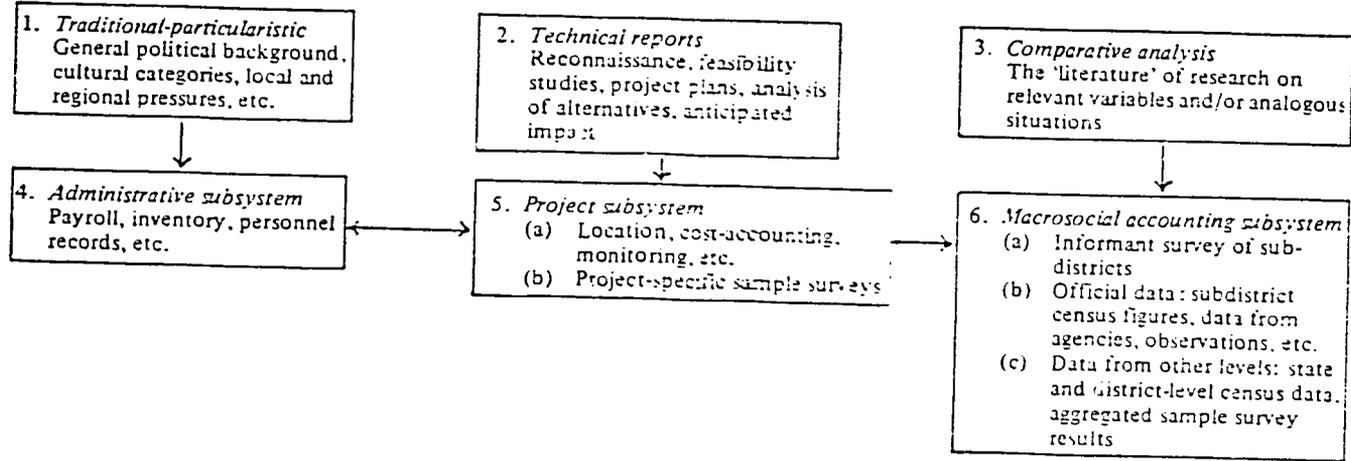
The reader will have guessed by now that the informant survey mentioned above produces comparative information and, furthermore, that such comparative information is central to the argument of this essay. We will attempt to show that macrosocial information has uses which cannot be ignored in the present epoch of rural development activity. Moreover, such information offers an alternative approach to evaluation. All this will be covered in subsequent sections. The present task is to explain how all three types of information can be combined into a unified system.

Figure 1 describes a functioning system, locates the three streams of information and indicates those parts that may be computerized. Thus the traditional and particularistic knowledge available to the administrator is indicated in box 1, the project-specific technical knowledge is located in box 2, while the accumulated comparative knowledge, what there is of it, is designated in box 3. At the outset, all three types of knowledge are available to the agency staff in the form of documents and can only be synthesized by means of human memory and intelligence. For certain types of materials it might be worth the time and money to devise a computerized retrieval system, but such a system is simply an adjunct to the conventional document file, and is not what is here meant by an information system.

The departure that computers make possible is indicated by boxes 4, 5 and 6. These categories refer to those aspects of the three types of knowledge that are subject to computerized rationalization. What is involved is, first, the use of raw data instead of synthesized and interpreted information. Second, the information is organized by unit of analysis: person, project, community, etc. And third, it is stored in variable form.

All this is quite familiar in administrative systems where the person is the natural unit and money is the conventional variable. Projects also have a unit character for most people even though in practice their boundaries are often difficult to define. Happily, many of the variables needed for project

Fig. 1. Structure of a Rural Development Information System.



monitoring take a monetary form. The difficulties appear when one begins to ask how a project may have benefited people or what aspects of project design contributed to success or failure.

These problems are magnified for what is here called 'macrosocial accounting'. The unit of analysis is not a major problem. It is just that there are so many of them: community, district, state and perhaps several levels in between these. As for variables, that is almost uncharted territory. The recent interest in 'social indicators' has focused attention on this problem with as yet indeterminate results. The set of variables that we propose as general yardsticks of rural progress are described in the next section.

The sequence of numbers for these boxes reflects the accepted priorities for such information. One cannot have a development project without central administration and the whole corpus of traditional knowledge that an administrator brings with him. Equally obvious is that the agency will not survive unless it can implement projects and deliver specific goods and services to the rural population. That statement should be qualified by saying "in the present era and given the structure of foreign assistance", because many projects bump along without technical support. Or at any rate the technical support is not codified. After all, most regions in the world have school houses, some kind of water supply and a host of other 'projects' that were created without the help of professional engineers and planners.

What, then, is the status of the macrosocial information proposed in box 6? Clearly, a rural development project could survive without it. Most administrators have a rough comparative picture of their region; they know perfectly well which are the dry and the wet areas, and which subdistricts are rich and which are poor. So the question is whether or not this kind of computerized comparative picture is in some sense necessary in the contemporary aid situation. This paper claims that it is, that new forms and levels of accountability are required and these must be based on comparative data. It will argue, additionally, that regional planning is difficult if not impossible without comparative data, that administrators in charge of integrated rural development in a regional context cannot operate effectively on the basis of the uneven and fragmented comparative picture that they normally have. No responsible sea captain would rely on his system of lookouts once he has radar, and that will soon be the situation for administrators of complex development organizations. On the other hand, we

can be sure that both the sea captain and the modern administrator will continue to keep their lookouts posted.

Of the three types of information used by a development agency, the traditional-particularistic is almost immune to computerization while comparative data is of little use without it. Technical project-specific data stands somewhere between these two because project inputs, outputs, progress, etc. can be organized into files, while the reports that propose, defend and compare the projects are complex case studies and not reducible to the comparative format required by computer files. This differential amenability to codification has implications for the sequence of work. As noted above, the natural order of priority is traditional, technical and comparative but in practice the three types of information are generated by different teams so they develop simultaneously. The real question is which to computerize first, whether to institute the informant survey and base the information system on it or, alternatively, whether to start with the projects and organize the file for these. In this report we opt for the informant survey for the following reasons:

(a) It is a relatively autonomous field operation and thus does not require close cooperation or support from the agency during the first year when relations are unsettled or the agency is just getting organized.

(b) In a new agency only a few projects will have been initiated while the communities in the region have been there for a long while and therefore are ready to be surveyed at any time.

(c) Collecting, analyzing and articulating informant data with the planning and implementation process requires about a year, and therefore it should be begun immediately. Project monitoring can be initiated later without loss of information.

### *3. Macrosocial Accounting*

The backbone of the information system proposed here is the informant survey of the subdistricts. Once a computerized file is established for these units all other types of data can be quickly linked to it and will usually supplement the socioeconomic profile of institutions that it yields. Concretely, an informant survey is a questionnaire administered to one or possibly several leaders in a set of rural communities. The questionnaire con-

tains questions about the community, not about the informant himself. Thus, the local leaders of the 80 subdistricts (*secteurs*) of the nine districts (*délegations*) of the Central Tunisian development region were asked about the whole range of services available in their community, about agriculture, about water, electricity, the environment, social life, level of living, migrant work, organizations, contact with projects and their expectations for the new development agency. They were also asked a few questions about themselves in order to generate a profile of these subdistrict leaders and to provide variables for quality controls. The Tunisian informant schedule also included a checklist of such readily observable establishments as the food and hardware shops, industries, recreation facilities, monuments, etc. The schedule was relatively long, covering 30 pages and sometimes requiring two to three hours, and it generated 354 'items' in the computer file. Some of the information could not be compressed into machine-readable form, but, on the other hand, the 354 items represent raw data, which will reduce to perhaps 30 or so scales and indices.

In the ideal case, each subdistrict leader should be interviewed in his community, but an alternative is to conduct the interviews in the district headquarters, often on market days when the subdistrict leaders are in town for other purposes. A survey like this requires four to five weeks of interviewing, preceded by several weeks of pilot tests, and, of course, much preliminary reconnaissance and review of the literature prior to writing the schedule.

An informant questionnaire necessarily deals with well-known institutional facts and patterns of the rural community. A local leader cannot be expected to know what is not public or what is public only in a statistical way. Thus, it is probably useless to ask the subdistrict leader what the district leaders' plans are because they may not have been revealed to him. Similarly, it is a mistake to ask the average number of goats or sheep per farm. An informant may know some broad facts about households and farms, such as the type of houses in the area, or even the number of tractors, trucks, etc. But he is unlikely to know the infant mortality rate or the divorce rate. These figures, if available at all, must be obtained from the census office or a household survey.

*The Structure of the informant survey.* The questionnaire is organized according to categories like services, agriculture, environment, etc. but these are convenient, not analytic categories. The real structure of the questionnaire turns

on two axes: an attempt to develop general 'yardsticks of progress' and second, an interest in delineating the major socioeconomic dimensions of the region. Both of these foci are relevant to the overall goal of generating a baseline description that is relevant to planning. It is also apparent that the first set of dimensions can be considered 'dependent variables', that are explained in terms of the socioeconomic dimensions.

How should progress in rural areas be measured? Certainly not in terms of project inputs and their realization. The history of rural development is full of bridges and roads, Green Revolution technology and credit programs, to name a few, that were successful projects but did not necessarily benefit the general population or change the organization of the countryside. On the other hand the more general criteria of development are quite diverse and sometimes contradictory. The advocates of growth, for example, would be satisfied with an increment in the average income of the families in a subdistrict, while those concerned with distribution would question that emphasis. Meanwhile agricultural specialists would argue that the source of wealth is in the ground, so agricultural productivity is crucial. A case can be made in fact, for a wide variety of indicators and therefore it seemed reasonable to attempt to measure as many of these as possible given the limits of the informant survey technique.

As noted above, it is difficult for a local leader to estimate average income, infant mortality, and other aggregate characteristics yet measures of rural progress often come down to just these kinds of indicators. Our solution involved a selection from the long list of possibilities combined with various innovations in questionnaire construction.

*Level of living.* The basic measure of this aspect of poverty is the proportion of houses with particular attributes such as windows. In addition we asked for proportions of housing types, as well as other possible validating indices such as the number of families receiving aid for the poor. Thus, while we focused on a general and feasible index we also included a number of related indicators that would help us to understand the ramifications of poverty and which could serve as validators. If other indicators become available from special runs made by the census office they can be added to the file and included in this 'family' of indicators.

*Level of living differentials.* In rapidly developing regions it is typical that one segment of the population moves ahead of the rest, so it is important to measure discrepancies in level of living. Accordingly we asked the subdistrict

leader to distinguish between farmers with irrigation and those without, and then to estimate the housing characteristics of each group. This strategy omits shopkeepers and construction workers, among others, but it deals with the two main classes in this area. In other regions, the strategy might be applied to other groups.

*Agricultural productivity.* Contemporary rural development strategies emphasize increases in productivity as a way of benefitting rural populations, but this goal is of general interest in evaluation. Our estimate is based on the local leaders' judgment of the average yield in his subdistrict for the major crop, wheat. The questionnaire asks the local leader for his estimate of yield for both rainfed and irrigated farms. With more time, his knowledge could be probed more deeply, but this set of questions corresponded to the reports that the local leader routinely made to district headquarters, so we thought that our information would be at least as good as the official estimates. Central governments usually conduct national agricultural surveys but the results are disaggregated only to the state level and these estimates may not distinguish between dryland and irrigated farming. Furthermore, the national surveys have their own problems of accuracy because individual farmers tend to report less land than they usually own for fear of higher taxes. It may be, therefore, that the local leaders' general estimate of productivity is as accurate as the on-farm surveys.

*Ecological problems.* Semi-arid regions pose threatening and sometimes intractable problems of erosion, water shortage, salinity, etc. It is imperative therefore to construct at least a rough index of ecological problems in order to see whether they have increased or decreased during a period of intense development activity. Again we simply asked the local leaders whether or not their subdistrict was experiencing one or more of a list of well-known problems. Skeptics will question whether such information is reliable or valid. Would it not have been better to send out a team of experts to survey the region and make a truly scientific assessment? There are two answers to this counterproposal. The first is that no team of experts was available or interested. The second is that the local leaders are experts in this matter if anybody is. Their livelihood as well as that of their community depends on the soil and the water, and they are certainly aware of any major changes in their environment. Very likely the questions we formulated were not as precise as they might be, and others might be included. But for the moment the reports of the local leaders are important social facts and must be taken seriously.

*Status group restrictions.* In almost all parts of the world minority groups experience institutionalized restrictions of one sort or another. The emphasis here is on customary and sometimes legally enforced restrictions; these are fundamentally different from the individual differences of wealth and prestige. In order to measure this dimension of progress we singled out the minority that is most obviously restricted: women. We simply asked a set of seven questions regarding variations in the customary restrictions imposed on them and constructed an index on the basis of the responses.

Combining a set of items such as wearing the veil, staying at home, eating apart from men, etc. is a standard technique for social measurement. That is about the only way that many social patterns can be measured and where research involves high levels of measurement error, it serves to increase the reliability of the measures. Occasionally, as in the case of the wheat yield estimates, it is necessary to depend on a single response, but even these can be reinforced by correlations with related indicators, such as land prices or yields for the previous year.

The five evaluation criteria were relatively easy to formulate even though they extended and perhaps strained the limits of the informant survey technique. In contrast, obtaining data about institutions in the subdistricts was easier and the responses were probably more reliable. The new problem now was conceptual: What dimensions of socioeconomic organization are important for a baseline description and for explanation? The economists' answer of land, labor, capital and variations thereon cannot be delivered with the information from this type of survey. The questionnaire can include items about marketing, transportation, the variety of agricultural products, local industries, etc. but it is difficult or impossible to elicit the refined information that economists normally demand. Most of that information must come from farm surveys. So the additional question is posed: What aspects of rural social structure can be measured by this technique? Experience shows that, depending on the actual pattern of rural organization, it is possible to measure the specialization of institutions, particularly as these are manifested in urban centers and related lines of communication. Second, it is usually possible to measure the influence of the central government and any long-term patterns of subsidies and special organizational enforcement. Third, the pervasive rigidities associated with ethnic cleavages or entrenched dominance are usually captured by even simple description. And fourth, patterns of mobilization, which may also be associated with ethnic groups, can also be

summarized. There is more to social organization than these four patterns, of course, and within each there are a number of variables that may stand alone. On the other hand, these dimensions summarize much of what is called rural social organization (as it operates at the subnational level). The one exception is the internal class structure of communities. Insofar as this takes region-wide form it shows up as rigidity, but within communities it is difficult to measure.

Delineating relatively pure measures of structure is often impossible with the data from informant surveys, but they can be approximated by measuring the strength or elaboration of the dominant institutions. The major types of agricultural enterprise, the growth of local government or religion, or the distribution of public services and industry may often be interpreted as embodying particular social processes. Ambiguous results can be followed up. A finding, for example, of a firm association between high levels of living and strong religious organization can be studied more intensively to decide whether the community was religiously mobilized, had secured government subsidies or whether, perhaps, the community had a higher proportion of advantaged families to begin with.

The working hypothesis that stands behind this approach is simply that these structural dimensions – institutional specialization, community and regional solidarity, central government support, and flexible administrative and social boundaries – all contribute independently and additively to high (positive) levels of the five dimensions of progress.

Another and more profound version of this hypothesis states that all fundamental dimensions of social organization contain problematic aspects that show up in the form of well-known social indicators. For example sedentary herding tends to force overgrazing and then environmental degradation. Similarly different aspects of poverty are associated with low levels of institutional specialization, solidarity, central government concern, and flexible administration.

Then there is the question of change over time. Informant surveys permit a certain time depth in that one can ask for the year in which particular institutions were initiated. It is also possible to ask about certain broad trends, such as whether the number of men leaving the community for work in coastal cities has increased, decreased or stayed the same. However the informant survey is fundamentally a cross-sectional technique until such time as it is possible to repeat it. Given the pace of work in development agencies

and the probability that any impact involves a time lag, it is probably unproductive to repeat the survey in less than three to five years. After such an interval, some effects should be evident even with the lack of precision in these measurements.

Describing the analysis procedure for informant survey data is almost impossible without concrete examples, but a number of general points can be made. As already suggested, the technique compensates for the relatively crude responses and perceptions of the informant by combining items into scales, scores, or indices and by various multivariate techniques, such as factor analysis or multiple regression, that are capable of revealing the broader patterns that exist at the subdistrict level. This methodology is consistent with the underlying theoretical approach which assumes that broad formal dimensions of institutional organization exist and are at least partial determinants of social indicators, such as the five dimensions of progress. Thus, the ultimate aim is causal analysis, and in those cases where a second survey is available the time dimension can be included explicitly.

*Alternative and complementary data sources.* Assuming that the informant survey becomes the starting point of the information system, how should complementary data such as census figures and aggregated sample survey results be incorporated? The answer must be: as quickly as possible! Census statistics are invaluable for validity checks and for exploring problems that cannot be studied on the basis of informant responses. The same is true of household surveys which open the additional possibility of studying the relationship of institutional complexes to measures of central tendency for individuals and households.

It might be argued that many of the institutional facts collected in the informant survey are readily available in agencies. After all, the Ministry of Education keeps records, as does the Health Department. Indeed, it is sometimes more efficient to go to these agencies instead of asking the local leader. On the other hand if the questions are well phrased, one can obtain most of the basic facts in one set of interviews as compared to the multiple visits and long waits required to obtain information from the various agencies. And, of course, it is possible to ask the local leader many questions that the bureaucracies cannot answer.

Thus, if one wants socioeconomic information on the region the only efficient way to get it is to ask the local leaders. This technique, in fact, is

used throughout the world by governments and professional social scientists. What is novel in its use here is the degree of codification and the intensive analysis of data.

It may be argued that a household survey is a much more appropriate instrument for gathering baseline data. It is certainly true that one can make estimates of poverty, nutrition, health, agricultural productivity, labor patterns, and family organization on the basis of household survey data and that such information is an important component of a baseline and quite relevant to many types of evaluation. Surveys of this type are extremely useful for most integrated rural development projects. But the question here is whether sample survey data should form the core of an information system. There are several reasons why it should not. In the first place sample surveys are expensive if one really covers the whole region. Given rough terrain and a dispersed population, a household survey can cost ten times as much as an informant survey. Even so, it is doubtful whether the sampling rate will be high enough to permit aggregation to the subdistrict level. And yet planning must focus on the subdistricts which are, for the most part, natural rural communities. The nature of this unit varies from country to country, of course, but in many countries it is the juncture between the central government and the rural people. The subdistrict leader is both a long term resident and a paid employee of the government. Planning and implementation simply cannot ignore this unit.

A third reason for favoring an informant over a household survey, assuming the latter is feasible at all, is that the informant survey is simpler both as a field technique and as an analysis task. Professionals without much previous training can be trained to analyze informant data more quickly than they can be taught to analyze household survey data. There are two reasons for this. First, institutional data is simply more familiar and comprehensible. In modern household surveys the questions get rather refined and often require considerable technical knowledge. Second, the analysis of informant surveys can utilize whatever general information is available, which is often considerable. The analyst may know quite a lot about the agriculture and institutions of the region, and can make better interpretations of the patterns. For him it is not simply a matter of statistical inference and pattern delineation. After a few weeks of working with this kind of information most analysts form quite comprehensive pictures of at least the larger rural communities, and this gives them a point of reference for interpreting the trends

and general patterns. These reasons assume that an in-house research staff exists or can be trained. However, it is doubtful whether a rural development agency can operate on the basis of contract research or whether it should sacrifice its autonomy in this respect, even if it is possible.

All these arguments do not answer the most frequent objection to the informant survey: it is inaccurate. This charge takes various forms: the local leaders do not know anything to begin with, they give biased answers, they give inaccurate information, and finally, even if they did give accurate information, it is so crude that it is not worth having. We will not attempt to answer this charge here. Unless one has seen the results of these surveys there is simply no basis for debate. One can talk all day and all night about levels of accuracy and which levels are appropriate for what tasks, and the trade-offs between costs and accuracy, but the whole discussion has an air of unreality until one has digested at least one report based on informant data. The fact is that computers and modern multivariate analysis have transformed this rough-and-ready technique to a relatively sophisticated instrument which has many advantages over all other types of data. For the moment there is only one point to be made and that is that in the context of a large development agency such as is assumed for this report, there is simply no other feasible source of comparative information, during the last year or two. Either one uses informants as a source of data, or else one continues with the impressions and technical analysis that is the basis of most rural planning at the present time.

#### 4. *Project Monitoring*

Despite all that has been written about it, project monitoring and the forms of evaluation that are associated with it are very much like carving a turkey: there's really only one way to go about it. One obtains a list of the projects that the agency has initiated or is planning, and then attempts to find accurate information on planned and actual *inputs* (personnel, equipment, materials), *activities* (meetings, plans, negotiations, work) and *outputs* (physical and social products). One uses this information to compute various statistics, such as proportion of budgeted funds expended, expenditures by categories, progress of the work, cost per unit of output or beneficiary and, sometimes, benefits in relation to cost. Some of these statistics are difficult to compute and involve many assumptions, but most of them do not. Once the data are

collected, most of these indices are obvious and quickly computed. There are two problems: deciding what variables (and the most appropriate form) to collect, and then the matter of extracting the data from busy or unwilling colleagues.

We should note at this point that unlike the informant survey described in the previous section, this component of the information system has not been given a preliminary trial run. Nonetheless, we believe that our version is useful, feasible, and generalizable, and it is proposed with considerable knowledge of how this agency and other large bureaucracies actually function.

Table I presents a list of variables that are necessary for just about any project monitoring component. As the footnotes indicate, there are two kinds of expansion possible for this list. The categories that are asterisked (i.e., Source of Funds\*) must be further specified. For instance, potential sources of funds are the federal government, the state government, local contributions, or foreign donors. The second type of expansion occurs where a category such as Person #1 is shown. Obviously the same characteristics, such as rank, salary, etc. should be coded for Person #2, #3, etc. With this clarification, the structure of the variable list follows the categories already mentioned. The only new element in addition to inputs, activities, and outputs, are the *general characteristics*, which of course include a description of the project and the budget categories.

How often should the information be collected? For the kinds of intervention usually initiated in integrated rural development programs, perhaps every three months. A more refined time series is probably unnecessary and it would certainly overload the data collection capacities of most agencies. On the other hand, changes in personnel, equipment and even the nature of the project do occur if the agency is doing its job, so the data collection points should be frequent enough to catch these. Apart from the computer program for storing this information, what is suggested is a set of forms that the person in charge of project monitoring can circulate to the offices that have the necessary facts. And what kind of person should the chief project monitor be? He is easily described: he should be computer trained and knowledgeable about the agency and the projects; he should be accurate, reliable, resourceful, uncorruptable, tenacious, dedicated, diplomatic and endowed with the authority to get the information that is required.

Despite the difficulties of project monitoring there is at least one strong

TABLE I

List of variables for Project Monitoring Accounting System

Variables	Data entry points			
	1	2	3	4
<i>General Characteristics</i>				
Identification #				
Dates of start and major change				
Type of project*				
Budget*				
Source of funds*				
Responsible offices*				
Estimate of number of beneficiaries				
Location*				
<i>Inputs</i>				
Person #1 (name or identification number)				
Rank				
Salary				
Proportion of time on this project				
Materials #1				
Types*				
Cost per unit				
Amount needed				
Amount ordered				
Amount used				
Location of use				
Equipment #1				
Type				
Number used				
Number of use units (miles, hours, days)				
Cost per unit				
Location used				
Activities				
Dates of				
Planning sessions*				
Dates of meetings with relevant actors*				
Dates of significant negotiations*				
Dates of site inspections*				
Dates of consultant visits				
<i>Outputs</i>				
Physical output #1				
Proportion completed				
Number of				
Type				
Location				
Defects*				
Beneficiary #1				
Type*				
Number of				
Percent satisfied				
Location				

# Indicates the option of multiplying the file for additional cases.

\* Indicates need for specific categorization.

reason for going to the trouble and expense of setting up such a component. It is the only way to get some immediate feedback on the activities that most people consider central in integrated rural development programs. In contrast to macrosocial accounting, project monitoring generates various indices of progress, cost effectiveness, and, when additional data are collected, a profile of the target population.

From the perspective of conventional project monitoring and evaluations, it will be objected that the schema in Table I omits a crucial element: the goals of the project. After all, monitoring consists of comparing performance to objectives so how can this be accomplished with these categories? One answer to this objection is that to some extent the immediate goals are listed in this accounting system. The project name and budget communicates the objective facts: activate a given number of wells for irrigation, construct ten dispensaries, repair bridges and agricultural roads, extend drought-resistant seed, etc. If a description of goals beyond these concrete facts is needed, it can be recorded in a paper file, but the fact is that such goals are usually stated in such a broad and ambiguous way that they are practically useless for monitoring. Almost every project can be construed as improving the level of living of the rural people or reducing out-migration. In any case some of these criteria are built into the informant survey analysis, providing the basis for "impact analysis" of the subdistricts. These criteria can be linked to project monitoring via the location codes in the first section of the list.

### *5. Administrative Accounts*

All functioning agencies will have some kind of accounting system for payroll, personnel records and for inventorying equipment, but these operations usually require many workers and are slow at best. If a computer is available, there will be great pressure to use it for these tasks. If computerization is introduced, it is unlikely that the administrative staff will be technologically unemployed because skilled people are usually in short supply. And it must be admitted that accurate and convenient records of this type would contribute to any comprehensive evaluation of the agency's functions. The extent to which these data can be added to the macrosocial accounting file will vary widely.

## III. THE MICROCOMPUTER SYSTEM

The choice of the microcomputer is governed by a number of considerations

- (a) reliability;
- (b) adequate maintenance and repair;
- (c) portability;
- (d) adequate mass storage and central processing capacity;
- (e) ease of operation;
- (f) some software availability;
- (g) price;
- (h) access to identical equipment in the United States. The consultants who set up the system must be able to work with the same machines.

Given these criteria, the decision is narrowly circumscribed: the big computer companies provide repair and maintenance and most of these machines are accessible to a university-based consulting team, but the price is \$20 000 and up. Of course, everything depends on the particular year that the decision is made.

The portability criterion is quite important. There is always a delay in acquiring and setting up equipment such as this, so one may be forced to carry a computer back and forth during the first two years. This criterion points toward some type of microcomputer. Similarly, if the consulting team must purchase its own computer, the low cost of microcomputers is attractive. The low cost of this equipment is also relevant to the need to buy two complete systems, in case one breaks down. Even with a box full of spare parts, in-house troubleshooting skill, and the possibility of carrying some of the equipment back to the United States for repair, a dual system is necessary.

Computing equipment is only as good as the programs available for it. We had decided at the outset that a system like this must have an integrated package of programs, that teaching host country nationals to handle separate programs for separate tasks was too difficult and inefficient. What was needed was a general file system within which a given set of data could be edited, recombined, and statistically analyzed without complicated input and output or changing programs for different tasks. The experience with social science computing in the U.S. underlines the necessity for a well-documented and easy to use package. Otherwise busy or fearful professionals simply will not go near a computer.

The package<sup>2</sup> that we introduced combined simplicity with generality. It is based on a generalized file and editing system, and includes a broad range of statistical programs. It is appropriate for the analysis of data from households, farms, irrigated perimeters, small businesses, the characteristics of water points or of rivers, the performance of the planners, as well as the characteristics of projects and subdistricts that is the main focus of an information system. It is an all-purpose data management tool, equivalent to a skilled, tireless, error-free and low-salaried clerk who is capable of working for all sorts of different people on many different problems. This democratization of computing is further facilitated by the use of diskettes for data storage. These plastic disks are about five inches in diameter and can, if necessary, be transported to a professional's own office. In conjunction with the general data management programs these portable data sets allow any technician or, for that matter, a secretary, to use the computer. The equipment will of course require one or two specialists to maintain it and deal with special problems, but the system tends to eliminate the specialist 'gate-keeper' who frequently appears in computing facilities in the less developed countries. These people quickly develop a monopoly on certain types of knowledge and then gain undue leverage on the rest of the staff. A computer 'czar' could still get control of the system described here, but it is much less likely.

#### IV. THE USES OF INFORMATION SYSTEMS

Organizations have always maintained information files. These incorporate, with varying degrees of efficiency, the three types of information identified in this report. What is new is the rationalization and integration of these files. The very term 'information system' signals this new status, and the increasing prominence of comparative data coincides with this development. Thus, the most general answer to the question of how information systems are useful is simply that they will serve the same purposes that they have always served: assisting decision-making and enabling an organization to modify its policies on the basis of past experience.

What, then, can these improved information systems deliver? The three components that bear on this question may be briefly labelled "better road maps, rapid recognition of deviations from plan or good practice, and long-term, probing evaluation". In other words description, monitoring and evalua-

tion. These are the familiar purposes; they take on radically new forms in the present context.

### 1. *Static and Dynamic Description*

Once an administrator has seen his constituent subdistricts displayed on a computer screen or paper output, ranked from rich to poor, or from urbanized to isolated rural, it is difficult to ignore such information thereafter. Thus, an initial yield of the information system is simply the variations on variables that are likely to be of interest to planners. The same is true of trends, which are simply comparisons into the past.

Exactly how the planner should utilize comparative information is beyond the scope of this paper and in any case quite in dispute. What is needed first is a clear delineation of the kind of outputs that may be reasonably expected from an information system. These, coupled with examples, should then be the subject of an intensive dialogue between information specialists and planners. There is much more to planning than simply extrapolating the results of data analysis, but planners would do well to incorporate these results more fully than they have.

The second kind of descriptive output may be labelled static relationships. Most of what passes for sociological knowledge is limited to this category, variously known as generalizations or 'relationships'. These lack the explanatory power of dynamic models, discussed below, but they are more plentiful and comprehensible. For example, a well-known hypothesis<sup>3</sup> states that urban-industrial centers organize their hinterlands so as to enhance productivity and incomes of the rural population. Such a statement needs much specification, of course, and it is true only under certain conditions, such as the absence of a plantation economy or other forms of inequality. But it is obvious that a handful of reliable generalizations like this, specified for the region, could not help but make a difference in the perspectives of regional planners.

Most static models imply dynamic models despite the lack of time series data necessary for elaborating them. Thus the hypothesis about urban centers implies a process extending over a decade or two and it could of course be followed over 100 years or more as has been done in at least one case of U.S. data (see Nicholls, 1956, 1957; and Tang, 1958). However, dynamic models are best stated in change terms. Thus a better example might be: centralized

industrial nations experiencing rapid growth will generate high levels of income inequality in peripheral regions due to a dualization of the economic organization of these regions. If the dualized region contains an indigenous minority group, ethnic solidarity will develop.

Even if these dynamic and explanatory models can be conceptualized and empirically specified, they pose a major problem for the administrator. What he wants to know is which are the interventions that he can manipulate that will make a difference, and what difference will they make? Economic models are strongly oriented to these administrative levers — tax policy, subsidies, regulation, income redistribution, etc. — but more general socio-economic models have difficulty specifying manipulatable variables. The situation seems to be that if the factors are tractable, the results are trivial, and if the results are important, the administrator is unlikely to have the position, the finances, and the power to pull the indicated levers. Moreover, it is usually a matter of many levers in complex combinations, and social science knowledge cannot provide the instructions or a forecast of the consequences. Nonetheless, the claim can still be made that understanding, which is one result of a truly valid explanation, is better than ignorance. Even if some elements of structure are outside an administrator's power he can at least direct the money and effort to the more tractable situations.

## 2. *Monitoring*

The essence of monitoring is the successive comparison of measurements with expectation. If a housing project is proposed, it is of interest to know how the plan corresponds to various estimates of need. Once under construction, costs, inputs, allocation of personnel, and of course progress must be continually checked. The final product, and perhaps even the characteristics of the new residents, must be recorded. At this point, monitoring tends to merge with what is known in the literature as 'process evaluation'.

Project monitoring and the adjustments in investment and management that should result from such monitoring are examples of activities that are under an agency's control. That is why they are central to most integrated rural development programs. Of course, the recognition of discrepancies between plan and practice and subsequent readjustments requires an alert and confident administrator. In many and perhaps most projects, uncovering a discrepancy is considered an unfriendly act, and one not likely to bring

rewards. Moreover, it is often the case that discrepancies are recognized and then covered up. Only the institutionalization of project monitoring coupled with pressure from the federal government will correct such tendencies. Even marginal areas in most nations are now too valuable to be left in the hands of administrators who will not correct mistakes.

### 3. *Evaluation*

In the rural development literature, the term evaluation invariably refers to project evaluation (see Agency for International Development, 1974a, 1974b; Hoole, 1978; United Nations, 1978), that is, whether the project realized its goals. And yet it is easy to imagine one or more successful projects in a community with no change in the average conditions of life. In other words, a distinction can be made between project and community evaluation. The contrast can be outlined as follows:

<i>Project evaluation</i>	<i>Community evaluation</i>
(1) Beneficiaries are defined by project criteria	It is assumed that all members of community should benefit
(2) Criteria are project specific	Criteria are universal
(3) Short-term	Long-term
(4) Research focuses on one project	Research focuses on combined effect of all projects operating in community
(5) Beneficiaries tend to be class-specific	Beneficiaries less likely to be class-specific
(6) Success dependent on interventions	Success may be independent of interventions

The contrast of these criteria demonstrate that community evaluation is different in kind from project evaluation. It is not the difference between counting the number of wells built and measuring the impact on the health of the rural population. That difference exists but it is obvious that project evaluation could be extended to include such impacts, while community evaluation could take account of project activity. The fundamental difference, instead, is that the beneficiaries for community evaluation are defined by membership in communities while the 'target population' for a project is

defined by the project plan. A community of 2000 people may have only 15 or 20 project 'targets'. The other attributes of project and community evaluation are all related to this basic distinction. Evaluation criteria for projects must be project-specific, while those for communities must be general. The short-term, long-term distinction as well as the differential focus – on a single project versus the combined effect of projects – is also evident.

The last criterion, with respect to the assumed 'cause' is another fundamental distinction, and sets the stage for a different kind of data analysis. Clearly, if the planners believe that a given intervention will have a particular effect, then the research design and analysis should be oriented to excluding or controlling all other influences so that the consequences of the 'treatment' are apparent. The ideal design given this assumption is the classic experimental design involving randomization. If, on the other hand, it is assumed that a given intervention is simply an addition to or possibly a modifying factor in an ongoing and complex social process, the design must be enlarged to identify and to analyze the influence of a range of variables. The design ideal in this case is the so-called 'quasi-experimental design', specifically, multivariate comparisons with, if possible, an analysis of trends (see Brown, 1971 and Voth, 1975).

On the basis of this comparison, it is evident that the project file is geared to project evaluation, while the subdistrict file is appropriate for community evaluation. The five criteria – level of living, inequality, productivity, ecological problems and status restrictions – which were built into the informant survey now take their place as universal evaluation criteria. The starting assumption for community evaluation is that the subdistrict should show progress on at least some of these criteria within a reasonable time, from five to ten years. Which criteria depends on the general policies that guide the rural development program, but certainly some should show improvement. On the other hand, the world is too complex to expect improvement on all five at the same time. Trade-offs are inevitable in this kind of work.

But why should one wish to impose community evaluation on a development program? Isn't it enough that it delivers on specific projects to a given target population? There are several answers possible. In the first place rural development agencies usually claim that their work will benefit the population as a whole. The combined impact of a wide range of specific projects is considered a major impetus to regional advancement which implies some

degree of subdistrict progress. The second reason takes the form of a question: If a development agency does not have an impact on at least some of these criteria, can it be taken seriously? Surely it was not set up simply to put in roads, dispensaries, agricultural improvements, etc. with no thought as to the impact on the general population. Projects are means to ends, and the ends are people. The third reason is methodological. Unless comparable units and criteria are used around the world, we will never understand the development process. Projects by their very nature tend to be particularistic. Even an activity like new housing or improving agriculture must necessarily take different forms in different countries and even in different parts of countries. In contrast the unit that is here called the rural community can be identified around the world, and the five criteria that have been proposed can, in principle, be measured by standard indicators.

*Cornell University*  
*University of North Carolina, Charlotte*

#### NOTES

\* The research on which this paper is based was supported by the Office of Rural Development Administration of the Agency for International Development via its sponsorship of Cornell's Rural Development Committee. We are also indebted to the Central Tunisian Development Authority for its support. None of these agencies is responsible for the opinions and conclusions expressed in the article, of course.

<sup>1</sup> Recent discussions oriented to the problems of rural development information systems are Batt and DeWalt (n.d.); Cummings (1977); Development Alternatives, Inc. (1978); Mathew and Scott (1980); Scott (1978); Young (1973, 1977).

<sup>2</sup> Detailed descriptions of the hardware and software developed for this project are available from Frank W. Young, Department of Rural Sociology, Warren Hall, Cornell University, Ithaca, NY 14853.

<sup>3</sup> A recent test of this hypothesis, which cites the research literature, is Young et al. (1979).

## BIBLIOGRAPHY

- Agency for International Development: 1974, *Evaluation Handbook*, 2nd edition (Office of Program Evaluation, USAID, Washington, D.C.).
- Agency for International Development: 1974, *Project Evaluation Guidelines*, 3rd edition (Office of Development Program Review and Evaluation, USAID, Washington, D.C.).
- Brown, Dorris D.: 1971, *Agricultural Development in India's Districts* (Harvard University Press, Cambridge).
- Batt, R. Laura and Billie R. DeWalt (eds.): n.d., 'Social sciences in the planning process: baseline data collection in developing countries' (University of Kentucky, Center for Development Change [mimeo]).
- Cummings, Raiph W. Jr.: 1977, 'Minimum information systems for agricultural development in low-income countries' (Agricultural Development Council Seminar Report No. 14, New York).
- Development Alternatives, Inc., 1978: *Information for Decisionmaking in Rural Development*, 2 Vols. (Development Alternatives, Inc., Washington, D.C.).
- Hoole, Francis W.: 1978, *Evaluation Research and Development Activities* (Sage Publications, Beverly Hills).
- Mathew, N. T. and Wolf Scott: 1980, *A Development Monitoring Service at the Local Level*, Vol. I (United Nations Research Institute for Social Development, Geneva, Switzerland).
- Nicholls, William H.: 1956, 'Some foundations of economic development in the Upper East Tennessee Valley, 1850-1900', *Journal of Political Economy* 64, pp. 277-302; 400-415.
- Nicholls, William H.: 1957, 'Relative economic development of the Upper East Tennessee Valley, 1850-1950', *Economic Development and Cultural Change* 5, pp. 308-324.
- Scott, Wolf: 1978, *Measurement and Analysis of Progress at the Local Level*, Vol 1 (United Nations Research Institute for Social Development, Geneva, Switzerland).
- Tang, Anthony M.: 1958, *Economic Development in the Southern Piedmont 1860-1950* (University of North Carolina Press, Chapel Hill).
- United Nations: 1978, *Systematic Monitoring and Evaluation of Integrated Development Programmes: A Source Book* (United Nations, New York).
- Voth, Donald E.: 1975, 'An evaluation of community development programs in Illinois', *Social Forces* 53 (4), pp. 635-647.
- Young, Frank W.: 1973, 'Macrosocial accounting for developing countries', *Sociologia Ruralis* XII, pp. 288-301.
- Young, Frank W.: 1977, 'A rural development inventory' (Rural Sociology Bulletin No. 83, Cornell University).
- Young, Frank W., Donald K. Freebairn, and Reuben Snipper: 1979, 'The structural context of rural poverty in Mexico: A cross-state comparison', *Economic Development and Cultural Change* 27 (4), pp. 669-686.