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9. ABSTRACT

Before dealing with supply, a government must determine the types of data it requires and the uses to be made of them. The data supply function necessitates the ability to assemble data relating to contemporary questions and also the foresight to establish a data base to meet the changing needs of a planning process in a dynamic, economic future. Four distinct types of data may be categorized as: structural or benchmark data, resource inventory data, recurrent series on economic parameters, and special studies. Within the context of these data needs, the data supply industry can be disaggregated by source. Each source has its particular characteristics which lead to comparative advantages in producing different types of data. The need for a continuing flow of recurrent data to support policy and administrative decisions gives rise to agencies within government which are responsible for data collection, tabulation, and occasionally analysis. Two of the sources are central statistical organizations and census organizations. These agencies have no operational role in implementing government development programs and consequently will generally concentrate on national aggregate data. Centrally collected data is often characterized by a broader sampling base and greater accuracy. Another type of governmental data source is the statistical cell. This type is tasked more frequently for data to support an immediate policy or program implementation need. The output will be specific to these needs. Proximity to policymakers can lead to their having an influence on the definition of parameters or on data collection methods. While they may occasionally have lower levels of accuracy, they often collect and assemble data more specifically relevant to sector level planning and analysis. Other data sources are also discussed with their advantages and

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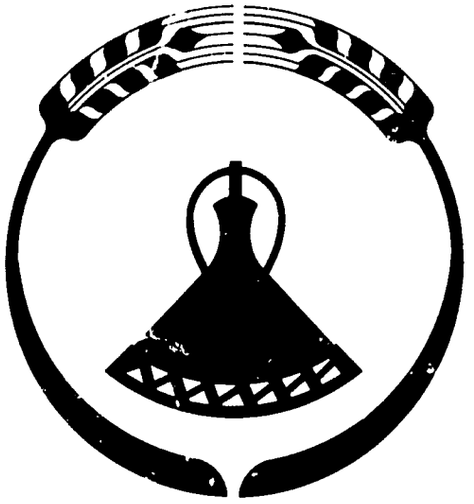

THE SUPPLY OF DATA FOR AGRICULTURAL ADMINISTRATION AND DEVELOPMENT PLANNING

Jerry Eckert

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LESOTHO AGRICULTURAL SECTOR ANALYSIS PROJECT

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Preamble

The basic concepts presented in this paper are drawn from the author's experience with data and statistics in the Indo-Pakistan Subcontinent. It is presumptuous to generalize from this environment to the developing world as a whole. In particular, almost all of the data series available in the Subcontinent reflect a legacy of definitions, procedures and format developed in an era of British colonial administration. These particulars may not be replicated in areas that have had different histories.

On the other hand, India and Pakistan have had and used data and statistical services probably longer than any other developing nation. The systems they have evolved can therefore be viewed as illustrative case studies. The proposition behind this paper is that the concepts and relationships apparent in this environment suggest a basis for developing sound and useful statistics in countries with a shorter development history.

The outline presented in the section of Specific Data Needs below was developed cooperatively with Professor Wolfgang Stolper whose book Planning Without Facts describes the frustrations possible when faced with an inadequate data base to support policy formation. The list represents, therefore, a blend of views from within the planning process in the Subcontinent and in Nigeria. Responsibility for the inadequacies of the list remains my own.

THE SUPPLY OF DATA FOR AGRICULTURAL ADMINISTRATION AND DEVELOPMENT PLANNING

Viewed from the context of a national planner, questions of the supply of data are closely intertwined with demand issues; the uses to which data will be put. Both sides of the question are discussed below in the context of a government that has a strong deterministic role in the structure and management of their statistical systems. It is assumed that statistical systems to support planning are, in themselves, the subject of planning. Little of the data necessary would be spontaneously available without explicit government effort or regulation, particularly in the early stages of growth when commercialized market and manufacturing sectors are relatively small and unorganized. Even as these sectors mature, aggregate data on their performance will not usually be forthcoming without an explicit collection effort, usually mounted by government. Before dealing with supply, therefore, government must determine the types of data it requires and the uses to be made of them. The data supply function then necessitates not only the ability to efficiently assemble data relating to contemporary questions, but also the foresight to establish a data base now to adequately meet the changing needs of a planning process in a dynamic economic future.

Types of Data

Four types of data seem conceptually distinct. They may be categorized as:

1. Structural or benchmark data
2. Resource inventory data
3. Recurrent series on economic parameters
4. Special studies.

Structural or Benchmark Data

Conceptually a benchmark study should establish a reference knowledge base for a particular point in time. In the context of this paper, these data provide information on the basic structure and internal dynamics of agricultural and rural economies, village and farm systems, extant institutional structures and similar items. Such studies develop generalizations for national or regional geographic aggregates, for various strata of the population, or for economic, social or other groups. A common focus in developing countries is the "project area", usually a geographic region which has been selected for special development programs and for which a detailed structural understanding is necessary. In order to measure change in several dimensions and to achieve relatively complete coverage, benchmark studies are characterized by their inclusiveness. A common error, however, is to collect information on practically everything assuming that the need for each datum will become apparent subsequently.

Specific statistics often included in rural benchmark studies are income levels, income distribution, resource ownership, employment levels, use of selected technologies, extent of involvement in the market, cash and consumption flows, household structures and many others. All too frequently the analysis develops only averages per group or subgroup. The more interesting calculations that would quantify economic or social behavioral patterns receive sparse attention and the data are often presented in such an aggregated form that these estimates cannot be made after publication.

The most obvious use for this information is to establish a base from which change is measured, or to monitor such change at periodic

(e.g., every decade) intervals. For this purpose, highly aggregated data may suffice in many instances. There are, in fact, limits to the amount of statistical detail that can be compared between two benchmark surveys. The simple fact of mounting a second survey can introduce sufficient variation due to different enumerators and different procedures to prevent direct comparisons of highly detailed measures.

A more significant use lies in defining target groups for development. Much previous development work merely assumed that an unspecified form of economic osmosis would adequately distribute the benefits of growth. The failure of this assumption is widely apparent today. It is no longer considered ethical to mount development programs without specific attention to the distribution of benefits. The structural data to support these decisions must be developed to characterize specific strata of the population and the differences between them. This militates against aggregative measures, however, suggesting much more detailed statistics buttressed with a considerable amount of inter-strata comparative analysis.

The contemporary emphasis on targeting development toward the bypassed, the resource poor and others on the bottom of the spectrum of life is of recent origin. It was not adequately anticipated by planners or statisticians. Many countries with otherwise extensive agricultural data systems do not have information that permits skewing development's benefits to these selected groups. The simple question "What are the specific means by which a development effort can reach the landless rural poor?" cannot be answered very well even in countries with long economic planning histories. Systemic linkages that determine income, employment and the quality of life are particularly worth study in this context. Adequate structural information of the type described could have caused previous development budgets to be more usefully spent.

Because of the relatively slow rate of change in most social, economic and political parameters, structural analyses need only be updated every 5-10 years once an adequate base is established. As is suggested above the base is not adequate in many countries and a high priority seems justified for plugging some of the existing holes.

Resource Inventory Data

These data define and characterize the resource base for development. They are distinct from structural data in that the category implies an emphasis on enumeration of magnitudes rather than analysis of systemic parameters. Different measurement techniques will predominate and the periodic need to update inventory estimates is not so urgent. Typical examples include data on soils, ground and surface water supplies, climatic data and mineral resources. Given the direction that development has taken to date, an inventory of energy resources seems advisable as well.

Renewable natural resources such as forests, rangelands, and fisheries constitute a resource set that requires special attention. If a biological natural resource is to be mined then little more is needed aside from identification, measurement and mapping. If, however, the resource is to be managed on anything like a sustained yield basis much additional information is required. In particular, the internal dynamics of the biological system that generates the resource must be carefully understood.

The third set of resources may be identified as those biological resources generated by human rather than natural systems. Inventory data in this group include crop and livestock censuses, labor force estimates and the nature and extent of the skills reservoir within a country.

Some resource inventories, such as soils and groundwater, require extended efforts with a substantial investment. The appropriate time to begin rests on a perception of when in the growth process this type of information will be critically needed. Unavoidable time lags in data generation necessitate careful planning of the data gathering function. Newly developing countries cannot be expected to have adequate resource information. However, a gradual programmed accumulation of such data is needed for long range support to planning. Some of it will be needed early on since important choices between growth strategies require knowledge as to the development potential inherent in the nation's resources.

Resource inventories are not completely static and some periodic reassessments will be necessary. Groundwater and range resources, for example, can show important short-term variations. Thus, for some information periodic revisions will be necessary because of their inherent variability. On another plane, the economic meaning of a physical resource (say minerals or groundwater for irrigation) is a function of available technology and relative prices. Dramatic technical advance or altered price relationships may periodically necessitate re-examination of the resource base, even for physically unchanged resources.

Recurring Data Series

Data of essentially time series nature form the operational basis for Ministries of Agriculture in the routine administration of policy and programs. Items usually included are commodity production and marketing data, prices, cost of living series, input usage, industrial and commercial activity and data on the flow and delivery of government services. Because of their recurrent nature, these data require an organization within government charged with statistics collection which can insure continuity and comparability over time.

Special Studies

Within the dynamics of planning there seems to be a constant need for special studies on one issue or another. Frequently these analyses will necessitate new data and will incorporate the field work to collect it. In addition, almost every country is the subject of research by national or transient foreign scholars whose efforts are not usually linked directly to the needs of policy formation. Consequently the data base of a developing country will receive periodic infusions of new information some of which will not need to be repeated while others may eventually develop into recurrent data series.

Specific uses for special studies include:

1. To address contemporary issues of policy or administrative concern.
2. To provide adjustment factors for periodic revisions of various recurrent data series.
3. To open up new areas of structural knowledge.
4. To assess the extent and rate of change in selected structural parameters without the expense of another benchmark survey.

Data Suppliers

Within the context of the data needs discussed above, the data supply "industry" can be usefully disaggregated by source. Each source has its particular characteristics which lead to comparative advantages in producing different types of data.

Government Statistical Agencies

The need for a continuing flow of recurrent data to support policy and administrative decisions gives rise to agencies within government responsible for data collection, tabulation and occasionally analysis.

Two sources can be identified. First are central statistical organizations under whatever name. Census organizations are a special subset distinguished by their single purpose and by the length of time in the observation cycle. These agencies have no operational role in implementing government development programs and consequently will generally concentrate on national aggregate data. As a result the definitions, concepts and statistical techniques used tend to be wider in their application, a level of generality that sometimes reduces the usefulness of these data for specific policy issues. Cost of living series, for example, are usually maintained by central statistical organizations and, while useful for monitoring generalized trends in the economy, rarely reflect rural areas or farmers adequately. Cost of living data for specific target groups, e.g. the landless, are almost never available.

On the other hand, these agencies are usually more mature institutionally than other statistical groups within a developing country's government. Terms and conditions of service including rewards and incentives, will likely be structured to emphasize statistical professionalism. As a result, the staff will include more people for whom statistics and data systems are careers, with higher average levels of statistical training than elsewhere in the bureaucracy. Data series maintained by central agencies will therefore tend to have a sounder base in accepted statistical theory and practice. Although at times too generalized for direct use on a particular issue, centrally collected data will often be characterized by a broader sampling base and greater accuracy.

The second generic type of governmental data source is the statistical cell or department that is often maintained within each of several operational ministries. It is not uncommon for the Ministry of Agriculture,

in particular, to have its own statistical staff. The more established (older) the government bureaucracy, the higher the probability of multiple statistics units throughout government.

These data sources are functionally distinct in at least one important dimension. Being within an operational ministry, these agencies are tasked more frequently for data to support an immediate policy or program implementation need. There are, of course, exceptions such as the Statistical Reporting Service of the USDA but the generalization seems valid in most of the developing world. Naturally, their output will be specific to these needs. Being concentrated in their focus, ministerial statistical cells often probe deeper into various problems than can the centralized agency. However, frequent demands for immediate responses or "brush fire" surveys can easily force these agencies to abandon precise statistical methods in the interest of immediacy.

Proximity to policymakers can lead to their having an influence on the definition of parameters or on data collection methods. Whether this is an advantage or disadvantage is a value judgment that must be made based on empirical facts. However, this connective link must be recognized particularly when using the output of special studies done by ministerial statistical units.

Compared to central statistical agencies, the ministerial agencies often have less of a critical professional mass composed of people with lower training levels and with lower access to technical assistance. However, while they may occasionally have lower levels of accuracy, they often collect and assemble data more specifically relevant to sector level planning and analysis.

On-Going Government Programs

Government programs often assemble routine data on their performance for purposes of evaluation or monitoring. Both regular government service programs and special development efforts have data on magnitudes of goods and services delivered, identification of recipients and costs of delivery. For example, the number, type, distribution, and utilization of tractors within the agricultural sector is often most immediately available from this type of source. Where public agencies control the distribution system, the use of other inputs such as fertilizers and pesticides may be best obtained from these agencies. Less frequently available are analyses of the impact of governmental programs on target groups. Family planning programs are probably unique in the extent to which monitoring data on delivery are routinely collected and used to continuously evaluate impact.

A word of caution is warranted concerning this data source. Incentive structures within operational ministries are built to reward successful programs. There can be very strong pressures put on statistical officers within individual programs to develop those data that emphasize progress toward announced goals. Since those keeping the data on applied programs are not employed by statistical agencies but rather by the program itself, these pressures are hard to resist. The usual compromise is to emphasize data showing progress and downplay or omit data that might indicate problems or negative results.

Benchmark data is sometimes generated by development programs and can become a valuable addition to the planning data base if kept in its proper context. Occasionally a new program will begin with a "socio-economic" survey of the project area. While intended primarily to provide a base for measuring change, these efforts can also be useful to address regional

differences, target group identification, identifying new parameters of rural economic or cropping systems and other similar contributions. An important dimension often overlooked in these studies is to evaluate similarities and contrasts between the project area and larger geographic, climatic or administrative regions. Yet this is precisely the extension that permits setting and retaining the context in which a particular study fits. It is an analytical dimension that is essential if a given benchmark study for a particular project is to become a useful part of the overall data base.

Private Enterprise

As the private sector matures it becomes the source of much needed data on such subjects as industrial performance, marketing and trade, certain price series, commercial credit use and the like. As mentioned above, data on these economic variables will not automatically be made available without some explicit collection effort, usually elicited by government. Two problems can be identified at this level of generality. First is the problem of obtaining consistent data from large numbers of private entrepreneurs each of which may have different operational, accounting and valuation procedures. Second is the difficulty in obtaining accurate reporting when the respondent often suspects that government will use the data to more closely control the economic subsector involved. In developing countries where government plays a much more determinant role in economic systems, and where severe resource scarcities force firms to use various non-price competitive practices, many of which are only quasi-legal, the latter problem can be particularly acute.

Research Organizations

In the first section the need for special analyses on selected issues was identified. These can be obtained from agencies within government,

local university and consulting organizations and foreign individuals and organizations. Each has its own particular strengths and weaknesses.

Most developing countries have a staff of research economists attached in some way to the planning agency. In many places additional such units are found with the statistical branch of one or more operational ministries. Properly run, these groups can prove most vital in supporting effective planning. In addition to direct access to all of the data available within government, they may receive regular input from policymakers as issues are weighed and discussed. Being in-house organizations, they are turned to more frequently, and, if productive, relied on more heavily than other sources of analysis. On the other hand, their proximity to the policy formation process brings with it the same twin problems faced by the ministerial statistics organizations; the possibility of bias imposed from above and the occasional need to sacrifice analytical depth for an immediate response.

Where the need for objectivity and either rigor or depth are paramount, a case exists for commissioning special studies by non-governmental agencies. Faculty and staff of local universities or research organizations are logical candidates. Private local consultant firms are another option but are not always available. It is particularly important to use non-governmental consultants for program evaluation functions where it is a government program being evaluated and it is presumed to have been a mixed success at best. Where analytical criticism is expected, expatriates often cannot adequately fill the role either, since criticism is more readily accepted if offered from within the culture rather than from outside. If a local university or consultant is to evaluate a program after it has been implemented, it can be advantageous to have them do the original benchmark study as well.

There seems a valid role for the work of foreign scholars. By being an outsider, the foreigner can see and understand things in a different and perhaps more objective, analytical framework. This point is often debated by anthropologists and other social scientists, however, the balance of evidence seems to fall in support of the above statement. Native citizens are often too close to the inner workings of an indigenous economic or behavioral system to perceive its systemic elements. In addition, having grown up in the culture, indigenous observers may take key components for granted, not even being aware of them except at the subconscious level. The expatriate scholar can often overcome these problems, but only if he is culturally and socially aware and consciously seeks to minimize the affects on his work of his own cultural biases.

Much of the foreign contribution will be through dissertations, theses and other special studies. Methodologically they will usually be as good or better than similar local products. These studies should be highly focused and contain considerable analytical depth. The most vexing problem is that they are very hard to find after completion particularly in the case of dissertations done for European universities. The scholar returns to his home country with his data, writes a first-class thesis and perhaps an article and then moves on to other things. Little of his information is incorporated into the actively used data base of the country studied and in many situations can be retrieved only with great difficulty.

The problem is actually broader than the expatriate. In countries that have been well studied, there exists a vast array of special studies by both foreigners and citizens. They exist scattered through the shelves of the academic or consultant and his client. Often only a few copies are made and these quickly disappear, predominately into private collections. Much of it is well enough done that its validity extends over several years

yet locating it is a significant problem. No reference service or bibliography keeps track of these studies to make them available when needed. Consequently, decisions are made without access to the full extent of available information and periodically duplicative studies are commissioned.

Specific Data Needs

It might be argued that a list of data needed for planning does not belong in a paper on the supply of data. However, as mentioned above, data supplies result from explicit efforts to meet felt or anticipated needs. To identify data needed for planning is to construct a framework for data supply efforts. In addition, questions of sequencing the supply of data with changing needs are easier to discuss in the context of specific data sets.

A tentative list of major and minor categories of data needed is given below. It is far from complete, no such list can ever be all inclusive. Hopefully it might serve as a point of departure in future discussions. The section that follows discusses issues of sequencing the supply of data in the context of differing stages of development.

Data for agricultural development can be classified in many different ways. Perhaps the most common is to disaggregate according to type of item being measured. One version of this system is used below. Another focus is to aggregate data needs by the type of policy issue being addressed. This classification system is less precise because particular estimates or time series may well serve decision makers on several issues. Since specific policy issues can vary immensely no attempt is made here to provide an example of the latter organization.

Given any group of economists, the number of classification systems could at least equal the number of group members. The list below was

drafted jointly with Professor Wolfgang Stolper. Consequently Nigeria and Pakistan form the experiential cornerstones of this listing. Inadequacies in the list remain the responsibility of the author.

Data needed for agricultural development include, but are not limited to, those listed below. Priorities and the extent of coverage needed will vary between countries depending on stage of development, growth strategies in use, the structure of the economy, existing resource bases and many other factors.

I. Resource Inventory Data

A. Physical Resources

1. Soils
2. Water (ground and surface water supplies)
3. Vegetation (forest and range and their productivity)
4. Meteorological and climatic data
5. Minerals
6. Energy resources

B. Infrastructural Resources

1. Transportation (roads, fuel distribution, maintenance)
2. Communications (telephone, telegraph, radio, T.V.)
3. Power distribution

C. Labor Resources

1. Unskilled
2. Skilled

II. Production and Income

A. Crop and Livestock Production

1. Acreage, production, yield
2. Supply elasticities
3. Comparative advantage differentials
   a. between regions
   b. between farm types, or farmers
4. Costs of production, net incomes
5. Potential for growth in production
   a. acreage expansion w/existing and new technology
   b. yield increases w/existing and new technology
6. Commodity policy and prices

B. Rural Incomes

1. Income levels, cost of living
2. Income distribution determinants
3. Tax bases
4. Growth rates, change in distributions

III. Output Usage

A. Non-Market (home consp., seed, feed, wastage)

B. Domestic Marketings

1. Volumes, values, sources and destinations
2. Supplies to processing industries

C. International Trade

1. Volumes, values
2. Balance of payments, foreign exchange balances
3. Sources of growth potential

IV. Input Usage

A. Quantities Used, Seasonality of Demand

B. Distribution of Use (among crops, farm strata, regions)

C. Differentials in Access to Modern Inputs

D. Land Distribution, Tenure

E. Levels of Technological Knowledge

F. Resource Productivity, Efficiency of Use

G. Domestic Input Supply Capacity and Potential

V. Systemic Linkages in Agriculture

A. Production Systems

1. Competitive, complimentary, supplementary relationships
2. Risk management methods in use
3. Extent, nature of market involvement
4. Price responsiveness of farmers

B. Farm-Household Interrelationships

C. Employment Dimensions

1. Individual farm operations
2. Input supply industry
3. Output processing and marketing industry
4. Population strata employed in each occupation
5. Labor's factor share in output
6. Non-farm employment by villagers

D. Value and Motivation Matrix of Farmers

VI. Consumption Patterns

A. Nutritional Levels, Deficiencies

B. Dietary Composition by Source

C. Rural-Urban Food Balances, Projections

D. Consumption Mix for all Commodities Including Non-Food Expenditures

E. Extent of Subsistence Production - Consumption Households

F. Per Capita Consumption Levels and Changes Underway

VII. Institutional Availability and Effectiveness

A. Crops Research, Testing

B. Extension

C. Technical Training, Academic Education

D. Marketing

E. Machinery Repair, Maintenance

F. Credit, Input Delivery and Allocation Systems

G. Socio-Economic Field Research Capacity

H. Policy Analysis Capacity

Sequencing the Supply of Data

Not all of the above data are needed or can be produced at any one time. Requirements for accuracy and extent of coverage will change through

time for any one item. And finally the nation's capacity to generate these data will vary, presumably increasing as development progresses.

At a very rough level of generality, agriculture in developing countries may be viewed as moving through three broad levels of development. The first may be labeled subsistence and is characterized by an agriculture composed of units producing primarily for home consumption with limited involvement in the market. Given the subsistence incentives to assure adequate food supplies, low rates of change will generally prevail. Incomes will be low but uniformly so, enforced by the distribution and welfare mechanisms inherent in still relatively intact traditional cultures and social structures. Governments may be small with serious shortages of skilled decision makers. It is assumed for the analysis below that they have decided to develop agriculture.

The second phase is best characterized as mixed. The percentage of farms producing primarily for the market has risen although a substantial portion has yet to follow. Some subsectors are experiencing more rapid growth, others remain stagnant. The culture and society come under stress from disintegrative forces as individuals make choices between modern and traditional worlds. Agriculturally related industries are multiplying although many face severe difficulties before becoming viable. Governments use a combination of direct and indirect measures to stimulate and guide growth. Since the country is still characterized by restrictive scarcities, government plays a major direct role in resource allocation using predominantly non-price measures. The market is still inefficient in its ability to transmit consumer demands to producers and often wasteful in moving supplies to consumers. Mark-up margins are high, volumes are low.

Significant, often traumatizing, differentials exist in incomes, level of living, access to productive resources, access to education and technical knowledge, availability of social services, etc. Under-employment often characterizes rural areas and the urban poor. Important strata of the population still spend almost all of their income for food with the result that they have little opportunity for more fulfilling activities. Target groups for development efforts are easy to define and their needs are urgent.

This phase actually encompasses most of what is considered development. I have structured the phases this way purposively to emphasize where the development process begins and what is its ultimate end.

Phase three could be called a market economy characterized primarily by a mature, viable private sector in non-agricultural production. Most agricultural firms produce for the market and rural households rely on the market for significant portions of their food supply. Purchased inputs are widely used in agriculture. While income differentials remain, the instances of severely degrading poverty have largely disappeared. As a result target groups become more generalized in their definition.

Government has, by now, attained some level of operational sophistication. With the growth of the private sector, government's role has shifted toward providing a stable environment for industry, commerce and agriculture. Indirect incentives have partially displaced the government's formerly direct role in funding development, rationing resources and redistributing incomes. Severe scarcities have abated: consequently, market prices, rather than rationing and influence, dominate the allocation process.

In making the transition from the first to the third stage, both the demand for, and the supply of data and information will change. Some

information, such as soil surveys, will not be required until well into Phase Two. Other information, such as cropping systems, is needed from the outset with constantly increasing needs for greater depth of understanding. Finally as government moves from a minimal role to a manipulative and deterministic role to a role of indirect influence and providing stability for private enterprise, the data system must adapt simultaneously.

Another view of the three phases focuses on the short run objectives of planning that prevail during each period. Conceptually, the goals of Phase One concentrate on initiating change processes, identifying and eliminating the more important bottlenecks in traditional systems, redressing major resource imbalances and market imperfections and articulating the goals of development to be pursued. Agricultural policy is geared toward beginning the process of change in selected high potential subsectors of the rural economy.

Phase Two concentrates on spreading participation in change and on building a sustaining dynamic base. Equity issues loom large: it is here that the target group approach is needed in most countries. Economic policy should focus among other things on developing the economy's internal capacity to perpetuate economic progress. This includes extending rural and industrial infrastructure and services, refining the policy framework and developing critically needed support institutions such as research and extension.

Phase Three concentrates on removing uncertainty in the economy, increasing market and institutional efficiency and fine-tuning the policy and incentive structures affecting the private sector.

Consistent with these ends, several conclusions regarding data supply sequencing are possible. First, choosing the initial foci for a development

thrust requires data on production activities with high potential. This requires an initial assessment of major parameters of the resource base, including human resources. Current technological and utilization levels need to be identified. Decisions made in Phase I regarding development strategy will determine those resources on which detailed information will be needed in Phase II. Resource inventories should be started early to ensure adequate data when needed.

Crop and livestock yields and production levels must be compared with their potentials. Critical constraints to expanded cropping must be identified in Phase I. Available time series data should be reviewed for adequacy of coverage. Data needed even in Phase I include production, yields, distribution of products, markets, incomes, costs of living and production, and commodity prices. It is also appropriate to identify systemic aspects of indigenous cropping systems and farm-household interactions. At the subsistence level, these factors are often skewed toward risk aversion and have, in the process, insured against rapid growth as well. Movement toward Phase II requires identifying and relaxing many constraining systemic linkages.

Other benchmark studies required in Phase I include the consumption mix of rural households, their sources of food supply, cash needs and flows, utilization of the household labor force and many other dimensions of the family unit. In addition, if not already available, data on the internal social and economic organization of the village is important. These factors affect the flexibility possible in resource use, labor sharing, acceptance of technical innovations and distribution of the products or costs of change. Somewhere in the benchmark study process it is important to identify rural and farm values and goals, as manifest in both individual and communal actions.

In short, data supply efforts in Phase I should concentrate on identifying the basic structural parameters of agriculture, identifying the resources and production processes with which to spur growth and insuring that an adequate set of time series data is being collected for current and future administration and planning. To the extent that data will be needed in Phase II which requires lengthy periods to accumulate, foresight is required to systematically begin assembling them in time for their ultimate use.

One additional dimension needs attention in Phase I. Later development efforts will require a balanced, sophisticated set of government services of many types. It becomes important, therefore, to evaluate the institutional base for its scope and effectiveness. Institutional change requires time and unless begun early the absence of critical elements can impede the rate of growth later on.

In Phase II, as conceived in this paper, government assumes a heavy direct involvement in development programs and a growing role in manipulating the indirect incentives affecting local entrepreneurs. Functioning as a change agent, government needs information to support decisions on allocating resources among various projects and regions. They must choose implementation methods that appropriately distribute the benefits of change. Often they will have to choose between maximizing technical efficiency and maximizing farmer adoption and will need to be able to weigh these factors carefully.

Data supplies in this phase must include all the benchmark and recurrent data needed to define and monitor target groups. Disaggregated data to permit comparative analyses of differentials in income, access to resources and services and economic progress are important.

Information on resource productivity and usage rates will contribute to the process of allocating the development budget. Other data needed for this purpose include technological alternatives, production possibilities, market and demand data, factors affecting adoption and the like. The list is, in fact, nearly endless.

Information on systemic linkages is particularly useful at this stage for quantifying primary and secondary benefits and for choosing the means of reaching selected target groups. Cropping systems, livestock and range systems, the determinants of employment adequacy and the matrix of farmer motivations are all needed. Their importance peaks in Phase II because government's direct role in managing field projects peaks at this time.

An important item usually overlooked is information on the social structure of villages, local leadership patterns and many cultural parameters. Government leaders frequently have partially lost touch with their social and cultural roots. What they do retain may be drawn from nothing more than childhood village experiences. Benchmark data on current rural structures at the cultural level is vitally needed. Change will strain existing social patterns and cultural values. The challenge is to implement change of the types and with methods that allow an orderely metamorphosis of these parameters rather than destroying them without replacement.

If, as postulated above, Phase III is characterized by governments shifting increasingly out of direct project implementation and into manipulating a viable private sector through indirect incentives, then data supplies must adjust accordingly. Data supplies at this stage emphasize price and market information. Most members of most strata are integrated into the market, either as producers, laborers or consumers, and their aggregative responses to incentives become crucial variables for government policies.

Another role for government-supplied data becomes increasingly important in Phase III. A publically available data base is important to facilitate efficiency in the private sector. Data on future prices, commodity estimates, trade movements, domestic marketings, inventories on hand and a host of others are relied upon by firm managers to remove uncertainty and increase efficiency within their enterprises. Supplying these data as a public good is a legitimate use of government resources at this stage.

Depoliticizing the Data Supply

At several points in the above discussion the potential for political influence of data supplies was noted. The problem can be particularly acute in developing countries in Phase II. Large differentials in income existing during this phase have parallels in power and influence inequalities. Unless great care is exercised, those with influence can manipulate or monopolize data supplied to increase their own advantage.

Politics and data supply may also become entangled at the national level if a country chooses to manipulate their data to affect their negotiations or image with the international or donor community.

Several means exist to prevent undue distortions.

1. The first is to staff statistical institutions with persons trained and motivated to strongly resist bias. A staff capable of producing accurate data and rewarded for avoiding bias can prevent the problem at the outset.
2. Immediately on the technological horizon are remote sensing techniques which can almost completely ensure against bias in many agricultural data series if used correctly. The technology itself is highly objective, and the fact that satellite data

can be stored, retrieved and processed by other countries will guard against all but the most subtle manipulations.

3. Data collection should be completely divorced from the revenue collection process. When the two are combined, especially in a society where interpersonal influence is a way of life, the incentives to reduce assessments by false reporting or negotiated entries are too strong.
4. Where objective data are absolutely essential, it may be necessary to have them collected and analyzed by an agency whose sole responsibility is statistics and which maintains a definite administrative distance from the operational or policy agencies.
5. Simultaneous and widespread release of data to all firms in the private sector will help to prevent a few influential firms from capitalizing on privileged information.
6. Periodically, autonomous analysis designed to double check data series or refine structural information will prevent deviations from becoming too extreme. Various agencies can contribute to this function, including expatriates, governmental review commissions and the country's own network of consultants and university professionals.

Foreign Assistance to the Data Supply Function

Several valid roles exist for foreign assistance to the data supply in developing countries. In general these roles rest on the assumptions that statistical institutions are more highly developed in the donor countries and that expatriate statisticians can bring with them experience with multiple data systems drawn from countries in different development stages and with various political and economic settings.

1. Training is perhaps the first requisite for a solid statistical base. At the outset this suggests academic training in statistics, mathematics and quantitative methods of analysis. To adequately handle all the data needs identified above, some students should build on this base with training in economics, sociology or one of the technical disciplines related to agriculture. Students who are returning to statistical branches of applied ministries or departments especially need exposure to technical relationships if they are to serve as more than statistical mechanics.
2. Technical assistance in-country focuses on two dimensions. First is advice and assistance in organizing statistical services. Many decisions in this process affect the objectivity and accuracy of the data eventually generated. The extent and structure of field data collection, administrative locus of central offices, internal incentive structures and the like are all crucial broad questions which determine long run effectiveness.

   A second, equally important dimension for foreign assistance is practical training in an applied context. Team approaches to specific data sets involving expatriate specialists and local statisticians can contribute substantially to refining methods and concepts in field situations. Such cooperation is easiest to obtain assistance for when tied to a specific study such as a decennial census of agriculture or a nation-wide benchmark study on some issue. However, the process of generating recurring data series on important crops or processes can use periodic infusions of specialist cooperation equally well.
3. The entire emerging discipline of remote sensing will probably, within five years, become the most active area of foreign assistance

to agricultural statistics. The capabilities of satellites envisioned for the near future include many types of data of vital importance to planners and program administrators. The technology itself will eliminate many problems of inaccuracy and delays in reporting. Remote imagery offers the possibility for accurate resource mapping including soil types, mineral deposits, forest and range resources, and, perhaps eventually, even soil moisture. Some resource management applications will be possible very soon, such as monitoring range and forest conditions to determine usage potentials. In some areas of the world river flow estimates can be derived from snow pack measurements. Crop inventories will soon be possible for major crops and yield estimates will follow. Some pest and disease outbreaks can now be mapped and monitored.

Obviously, remote sensing will soon be able to provide not only resource inventories but also recurrent data for the planning and agricultural administration functions. It can, at the least, provide periodic, objective adjustments to cropping data series collected by conventional means. Foreign assistance will be needed for the necessary computers and equipment as well as training in making full use of available systems.

4. Finally, it was earlier mentioned that most countries have been studied in several ways already. Even those governments who have yet to seriously develop statistical services have been visited by many who have in one form or another collected or generated information about the area. Historians, missionaires, sociologists, anthropologists, agricultural economists, agronomists, and many

others have undoubtedly wandered the remotest regions and written of their findings. For example, over 200 "village studies" exist for Punjab covering only the period between World Wars. Lesotho has had an autonomous government only ten years yet the world's literature includes over 1,500 items directly relevant to agricultural planning in that country.

Unfortunately most of this material is not readily available to planners, researchers and scholars in the developing countries themselves. There is an urgent need to assemble that which remains relevant and establish a facility in or near the central government to house the collection and make it readily available to all. Bibliographies of each collection would, if widely circulated within the country, greatly expand the awareness of administrators and researchers alike of the available material.

An additional effort is needed to incorporate all significant current material as it is developed. Most of it would be the result of benchmark or special studies, items for which the loss rate is all too rapid.

Despite the apparent usefulness of such a data base, the effort will probably receive low priority within developing countries. In part this stems from the severe difficulties of tapping the world's literature when it is largely housed in the developed nations. Foreign assistance to build this information base in support of agricultural planning and policy should be easy to justify.