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INDICATORS FOR MONITORING RURAL AREA DEVELOPMENT PROJECTS*

By BURTON T. OÑATE**

I. INTRODUCTION

1.1 Indicators for monitoring rural area development projects are generated to measure the level, pace and direction of the economic and social impacts of project components on the life of the rural poor. Without these unbiased indicators, it would be impossible to monitor the progress, if any, that is achieved by the development project. Economic indicators on production and its cost and other related variables are relevant to the economic feasibility of the project while indicators on the major concerns of poverty, inequality and unemployment and the traditional concerns on food and nutrition, health and welfare, housing and clothing, education and culture, security and family planning could indicate its impacts on the rural man.

1.2 Major movements in measuring development at the national level have emerged. Since progress must emanate from depressed areas which have been selected as priority projects for development, the indicators which are developed must refer to agricultural and rural area development schemes. The correspondence between the statistical monitoring system and project development will indicate objectively whether progress is being achieved as planned or whether there are certain constraints to development. In the latter case, policy decisions and follow-ups could be made or instituted immediately to remedy the constraints so that progress as envisioned in the appraisal or plan could move back to its desired path.

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** Dr. Onate is a member of the Board of Directors of the Philippine Agricultural Economics Association (PAEA) and the Philippine Social Science Council (PSSC) for 1976-1977. He served as President of the Philippine Statistical Association (PSA), the Society for the Advancement of Research (SAR), and Gamma Sigma Delta (GSD). Dr. Onate is presently the Chief Statistician of the Asian Development Bank (ADB). The views expressed in this paper are those of the author and do not reflect those of any institution, association or agency.

II. MEASURING DEVELOPMENT AT THE NATIONAL LEVEL

A. Major Movements

2.1 Development of Social Indicators is one of several movements which are currently the topics of the intellectual, financial and development institutions.[1] The other topics are referred to as the "Quality of Life Components of GNP" [2] and the "Development Indicators." [3] Since Man is the primary concern of development, we may refer to these efforts as measuring the "Quality of Life" or more precisely as measuring the "Improvement in the Quality of Man". A study for example of efforts on measuring development indicates that there is wide agreement about the role of the Fundamental Social Concerns such as population and family planning, health, housing, nutrition, education and culture, employment and social security, personal security, consumption, wealth and social welfare as the basic framework for the development of appropriate "social indicators".[4] Whether prepared and adopted by ESCAP Committee on Statistics, or the OECD which has only eight basic fundamental concerns (BFC) with numerous sub-concerns or by France, the United States, Japan (also similar to OECD's eight BFC), Malaysia,[5] Philippines,[6] Indonesia,[7] Thailand [8] or by other DMCs, one will note that the basic structure will include these

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[1] ESCAP Committee on Statistics. Social Indicators. Meetings held in Manila, 1971, New Delhi in 1973 and Jakarta in 1974.

[2] Moss, Milton (Editor). The Measurement of Economic and Social Performance. Studies in Income and Wealth, No. 38, U.S. National Bureau of Economic Research. Columbia University Press, New York, 1973. Of relevance are Japan's Net National Welfare (NNW) approach (1974) and the UN Committee on Development Planning (1973) on Net Beneficial Product (NBP).

[3] Basten, Nancy. Development Indicators: An Introduction. Journal of Development Studies, Vol. 8, No. 3, April 1972.

[4] For example, the Asian Development Bank Annual Report, 1974 (p. 11) states the following on Social Impact: "An Important Objective in Project Formulation—is to ensure—that within the framework of economic justification, the benefits of the Bank's development assistance are as widely spread as possible and the needs of lower-income groups in particular are taken into consideration."

[5] Department of Statistics. Social Statistics Bulletin, 1972. Kuala Lumpur, Malaysia, June 1975.

[6] Development Academy of the Philippines. Measuring Philippine Development: Report of the Social Indicators Project. Manila, 1976.

[7] Biro Pusat Statistik. Social Indicators, 1973. Jakarta, Indonesia, September 1974.

[8] National Economic and Social Development Board. Thailand. Social Indicators, Bangkok, 1975.

fundamental social concerns.[1] The difference will be in terms of the depth and complexity of the measurements or indicators developed for each sub-concern within a major concern. The complexity in the indicator will of course depend upon the stage and level of urbanization, modernization and industrialization of a given economy. Also, the more developed the economy, the more sophisticated and detailed are the indicators adopted. The collection and generation of these indicators are the the responsibilities of the statistical system and services of the country which are more efficient and elaborate in the developed world. But it is important to recognize that the specifications of such a list of concerns, both major and traditional, and their elaborations can only be done by those who have had an intimate knowledge of the country's culture, customs and traditions and social structures. Also, a country's statistical system must be completely involved in its development and its generation on a time series and the production of these series could not be done on an ad-hoc basis.

2.2 Another movement which focuses on the major issues of poverty, unemployment and inequality[2] has been the topic at the national, regional and international forums. But, if one analyzes critically the major social concerns mentioned earlier then one can derive, with the availability of sufficient data, level of poverty for each major or sub-concern as well as the distribution of poverty by concern. The latter will give us a picture of the inequality not only of income but of each major or sub-concern as the case may be. Unemployment, as a component of the labor force, could be a sub-concern under the population and its relationship with poverty and inequality could be analyzed critically. In fact, we may wish to add agricultural land per capita as a measure of "population pollution". This framework was suggested by Oñate in 1974.[3]

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[1] Refer to B. T. Onate's "Statistics in Southeast Asian Agriculture". Chapter XVII. Tables 17.1 and 17.2.

[2] Friedrich-Ebert Stiftung, ESCAP Workshop. Effective Anti-Poverty Strategies, Bangkok, 12-21 December 1973. Inequality may also be reflected in terms of the level, pace and direction of social and political mobility.

[3] Onate, B. T. "Measuring the Quality of Life: Man as the Concern of Development". Philippine Statistical Association Annual Conference. July 1974. See also the author's Chapter XVII of "Statistics in Southeast Asian Agriculture", SEARCA, 1976 which describes in more detail this statistical framework. GNP may grow rapidly without any improvement on these three criteria; so the pace of development must be measured more directly. See also Dudley Seers paper "What Are We Trying to Measure?", Journal of Development Studies, Vol. 8, No. 3, pp. 20-36. April 1972.

B. Who Measures and For Whom

2.3 Indicators attempt to measure the level, pace and direction of development with special reference to the "Quality of Life" or the "Quality of Man". But the philosophical and other interpretations will depend upon whether the points of view of the national government prevails or that of the group of experts commissioned to develop the measurements or those of the financial or bilateral or multilateral financial development agencies. Also, if one applies the "phenomenological" approach, then the views of the people comprising the given sector of society or the target population in the project area must prevail in measuring or evaluating the pace of development.[1] Another complication arises if the area under study is at the national/regional or at the project level as in the case of an integrated area development scheme. In the latter case, the participants or target population in the project area should be given an opportunity to indicate their position before, now and possibly in the future on the basis of a scale developed with regard to their own views and interpretations. Probably, the objective of higher per capita GNP for the Developing World or the Third World may have to be revised or reconsidered on the basis of the possible impact of modernization, urbanization and industrialization on the "Quality of Life" or the "Quality of Man"; on the destruction of wholesome national family life, customs and traditions; and/or on the loss of irreplaceable natural resources.

C. Direction and Pace of National Development: Composite Index [2]

2.4 A developing country would be at a given stage of development which may consist of a structural mix between the old and the modern technologies. The level and growth of real per capita income (GNP) are economic indicators which are considered as very rough approximations or measurements of the possible direction and pace of national development. Real per capita GNP is often referred to as a national level of

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[1] Through the educational and training programs, continued exposure to extension services and other rural development approaches, the rural man becomes more attuned to the need for changes to attain "progress" but with a very critical eye on the effects of "progress" on wholesome rural customs and traditions and to the overall quality of life of the rural poor.

[2] Onate, B. T. Composite Index for Measuring the Direction and Pace of Development. Philippine Statistician. Vol. XXVII, Nos. 1-2, pp. 21-28. June 1976.

"poverty" but due to varied reasons it is considered not a good single indicator of the developmental potential. Firstly, the income data for most developing countries (DCs) in the Asian Region are either poor or fair in quality[1] and of the 20 DCs, about one-third has no official income series. Per capita income data as an index does not reflect major conditions of development such as income distribution or structural change. Secondly, a given DC may be in a given stage of dual technological structural mix so that at this stage of development real per capita income may be stagnant or may even decline during the period. Under these conditions real per capita income is not an adequate single indicator for measuring the pace of development. Also, GNP has a built-in tendency to give an exaggerated picture of the material wealth produced by the more complex, market-oriented economies and at the same time it has an equal tendency to overlook significant activities in the simpler, more self-sufficient and non-monetized societies. Applying the same measure to both can lead to serious distortions.[2] Thus, depending on the stage of development of its statistical system, other indicators may be available or could be collated to serve also as possible determinants of the developmental potential.[3] In measuring and quantifying development during these stages of structural mixes, it might be worthwhile to consider other indices of development. Some possible determinants of development have been identified and may be measured through the combined impact of the growth in these determinants such as (a) managerial or entrepreneural ability; (b) capital; (c) skills; (d) employment of labor; and (e) technological changes. See Table 1.1 as an empirical study for the Philippines.

2.5 The identification of variables or indicators which must be collated to approximate these determinants is a difficult problem. However, certain statistical series are currently available in each DC which could be used as approximate proxy variables of these determinants. Thus, the first step would involve a critical study and evaluation of the statistical series, both economic and social, in physical or monetary terms, which could be used as possible initial measurements of the development potential. The number and type of these proxy variables

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[1] ———————. Improvement of the Quality of Current Statistics in the Asian Region. ADB Occasional Paper No. 5, Manila. May 1971. Revised 1977.

[2] U.N. Development Forum. Not by GNP Alone. Center for Economic and Social Information. 1974.

[3] Divatia, V. V. and V. V. Bhatt. On Measuring the Pace of Development. Banca Nazionale del Lavoro Quarterly Review. No. 89, Rome. June 1969.

Table 1.1. INDEX OF DEVELOPMENTAL POTENTIAL Philippines: 1958-1969 (Equal Weight = 1/25)

Determinants	1958	1963	1969	
I. Managerial/Entrepreneural Ability				
A. Factory Establishments (Number				
1. Small	100.0	119.9	151.2	
2. Large	100.0	117.2	114.7	
3. Total	100.0	119.2	141.9	
B. Professionals, Managers, etc.	100.0	93.4	109.4	
II. Capital				
A. Power Capacity - Electricity Production	100.0	195.1	399.2	
B. Transport Capacity				
1. Length of Railways	100.0	106.8	109.1	
2. Registered Trucks	100.0	127.9	224.3	
3. Registered Passenger Cars	100.0	131.3	349.0	
4. Seaborne (loaded)	100.0	102.1	257.8	
5. Seaborne (unloaded)	100.0	217.9	433.8	
6. Passenger Traffic (air)	100.0	282.4	797.3	
7. Cargo (Air)	100.0	184.5	686.7	
C. Number of Banks	100.0	197.4	410.4	
D. Communication: No of Telephones	100.0	183.6	367.6	
E. Output				
1. Food Manufactures	100.0	218.4	356.3	
2. Transport Equipment	100.0	396.1	547.5	
3. Textiles	100.0	219.5	345.3	
F. Imports				
1. Intermediate goods	100.0	125.0	213.5	
2. Capital Goods	100.0	176.4	361.1	
III. Skills				
A. Elementary Schools Enrolment	100.0	129.2	179.1	
B. Secondary	100.0	142.6	255.1	
C. University College	100.0	147.5	381.2	
D. Vocational/Technical	100.0	132.7	187.9	
E. Clerical, Salesman etc.	100.0	108.9	122.5	
IV. Employment in Industry (Total)	100.0	108.3	121.7	
Simple average of 25 Indicators	100.0	165.5	312.2	
Estimated overall Annual Growth Rate of composite Index				10.9%
Annual Growth Rate of GNP (current)				10.6%
Annual Growth Rate of GNP (1967 prices)				5.8%

may change depending upon their availability in a given DC. Some of the social and proxy variables are highly correlated with GNP at current prices. In fact, these indicators can serve as excellent predictor variables for GNP. These correlations are surprisingly high. For example, the correlation between GNP and enrollment in the secondary schools was 0.992 for the Philippines and was 0.999 for another DC.

2.6 The index of developmental potential seeks to measure the real changes going on in the country during a given stage of the developmental process. In the Philippines, the composite index showed a compound annual growth rate of 10.9 per cent while GNP grew at a rate of 10.6 per cent at current prices and 5.8 per cent at 1967 constant prices. Thus, the growth rate of the developmental potential is almost double the rate of growth of real GNP. Table 1.2 shows that as a DC moves along the development axis measured in terms of per capita GNP, then the ratio of the Composite Index (B) to the GNP Index (A) decreases. Thus, the Composite Index reflects a more rapid rate of growth in the overall process of developmental transformation in the three DCs than is shown by the more conventional real GNP Index. The empirical results indicates that as a country moves from the lower scale of development as measured by per capita GNP, then the ratio of B/A will approach unity which implies that at higher levels of modernization, urbanization and industrialization, the Composite Index would approach the real GNP Index. Probably, at the higher developmental stage of the more affluent societies, real GNP or per capita Index would be an appropriate

Table 1.2. **Development Potential: Composite Index v.s. Real GNP**

Index	Developing Member Country Per Capita GNP in US$ in 1970			
(Per cent per Year)	A (US$100) 15 Years[a]	B (US$200) 11 Years[a]	C (US$450) 18 Years[a]	D[b] (US$6,000)
(A) Real GNP	3.5	5.8	8.5	[4.0]
(B) Composite Index	7.0	10.9	13.1	[4.0]
Ratio B/A	2.0	1.8	1.5	[1.0]

[a] Length of series in years.
[b] Projected on the basis of trends and current levels.

single index to use. The development and improvement of the Composite Index as a measurement of the developmental potential should be recognized as a concomittant part in the process of structural transformation. While the major movements in the measurement of the "quality of life" at the national level is still in its developmental stage, the Composite Index may be used to supplement the per capita GNP indicator with special reference to DMCs in the Asian and Pacific Region.

III. INDICATORS FOR RURAL AREA DEVELOPMENT PROJECTS

A. Monitoring Development in Project Area

3.1 Experiences in developing programs and problems of approaches in rural development could be discussed and illustrated but successes of such programs can only be unbiasedly demonstrated with the use of a sound and objective statistical monitoring system which at this stage is less than satisfactory. Approaches to rural development have mentioned, among others, production oriented, emphasis on human development and the integrated project with the required institutional supports to the developmental effort. Thus, indicators for monitoring rural area development projects must necessarily consider the objectives of the programs and/or approaches which are used to generate progress for the rural poor. Basically, rural development must concern itself not only with the improvement of the quality of life but more importantly toward the improvement of the quality of the rural man. There are many conceptual, technical and philosophical difficulties in the generation of relevant economic and social indicators for rural development. Some of these issues on indicators for social development [1] are as follows:

(1) Aggregation at national, regional or project level and measurements in terms of indices or sub-indices;

(2) Identification of major social concerns on poverty, inequality and unemployment and the traditional concerns on food and nutrition, health and education, clothing and housing, etc;

(3) Measurement of inputs, facilities or use of facilities, benefits or individual well-being;

[1] Op cit. p. 5

(4) Evaluation in terms of standards set by experts or in terms of the participants or recipients' values or scales in the project area; and,

(5) Social concerns as building blocks are not mutually exclusive and in this aspect the social concerns would differ from the economic sectors of GNP.

3.2 The indicators for monitoring rural area development projects will be **site-specific** and these projects would generally refer to those schemes where the financial support are contributed to and participated in by national and/or bilateral, and/or multilateral resources. Since 1946 or a period of 31 years, the World Bank has lent US$8 billion for agricultural and rural development. If in general, this investment is matched by an equivalent amount from domestic sources, then the World Bank contributed to and participated in the financing of some US$16 billion in agricultural and rural development projects.[1] Similarly, the Asian Development Bank (ADB) approved during the period January 1968 to 31 July 1977, 88 projects amounting to US$886.353 million in agriculture and agro-industry.[2] The introduction and importance of a sound statistical framework for project monitoring is not yet well-recognized and appreciated. This framework involves the setting-up at time of appraisal precise key objectives, yearly during its project life, in the form of key indicators which could be checked through a sound monitoring device on a regular or periodic basis by the generation of current values of these indicators for comparison with the projected values (cost and benefit streams) in the appraisal reports. The implications of these comparisons in terms of necessary policy decisions could be easily perceived by the national governments and financial development institutions. There are other uses of the micro indicators obtained from agricultural and rural area development schemes such as sources of data for the components in the production accounts in agriculture (PAA) for specific crops/livestock/poultry by location and by the level of technology. In the statistical system in food and agriculture, this sub-system is referred to as "Micro-Data in Rural Area Deve-

[1] IMF and World Bank. Finance and Development Quarterly, Vol. 14, No. 1 March 1977.

[2] Asian Development Bank (ADB). Loan and Technical Assistance Approvals as of 31 July 1977. No. 77/7. 5 August 1977.

lopment Schemes" [1]. For example, the ADB agricultural and rural area development projects in the Philippines during 1969 to 1976 are shown in Table 2. Indicators are needed for monitoring each of these projects so that the level, pace and direction of progress envisioned for the particular area are assured. The setting and implementation of this type of statistical framework is referred to as "Project Monitoring" with special reference, in this case, to agricultural and rural area development projects.

B. Statistical Framework for Project Monitoring

3.3 The statistical framework will provide timely, up-to-date, consistent and accurate key indicators for monitoring the benefit streams assumed in the appraisal of the project. The cost streams could be checked by standard accounting procedures but the basic data used in the benefit streams could be obtained only from households at the village or hamlet level. The suggested statistical framework, if well designed, will provide (a) benchmark data at appraisal time; (b) data at post-evaluation stage and (c) key variables needed for charting the overall economic and social impacts of the project on a continuing basis. This framework will provide valuable information for a particular project which could contribute to a better understanding of the project, assist toward sound preparation and formulation of similar developmental projects and in providing data on a time series during the project life for policy decisions and follow-up at all levels; national, bilateral and international financial developmental institutions.

3.4 The objectives of the statistical framework for the project monitoring of rural area development projects are as follows:

(1) To generate adequate data on a time series for appraisal, post-evaluation, and during the project life for the farm economy, with special emphasis on the income and expenditure aspects of the farm household. With such time series data, an assessment of the socio-economic well-being of the beneficiaries in the area would be possible;

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[1] Onate, B. T. Statistical Ssytem in Food and Agriculture: Evaluation, Analysis and Uses of Agricultural Census Results. ADB Lectures at the Asian Statistical Institute, Tokyo on the 1980 Census of Agriculture for the Asia and the Pacific Region. Pp. 4-7, June 1977.

Table 2. ADB Agricultural and Rural Area Development Projects: Philippines, 1969-1976.

Project	Amount (Million US$)	Terms in Years (Incl. Grace Period)	Interest (Service Charge) %	Date Approved
1. Cotabato Irrigation	2.500 (Special)	25(5)	3	18 Nov. 1969
2. Angat (Bulacan)-Magat (Isabela) Integrated Agric. Development (I)	6.000 (Special)	30(7)	3	28 June 1973
3. Ditto (II)	3.600 (Ordinary)	30(7)	7-1/2	28 June 1973
4. Davao del Norte Irrigation	4.200 (Ordinary)	30(7)	7-1/2	28 June 1973
5. Agusan del Sur Irrigation	5.800 (Special)	40(10)	1	17 Dec. 1974
6. Pulangui River Irrigation, Bukidnoon	13.500 (Ordinary)	30(7)	8-3/4	26 June 1975
7. Laguna de Bay Dev. (w/ agric. components)	27.500 (Ordinary)	30(6)	8-3/4	9 Dec. 1975
8. Second Davao del Norte Irrigation	15.000 (Ordinary)	30(7)	8-9/10	7 Dec. 1976

* Source: Loans and Technical Assistance Approvals. ADB. As of 31 July 1977. No. 77/7, 5 August 1977.

(2) To determine the direction and extent of distributive effects of the Project. With provision of irrigation water, the use of high-yielding varieties and the application of other modern agricultural inputs may be intensified and the cropping index due to double-cropping may be increased. It is hoped that the net result would be higher agricultural production and productivity. It is not clear whether these economic gains if attained, would accrue only to certain groups of farmers and whether the introduction of these modern farming practices, often characterized as labor-displacing, would have in fact more adverse effects on employment. Are there noticeable shifts in the distribution of the social concerns which could be used as indicators for improvements in the poverty levels?

(3) Governments have emphasized socio-economic development on a regional level, including rural area development schemes; data to be generated by the Survey would be useful also to the Governments (DMCs) in assessing the effectiveness of its regional and rural area development policy; and,

(4) The survey results will not only facilitate but will also improve the data base of appraisal reports, post-evaluation of these projects and would provide in general sound data for the overall scheme of monitoring the results during its project life.

A tentative list of items to be collected for agricultural and rural area development scheme is given in Table 3.1. The frequency of the collection could be yearly or annually at the initial stage. This frequency could be made longer depending on the progress achieved in earlier years.

3.5. Sampling methods will be used and farm households will invariably be the ultimate sampling units. The ease and practicability in the application of the sampling techniques must be the primary consideration in the application of this approach. The availability of the results of recent population and agriculture censuses would be helpful in the development of the sampling frame in the project area.[1] A multi-stage design with

[1] The author suggested during the Advanced Seminar on 1980 Census of Agriculture for the Asian Region held at the Asian Statistical Institute, Tokyo in May 1977 some approaches in utilizing the Census as source of benchmark data or frame and as a component of the monitoring device for agricultural and rural area development schemes. Op. cit. p. 12.

TABLE 3. 1. DESCRIPTION OF THE STATISTICAL MONITORING STUDY: RURAL AREA DEVELOPMENT PROJECTS

1. The Study shall consist of three major parts as follows:
   (a) A farm economy survey will be conducted at reasonable periodic intervals. Investigation will be made into the farm economics of the Project Area. A sample containing approximately 200 farms including both large and small farms and landless laborers will be taken from the Project Area and outside the Project Area and the results from the recent Census of Agriculture and Fishery will initially serve as the sampling frame of reference and possibly as the benchmark data. The primary objective of this investigation is to study the productivity of small and large farms in the irrigated portion of the Project Area (with and without water management) as contrasted with that of similar farms outside the Project Area. A further objective of the investigation is to elicit information on farms which are receiving project benefits as contrasted with those which are not.
   (b) Income and expenditure surveys of sample households will be undertaken at intervals of two years during a period of ten years. Investigation will be made into income and expenditures of sample households (farm and non-farm) in the Project Area, designed to shed light on differences in patterns of expenditure at varying levels of income.
   (c) A study of some aspects of social welfare and living conditions at the household and village levels will be carried out each year for ten years. A survey will be designed to evaluate the social impact which Project has on the local economy. Other multiplier effects will be considered by the Technical Consultative Committee after further technical discussions have been concluded.

2. The major items of information needed for carrying out the farm economy survey in the Project Area under 1 (a) above are:
   (a) Composition of the farm household by age, sex, and marital status
   (b) Size of farm holdings (area controlled/cultivated by farm family)
   (c) Owner/tenant/worker status
   (d) Educational status of farm household head
   (e) Number of children attending schools
   (f) Farm inputs (seeds, fertilizer, pesticides, maintenance cost of livestock and machinery, irrigation fee, land rent, labor, etc.)
   (g) Farm outputs (paddy, corn livestock, poultry and other farm products and their uses)
   (h) Farm equipment (pumps, tractors, power tillers, motor vehicle and other agricultural machinery)
   (i) Land area classified by use:
      (i) Cultivated land (paddy/other crop) with irrigation or not (and with water management or not)
      (ii) Idle and pasture land
      (iii) Forest
      (iv) Others
   (j) Planted area and yield by crop
   (k) Wholesale and retail prices of major and products
   (l) Net income of the project area by crop and by irrigated/non-irrigated land.
   (m) Status of water management, credit and extension services, and related services at the farm household level.

3. The study on Income and expenditure of sample households mentioned in 1 (b) will require the following information:
   (a) Details of household income (farm and non-farm):
      (i) Wages/salaries/managerial income
      (ii) Rents/dividends/loans
      (iii) Profit from business
      (iv) Sales of farm product
      (v) Subsistence production
      (vi) Income in kind
      (vii) Others (interest, remittances, etc.)
   (b) Details of household expenditure (farm and non-farm):
      (i) Food, drink and tobacco/home produced/purchased/imported
      (ii) Clothing and personal effects-imported/home produced
      (iii) Housing (rent and maintenance)
      (iv) Fuel and light-home produced/purchased
      (v) Transport and communications
      (vi) Recreation and entertainment
      (vii) Education
      (viii) Household durables
      (ix) Health
      (x) Investment in business (farm or non-farm)
      (xi) Farm/Business equipment purchases
      (xii) Savings
      (xiii) Debt repayments
      (xiv) Tax and local dues

4. For the surveys of some aspects of social welfare and living conditions at the household and village levels, the sources that will be examined will include:

(a) Commercial/Industry (at the village level only):
   (i) Wholesale/retail trade

(b) Housing conditions and facilities (at the household level only):
   (i) Type of house
   (ii) Tenure of accommodation
   (iii) Water supply facilities
   (iv) Toilet facilities
   (v) Main energy source for cooking and lighting
   (vi) Electrical appliances in use

(c) Food and nutrition (at the household level only):
   (vi) Electrical appliances in use
   (i) Calorie consumer per person per day
   (ii) Protein (Animal/Non-Animal) consumed per person per day

(d) Health and medical facilities:
   (i) Number of hospitals, puericulture centers, etc. — at the village level only
   (ii) Number of hospital beds, doctors, nurses, midwives and dentists — at the village level only
   (iii) Infant mortality rate (rough estimate) — at the village level only
   (iv) Crude annual death rate (rough estimate) — at the household level only
   (v) Number and nature of household illnesses — at the household level only
   (vi) Fertility status (for married women only) — at the household level only

(vii)	Distance of medical facilities (hospitals/clinics/etc.) from household	at the household level only
(viii)	Expectation of life at birth (rough estimate)	
(e)	Education:	
(i)	Number of schools by type	at the village level only
(ii)	Number of teachers and pupils	
(iii)	Municipal expenditure on education	
(iv)	Number of year of education	
(v)	Number in household with or receiving primary/secondary/vocational higher education	at the village level only
(vi)	Distance of household from educational institutions (primary, secondary, vocational or college)	
(f)	Transportation and communications:	
(i)	Total length of roads by class	at the village level only
(ii)	Number of registered motor vehicles by class	
(iii)	Total circulation of daily/non-daily newspapers	
(iv)	Number of telephone in use	
(v)	Number of cables/letters sent and delivered	
(vi)	Principal means of transportation	
(vii)	Number of newspaper, magazine, journal and periodical subscribed to by members in the household	at the household level only
(g)	Entertainment and Recreation:	
(i)	Number of movie theatres, sport clubs, public parks, etc.	at the village level only
(ii)	Number of theater goers	
(iii)	Number of household who are members of sport clubs, and other recreational organizations	at the household level only
(iv)	Average daily leisure hours	
(h)	Religion and culture:	
(i)	Number of churches, mosques, cultural centers (societies), charitable organizations, etc.	at the village level only
(ii)	Number of church/mosque goers	
(iii)	Total membership of charitable organization	
(iv)	Number of household who are members of religious and cultural organizations	at the household level only
(v)	Type of religious affilation	
(i)	Insurance (at the household level	
(i)	Number with medical/life insurance	
(ii)	Number covered by unemployment Insurance	
(iii)	House and property under Insurance or not	
(j)	Others (at the village level only):	
(i)	Number of cooperatives	
(ii)	The multiplier effects	

villages (or hamlets) as the primary sampling units (PSUs) and the farm households (holdings) as the secondary sampling units (SSUs) will be adopted. To reduce cost to a minimum, the sample size will be between 200 to 225 farm households. This sample size will generate fairly reliable estimates of the key indicators at the project level. For comparative purposes, a small sub-sample will also be drawn from outside the project area and from the "pilot" area, if such a "pilot" or demonstration area is included in the scheme. A tentative sample allocation is given in Table 3.2. There are other technical requirements which could be considered, namely:

(a) Establishment of suitable sampling framework and preparation of paper strata,

(b) Methods of drawing sample households,

(c) Estimation procedures for total and sampling error, and

(d) Methods of collecting data at the village level.

The specific recommendations will depend upon the characteristics of the specific site or project area and the types of data available from various sources which could be used to implement these technical requirements of the statistical monitoring system.

3.6. The beneficiaries in the project area are expected to be mostly small farmers, landless laborers and harvesters. If so, the stratification will consider these groups as domains of the survey. With an irrigation component, then the stratification of the area for sampling purposes will also consider the upstream, middle-stream and down-stream portions of the irrigation scheme in order to find out the interaction between water management and control with the location of the fields in the project area. In order to maintain utmost objectivity and to remove any suspicion of bias in reporting the results, the Survey Team that will implement the statistical framework for Project Monitoring must not be directly involved in the implementation of the program for agricultural area development schemes. The design and analysis of sampling surveys require adequate technical competence in the theory and application of sampling methodology. Thus, it is necessary that the planning and implementation of the statistical framework for Project Monitoring should be reviewed by a Technical Committee with representations from the Executing Agency and the Survey Team.

Table 3.2
Sample Allocation of Farm Households in Project Area

Location	Sample Village	Number of Sample Households (SSUs) by Type of Participants [1] Farmers: Small	Farmers: Large	Landless Laborers/Harvesters		Total Sample
Tentative Proportion	PSUs	2 :	1 :	2		
Upstream	1	10	5	10		25
	2	10	5	10		25
	(3) [2]					
					Sub-total	50
Midstream	1	10	5	10		25
	2	10	5	10		25
	(3)					
					Sub-total	50
Dowstream	1	10	5	10		25
	2	10	5	10		25
	(3)					
					Sub-total	50
Sub-total (A)	6	60	30	60	Total	150
Pilot Project	1	10	5	10		25
						25
Out-of-Project	1	10	5	10		25
	2	10	5	10		25
						50
Sub-total (B)	3	30	15	30		75
Grand Total (A/B)	9	90	45	90		225

[1] For illustration, the ratio of small farmers; large farmers; landless laborer is 2:1:2. The ratio will change depending on actual proportion observed from Census of Agriculture or other sources.

[2] For highly variable area, an additional village (3) will be included in the sample, one each for up-stream, mid-stream and down-stream or an additional 75 sample households (25 x 3). If this is so, the total sample size will be increased to 300.

C. Agricultural and Rural Area Development Projects

3.7 It may be worthwhile to take a look at some leading indicators which have been derived in the appraisal of projects from agriculture, fishing, the agro- and the non-agro based industries. These indicators include the length of the project life in years, the benefit/cost (B/C) ratios and the economic internal rate of return (IRR) in per cent. These results from about 100 projects of ADB are given in Table 4.1.

Table 4.1 **Indicators of Sectoral Projects** [1]

Sector/ Project	Project Life Years	B/C	IRR (%)
Agricultural Area Development	10-56	1.6 to 18.5	8.5 to 18.3
Fishing	10-15	1.6 to 4.9	11.1 to 42.1
Agro-Based Industries	15-25	1.7 to 6.0	13.9 to 24.7
Non-Agro Based Industries	14-17	3.1 to 8.5	21.8 to 54.1

[1] Source: ADB Appraisal Reports. Various years.

These indicators show that for agricultural area development schemes, the project life could be relatively long extending from 10 to 56 years. On the other hand, the B/C ratio could be very wide (1.6 to 18.5) indicating very wide variations in the benefit streams (total B) since C could be easily monitored through standard accounting procedures. This situation will show that agricultural area development projects are more sensitive to changes in the benefit streams since the slope or rate of change in IRR on B/C may be small but the B streams are subject to more error (Oñate, 1976.[1] The IRR is also relatively lower as compared to those exhibited by Fishing and the Industries, both agro- and non-agro based.

1. Phases in Agricutural Research and Rural Development

3.8. Agricultural and natural resources research cannot be confined into one short phase. It must consist of different

[1] Onate, B. T. Statistical Framework in Area Development Projects for Small Farmers. Presented at the National Workshop on Uses of Census Information, Chiangmai, Thailand.

phases depending on the stage of the research processes, the level of local control applied to the phase of research and the benefit (B) and cost (C) ratios. The B/C ratio may be negligible in the early phase but may increase substantially at the later stage when research findings are applied to rural or agricultural area development schemes. The suggested phases of Agricultural Research and Rural Area Development are given in Table 4.2. Note that the local control requirement for experiments would be an important criterion.[1] The productivity level is a good indicator of the trend in the absorption of the biological-chemical, hydrological and possibly also mechanical technology from research stations to the project area. Also, the total project life would necessarily include a portion, if not all of the project life of rural area development scheme. Phases II and/or III could be by-passed but what is important is to integrate a portion or part of Phase IV with Phase I in order to show whether the particular set of agricultural research development is economically feasible or that enough benefits are generated as a result of the research efforts. It is very important that the required statistical monitoring scheme could be established at an early phase so that objective estimates of productivity and other key indicators are made available at each phase beginning from the research proper (Phase I) and during the project life of rural area development schemes (Phase IV). Trends in productivity is one of the key indicators in the derivation of project benefits and therefore of the economic internal rate of return. This statistical monitoring approach may be considered as a separate project or as part of the overall program for the entire system of identification, appraisal, post-evaluation and monitoring of agricultural and rural area development schemes for small farmers which are implemented through the use of funds from national and/or bilateral, regional or international financial development institutions.

2. Sensitivity of Development Projects

3.9. By end July 1977, about 296 project loans amounting to US$3,519 million were approved by ADB of which about 88 projects or 22.3 per cent were classified under Agriculture (Code 10000). The purpose of the loan was available and on the basis of this information, the classification of the project by economic sector could be made with the use of the Unified

[1] Onate, B. T. Statistical Quality Control (SQC) in Agricultural Research. Revised paper read at the Philippine Council for Agricultural and Resource Research Conference. Cavite City. Philippines. 1977.

Table 4.2 Phases in Agricultural Research and Rural Areas Development *

Phases	Stage	Level of Local Control	Product-ivity Level	Project Life (Years)	Benefit (Social/Economic)	Cost
I	Research Proper	High (H) to Very High (VH)	H to VH	3-5	$B_{I,i}$	$C_{I,i}$
II	Cooperative Tests	High (H)	H	1-3	$B_{II,i}$	$C_{II,i}$
III	Trials in Farmers' Fields	Medium (M)	M	1-2	$B_{III,i}$	$C_{III,i}$
IV	Rural Area Development Schemes	Low (L) or neglible	L	10-30	$B_{IV,i}$	$C_{IV,i}$
	TOTAL			16-40	$\sum_{k,i} B_{k,i}$	$\sum_{k,i} C_{k,i}$

* Source: Onate, B. T. Statistical System in Food and Agriculture: Evaluation, Analysis and Uses of Agricultural Census Results. Asian Statistical Institute, Tokyo. P. 61. June 1977.

Purpose Code.[1] This coding system is based on the kind of activity carried on in the economic sector which is to benefit from the transactions being coded. The basic idea in using this code is to produce international comparability in the classification of project loans and to ensure correspondence with financial flows and the other economic sector in the national accounts. The major groups and their codes used in the classification of ADB loans are as follows:

(a) **Contributions Allocable by Sector (Code)**
Agriculture (including Livestock), Hunting, Forestry, Fishing (10000)
Mining, Quarrying (20000)
Manufacturing (30000)
Electricity, Gas, Water (40000)
Construction (50000)
Trade, Restaurants, Hotels, Tourist Facilities (60000)
Transport, Storage, Communications (70000)
Business Services (80000)
Community, Social, Personal Services (90000)
Multi-Purpose Seperately Allocated (0000)

(b) **Contributions not Allocable by Sector** (410000 to 424000)

(c) **Other Commitments not Recorded as DAC Flows** (61999 to 63000)

Many projects reported benefit (B) and Cost (C) streams and the levels of the Internal Rate of Return (IRR) and these results were utilized to derive the sensitivity of ADB projects with special reference to the Agricultural Sector (Code 10000) and the Agro-based industries classified under Manufacturing (Code 30000).

3.10. Projects under Area Development in Agriculture (Code 10000) have relatively longer project life, wider B/C ratios but lower IRR while those on Fishing exhibited shorter project life, low but narrow B/C ratios and higher internal rates of return. Projects in Manufacturing (with Code 30000) have also shorter project life, low and narrow B/C ratios but higher

[1] Onate, B. T. Tentative Allocation of the Unified Purpose Code to ADB Loans. IBRD/ADB Seminar on External Debt Reporting. Proceedings and Papers, pp. 169-190, November 1971. This allocation conforms basically with the United Nations International Standard Industrial Classification (ISIC).

Table 4.3: Unified Purpose Code and Sample Indicators by Major Sectors

(Illustrative Table)*
(see Table 4.1)

Major Sector Code	No. of Projects	Project Life	RANGES B/C	IRR (%)
Agriculture (10000)	22			
Area Development	17	10 to 56	1.62 to 18.5	8.54 to 18.29
Fishing	5	10 to 15	1.65 to 4.9	11.1 to 42.1
Manufacturing (30000)	8			
Agro-based Industries	4	15 — 25	1.73 — 6.0	13.9 — 24.7
Non-Agro based	4	14 — 17	3.06 — 8.5	21.8 — 54.1
Electricity, Gas, Water (40000)	28			
Electricity	25	21 — 55	2.1 — 6.87	10.5 — 24.0
Water	3	22 40	1.9 — 3.47	5.5 — 13.8
Transport, Storage, Communications (70000)	24			
Transport				
Airport	4	16 — 28	2.44 — 10.91	10.2 — 28.9
Highway/Road	7	20 — 25	3.87 — 12.21	14.3 — 34.0
Port/Harbor	10	17 — 54	1.72 — 8.26	8.7 — 27.0
Communications				
Comm/Satelite	3	17 — 24	2.05 — 4.01	13.6 — 21.3

* This Table was prepared in 1973 and is subject to revision. The contents are used to illustrate the concepts related to developmental projects and is an expanded version of Table 4.1.

IRRs; these characteristics are almost similar to those under Fishing. The agro-based industries are classified under Manufacturing not under Agriculture. In between Agriculture and Manufacturing are the projects in Electricity, and Water (with Code 40000), and Transport and Communications (with Code 80000) (see Table 4.3). These results also indicate the possible range in the levels of important characteristics which could be attached to projects in a given economic sector and may be used as basis of comparison of projects within and between sectors in the overall strategy for optimal allocation of resources to projects by economic sector.

3.11. Many projects contain data on undiscounted benefit (B) and cost (C) streams during the project life. One of the feature of the B and C streams from these projects is the close similarities from sample to sample of the percentage distribution of the B and C streams. This distribution may be assumed to be parametric and could be used to derive the curve of the IRR on the B/C ratio. In view of the recognized existing variations,[1] a sample matrix of B/C was generated which in turn generated a sample matrix of the IRR. Thus, instead of a point (B_o/C_o)[2] or a limited number of sample points, the economic evaluation of the project may consist of an IRR on B/C curve, within a narrow band of the B/C ratio, say, around the original point $(B_o/C_o, IRR_o)$. With a sample matrix of B/C, the sample points (B/C, IRR) are derived and simple linear regression[3] was fitted. The slope of the line can be used as a measure of the sensitivity of a project and may be used as possible criterion for classification and/or cataloguing of ADB projects within a given economic sector and as basis of

[1] At this stage, no probability distribution of the B or C is assumed.

[2] Guideline No. 2, (p. 8 of the Guidelines for Economic Evaluation of ADB Projects, April 1970) states as follows: "It is recommended that only the internal rate of return be used as the main indicator of the economic worth of a project for the Bank's purposes. By internal rate of return is meant that particular rate of discount which will equate the present value of net social benefits to that of the social cost of the project". See also p. 49, para. 10 of the ADB Economic and Financial appraisal of Bank-assisted projects dated 21 September 1976.

[3] The equation is of the form $B/C \sum_{k=1}^{m} P_k (1+i)^{-k} / \sum_{k=(m+1)}^{M} Q_k (1+i)^{-k}$

where Pk = Ck/C may be assumed to be a parametric ratio (or percentage) of the C streams,
Qk = Bk/B may be assumed to be a parametric ratio (or percantage) of the B streams.
m = number of years of the C stream,
M = duration of project in years,
C = total cost,
and
B = total benefit.

comparison between sectors in terms of relative sensitivity to errors in the B and C streams.

3.12. **The Slope as Measure of "Sensitivity".** The slope of the linear form is defined as the rate of change in IRR with respect to (B/C). The slope may be used as a measure of sensitivity and this analysis will show what types of projects are more "sensitive" to errors in estimating benefits and costs. The flatter the curve or the lesser the slope, the less sensitive is the project subject to errors in the estimation of benefits and costs and vice-versa. These results imply that more attention should be paid to the estimation of the benefits and costs for the "more sensitive" types of projects.

Agriculture, Hunting, Forestry, Fishing (10000)
Three broad tentative groupings are distinguished with regard to the "slope" criterion:

(1) **Low Slopes Ranging from 0.79 to 1.24**
Under this group will fall the Besut, Gawargan, Sempor, Char-Darrah, Tha Ngon and the Kankai Agricultural Projects. To attain an IRR of about 10 per cent,[1] the B/C ratio for this group of projects with low slopes had to be inflated to about six units.

(2) **Medium Slopes Ranging from 1.35 to 3.77**
This group includes PNPII, Gambarsari-Pesanggrahan, Walawe, Sawit-Sebarang, Binh-Dinh and the Tajum Irrigation Projects. The range in B/C will be about 2.5 to 4 in order to generate an IRR of 10 per cent.

(3) **High Slopes Ranging from 6.10 to 14.62**
Projects in Fishing, Livestock and Agricultural Credit appear to have higher slopes. Thus a low B/C ratio of 1.5 to 2.0 is sufficient to reach an IRR of 10 per cent. This range of the B/C compares with those projects under Manufacturing. This sub-group qualifies as a "more sensitive" type of project.

(4) There appears to be an overestimation in the B/C ratios for projects like Gambarsari-Pesanggrahan Irrigation with a B/C of 18.54, Besut with a B/C ratio of 13.78 and Gawargan at 13.9. These projects were considered as

[1] This level is between 8 and 12 per cent and is the range as suggested on p. 19, para. 50 of the Guidelines for Evaluation of ADB Projects dated 27 April 1970.

possible projects for monitoring studies with special attention to the B streams.

Although the observed slopes in agricultural area development are comparatively lower, the variations and errors in the B streams may be relatively large. If this is so, the projects in area development are considered as highly sensitive and must be subjected to a statistical monitoring device. The sensitivity of projects in Agriculture is shown in Chart 1.

3. Indicators for Economic Feasibility

3.13. Production, cost of production and net income derived from crop, livestock, poultry with other related variables on the agricultural activities in the project area are the key indicators used in the derivation of the economic internal rate of return (IRR). The benefit stream (B) are derived from these variables by planting seasons and cropping patterns which are illustrated in Tables 5.1. and 5.2. The cost streams (C) and the benefit streams (B) are illustrated in Table 5.3. while the cost, benefit and project profiles are shown in Chart 2. Also shown in the chart is the relationship between IRR and B/C. This project may be said to be relatively sensitive to errors in B and C. Most of the cost streams (C) are available even prior to full completion through the use of standard accounting procedures while the B streams must, however, be monitored through a statistical device which could be applied to the farm households in the project area. Chart 3.1 illustrates an estimate of the incremental benefit [1] which is the difference between the benefit derived with the project (W) and without the project (W/O). The statistical monitoring device will provide the checks on whether the benefits as envisioned, say, in Chart 3.1 (as projected in the Appraisal Report) are being generated as planned. If not, the constraints could be identified and appropriate follow-ups necessary to bring the project under control could be implemented.

3.14. Micro-data from sample farms will consist of the production or yield of crops, levels of nitrogen and P_2O_5, moisture stress, hopperburn and other insect damage, weed control level and their interactions. The resultant regressions between these inputs on yield could be used to indicate the pace and direction of crop yields at desired levels of inputs and at prevailing prices of inputs and outputs which will generate

[1] Some forms of linear or related programming techniques could be applied to maximize incremental benefits.

Chart 1

SENSITIVITY OF ADB PROJECTS: AGRICULTURE

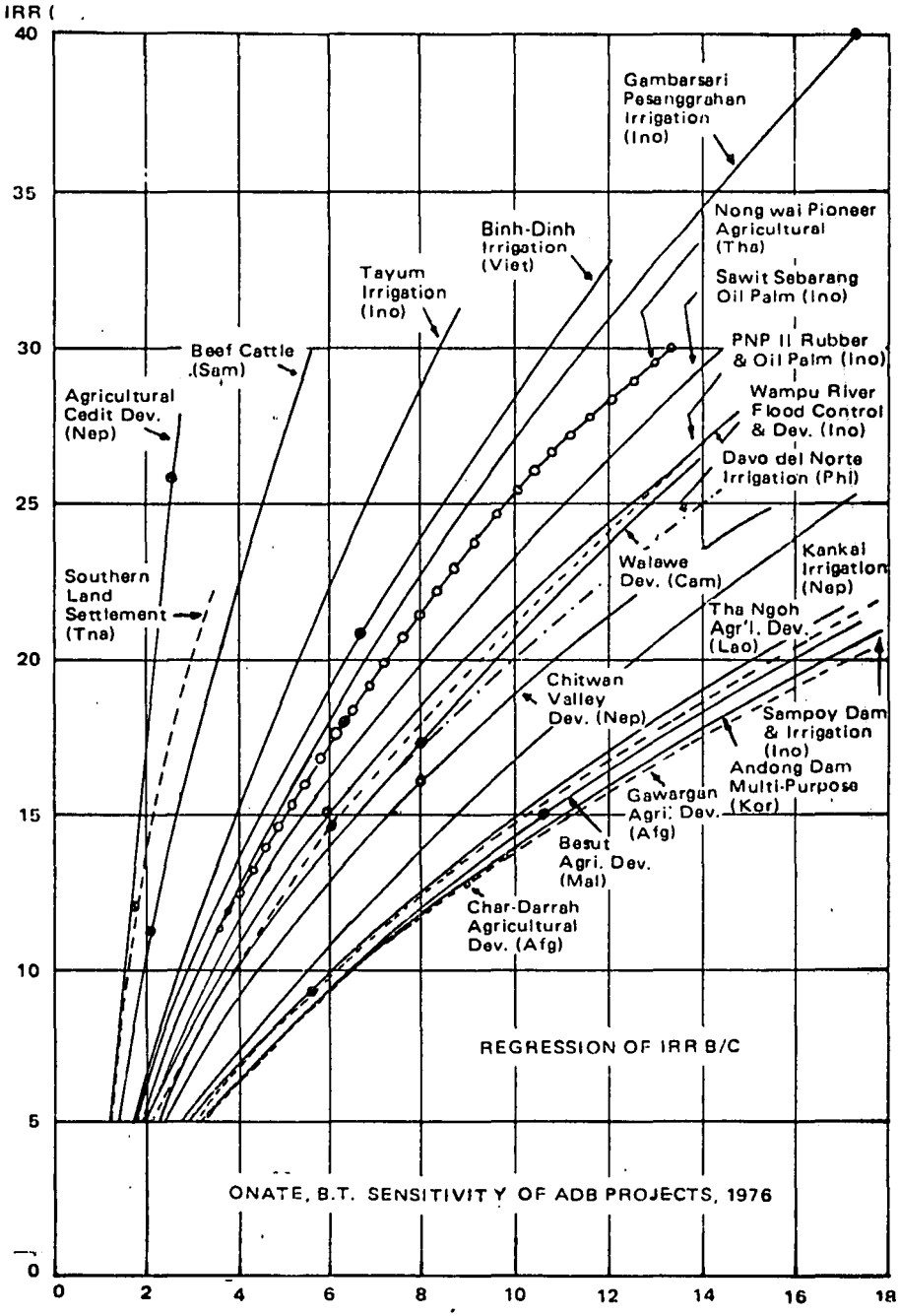


Table 5.1 COST OF PRODUCTION (1-ha.)
(For Illustration)

	Paddy		Vegetbles		Miscellaneous Crops		Peanuts	
	P	W/P	P	W/P	P	W/P	P	W/P
Wet Season								
Cash Inputs (₱/ha.)								
Fertilizer	25	725	300	1,800	100	—	—	730
Pesticides	10	350	200	1,500	—	—	—	200
Seeds	90	90	650	650	150	—	—	640
Hired Labor [a]	115	240	—	—	—	—	—	360
Miscellaneous [b]	80	120	200	500	50	—	—	190
Total	320	1,525	1,350	4,450	300	—	—	2,120
Total Labor Requirements (man-hours/ha.)	675	880	1,150	2,050	550	—	—	1,015
Hired Labor (man-hours/ha.)	75	120	—	—	—	—	—	180
Dry Season								
Cash Inputs (₱/ha.)								
Fertilizer	—	870	300	1,800	100	—	—	730
Pesticides	—	450	200	1,500	—	—	—	200
Seed	—	90	650	650	150	—	—	640
Hired Labor [a]	—	270	—	—	—	—	—	360
Miscellaneous [b]	—	120	200	500	50	—	—	190
Total	—	1,800	1,350	4,450	300	—	—	2,120
Total Labor Requirements (man-hour/ha.)	—	1,050	1,150	2,050	550	—	—	1,015
Hired Labor (man-hour/ha.)	—	135	—	—	—	—	—	180

W/P — Future with Project
P — Present

[a] Unit cost of manual labor ₱1.5/hr. at present, ₱2/hr. for the future.
[b] Include land tax, depreciation and repair of equipment and implements, etc.

Table 5.2. TOTAL FARM INCOME
(For Illustration)

ITEM	1-ha. Farm [a] Present	1-ha. Farm [a] With Project	2.5-ha. Farm [a] Present	2.5-ha. Farm [a] With Project
Net Income from Crop Production:[b]				
Paddy	2,880[c]	10,507[d]	6,730[c]	27,360[d]
Other Crops	2,504	4,410	3,048	4,902
Sub-Total	5,384	14,917	9,778	32,262
Net Income From Livestock [e]	1,200	1,400	1,200	1,400
Off-Farm Income [f]	1,400	700	1,400	350
Total Farm Income	7,984	17,017	12,378	34,012
(% Increase)		(113)		(175)

[a] Irrigable area per farm.
[b] Adjusted
[c] Based on present farm gate prices.
[d] Based on IBRD Price Forecasts with necessary adjustments.
[e] Income from backyard poultry, duck, pig-keeping, and income from the sale of cull and excess cattle.
[f] Mainly off farm income and some cottage industries like silk.

Table 5.3 **Percentage Distribution of Cost & Benefit Streams: N.W.P. Agriculture Project**
(For Illustration)

Year	Total Cost (US $ 000)	% C	Benefits (US $ 000)	% B
0	74	0.46	—	
1	802	4.94	—	
2	4,423	27.23	9	.10
3	1,947	11.99	67	.06
4	2,036	12.54	239	.23
5	2,238	13.78	618	.58
6	1,663	10.24	1,254	1.19
7	1,417	8.72	2,108	2.00
8	68	.42	3,046	2.88
9	68	.42	3,777	3.57
10	68	.42	4,242	4.02
11	68	.42	4,475	4.24
12	48	.42	4,475	4.24
13	277	1.71	4,475	4.24
14	48	.30	4,475	4.24
15	48	.30	4,475	4.24
16	48	.30	4,475	4.24
17	48	.30	4,475	4.24
18	48	.30	4,475	4.24
19	48	.30	4,475	4.24
20	48	.30	4,475	4.24
21	48	.30	4,475	4.24
22	48	.30	4,475	4.24
23	277	1.71	4,475	4.24
24	48	.30	4,475	4.24
25	48	.30	4,475	4.24
26	48	.30	4,475	4.24
27	48	.30	4,475	4.24
28	48	.30	4,475	4.24
29	48	.30	4,475	4.24
30	48	.30	5,270	4.99
	16,242	100.00	105,655	100.00

Chart 2.

N.W.P. AGRICULTURE PROJECT

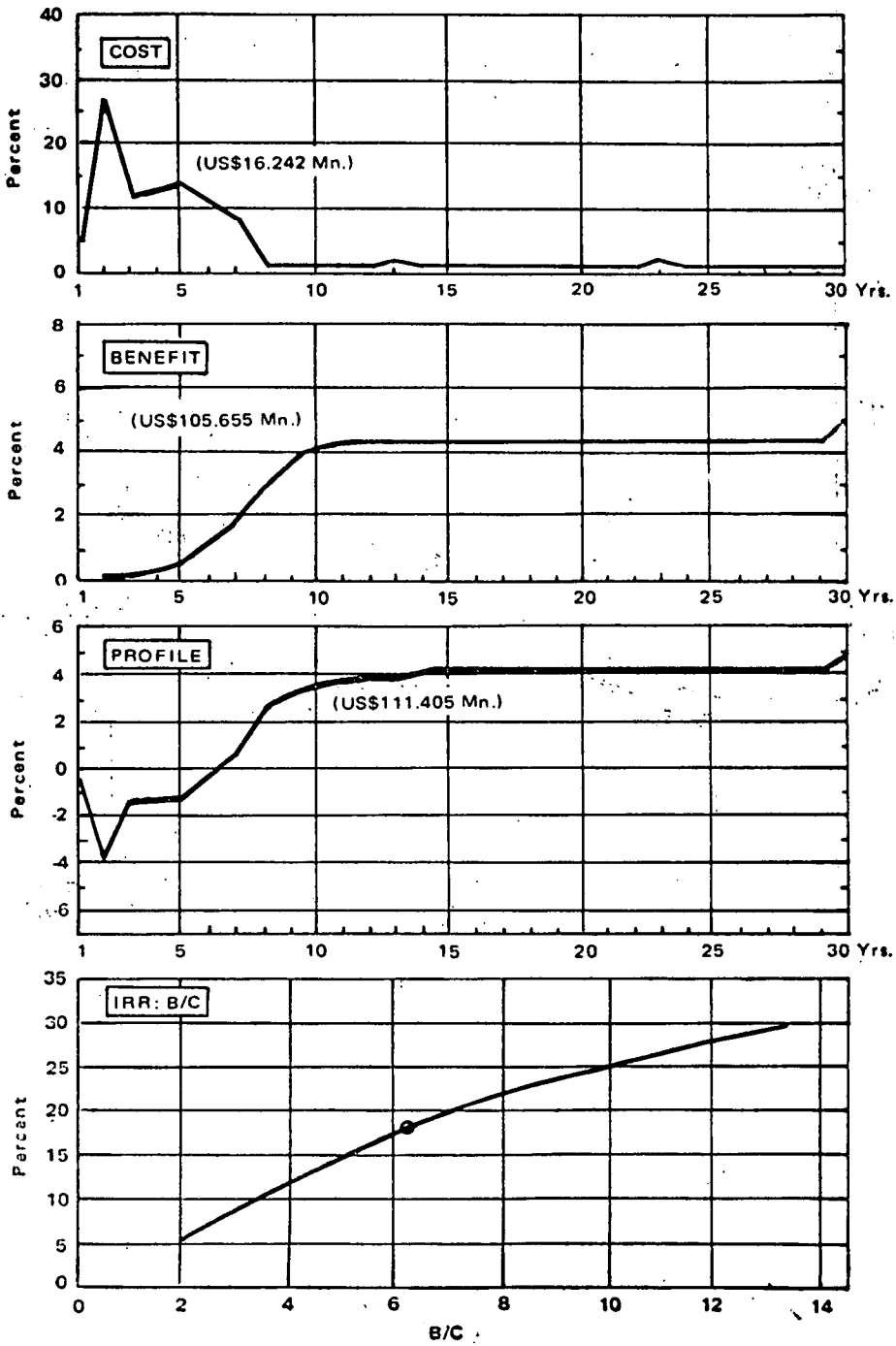
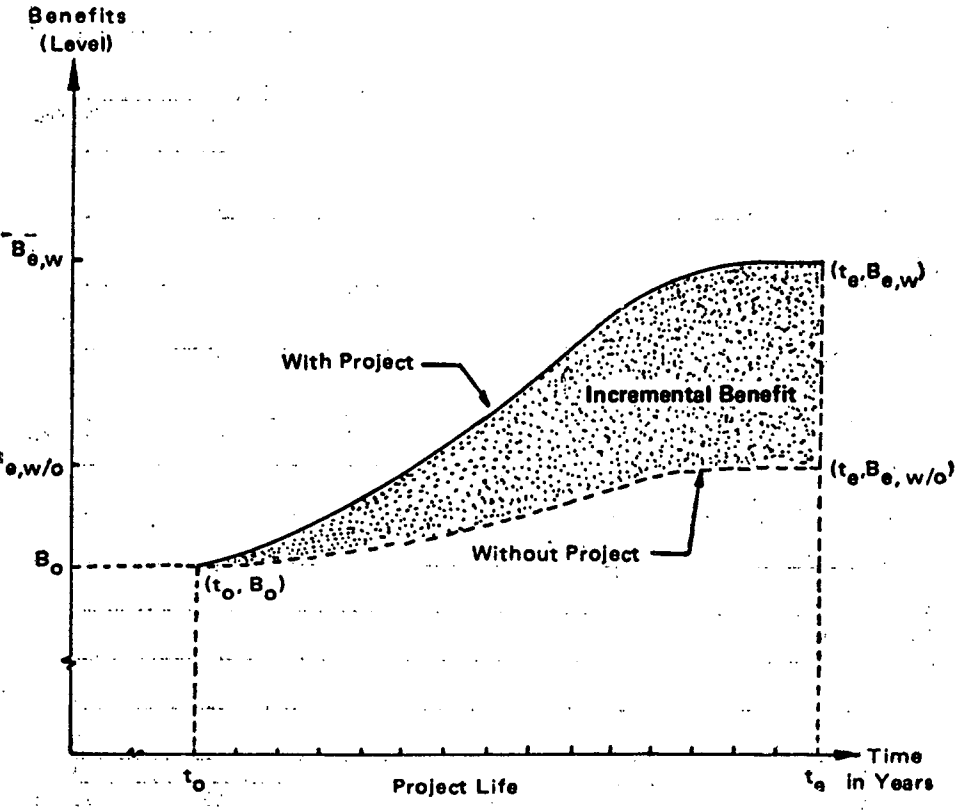


Chart 3.1

INCREMENTAL BENEFIT EQUALS WITH PROJECT MINUS WITHOUT PROJECT: AGRICULTURAL/RURAL AREA DEVELOPMENT PROJECTS



optimum net returns to the farmers in the project area. Since the inputs used outside the project area or without (w/o) the project are subject to normal changes the incremental benefit will also be close to optimum. Thus, the preparation of the projected benefit streams will also be based on micro-data obtained from the streams will also be based on micro-data obtained from the project area. If the statistical monitoring system is repeated periodically, then the projected benefit streams could be checked and if needed also adjusted on the basis of current information on key variables.

3.15. Some experimental data are available from farmer's paddy fields in the Philippines[1] which indicated that on many farms studied, a substantial increase in nitrogen input in the dry season can raise paddy yields by about 1 ton/ha. During the wet seasons, yields of more than 3.5 tons/ha. do not appear to be profitable due partly to the high cost of insecticides. It is interesting to note that in Laguna the yield gap between the farmers' level and the high level of inputs was 2.0 tons/ha. in 1974 wet season, 1.7 tons/ha. in the 1975 wet season and 2.6 tons/ha. in the 1975 dry season. Fertilizer accounted for about 50 per cent of this yield gap; insect control for about 33 per cent while weed control for less than the remaining percentage.

3.16. Data from experiments and farmers paddy field collected by the author in 1962 to 1966 indicated that the symmetry of the distribution function is affected by the level of nitrogen and the season. At zero or low level of nitrogen, the distribution (do) is positively skewed ($\sqrt{\beta_1} > 0$)[2] or a relatively long tail to the right. The mode is less than the mean. At moderate levels of nitrogen, the distribution (d_m) becomes more symmetrical and the mode equals the mean. But at relatively higher levels of nitrogen, the distribution (d_e) assumes a negative skeweness ($\sqrt{\beta_1} < 0$) or a long tail to the left and the mean is now below the mode. As the level of nitrogen increases, the yield potential also increases and the distribution shifts to the right. Higher productivity is also associated with larger variability. Chart 3.2 illustrates these concepts and results of the empirical studies.

[1] IRRI Annual Report 1974, 1975. The provinces are Laguna, Nueva Ecija and Camarines Sur.

[2] Test for skewness utilized $\sqrt{\beta_1} = \mu_3/(\mu_2)^{3/2}$

where μ_2 and μ_3 are the second and third moments about the mean, respectively.

3.17. Low level of fertilizer or inputs is generally associated with low level of technology or productivity at the initial stage (t_o) while high level of inputs is associated with high level of technology or productivity at the target date (t_e) in the project area. Under conditions in the Asian region, this time reference from t_o to t_e could be 20 to 30 years. But no objective data are available to indicate this trend. The statistical monitoring system will provide among others, this type of data as basis of future planning.

3.18. Also, the probabilities associated with d_o (low nitrogen) at the initial stage (t_o) are quite different than those for d_m and d_e at the target date (t_c). The economic feasibility study of the appraisal report must consider a more realistic assumption on the trends in productivity as provided by the statistical monitoring system and the shifts in the distribution from t_o to t_e in the application of sensitivity tests.

3.19. The statistical monitoring system will provide data on non-farm activities of the rural poor in the project area and on large numbers of small to medium scale non-farm activities in the villages and towns covered by the rural area development scheme. These data at the household, village and town levels will be useful in the design and provision of assistance for non-farm activities which merit special attention in formulating new approaches for rural development projects and programs.[1]

Table 6.1 Distribution of Farm Holdings by Number and by Area for Nine South and Southeast Asian Countries, 1960[a]

Farm Size (ha)	Number of Farms %	Number of Farms Comulative	Area of Farms %	Area of Farms Comulative
Less .5	21.8	21.8	1.9	1.9
.5- 1.0	22.2	44.0	6.1	8.0
1.1- 2.0	22.1	66.1	13.1	21.1
2.1- 3.0	11.0	77.1	10.9	32.0
3.1- 5.0	12.8	89.9	21.1	53.1
5.1-10.0	6.3	96.2	18.5	71.6
10.1-20.0	3.1	99.3	18.8	90.4
Over 20.0	0.7	100.0	9.6	100.0
Total	100.		100	

Basic source: FAO Report on 1960 World Census of Agriculture

[a] Countries included are Bangladesh, India, Indonesia, Malaysia (West), Pakistan, Philippines, Sri Lanka, Thailand, Vietnam (South).

[1] World Bank. Development Issues in Rural Non-Farm Employment. Development Economics Department. Report No. 1577. April 1977.

Chart 3.2
SHIFTS IN THE DISTRIBUTION OF PADDY RICE AT VARYING LEVELS OF NITROGEN, 1962-1966, PHILIPPINES*

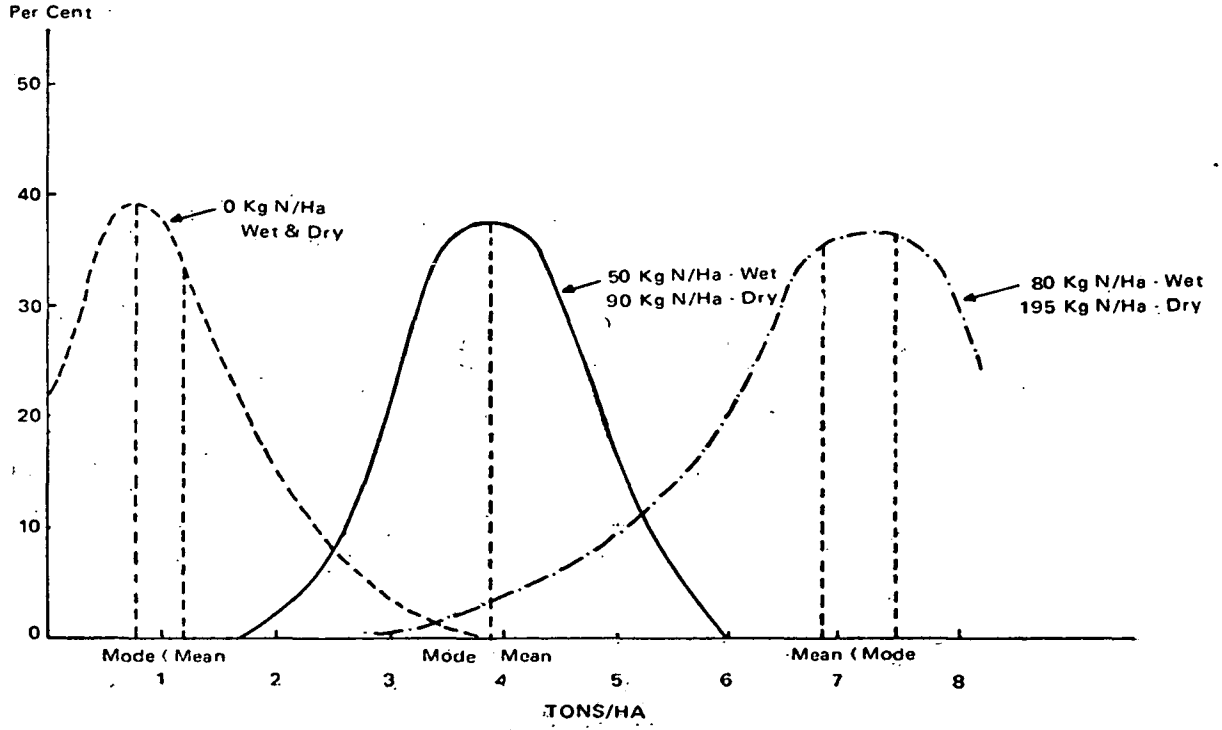
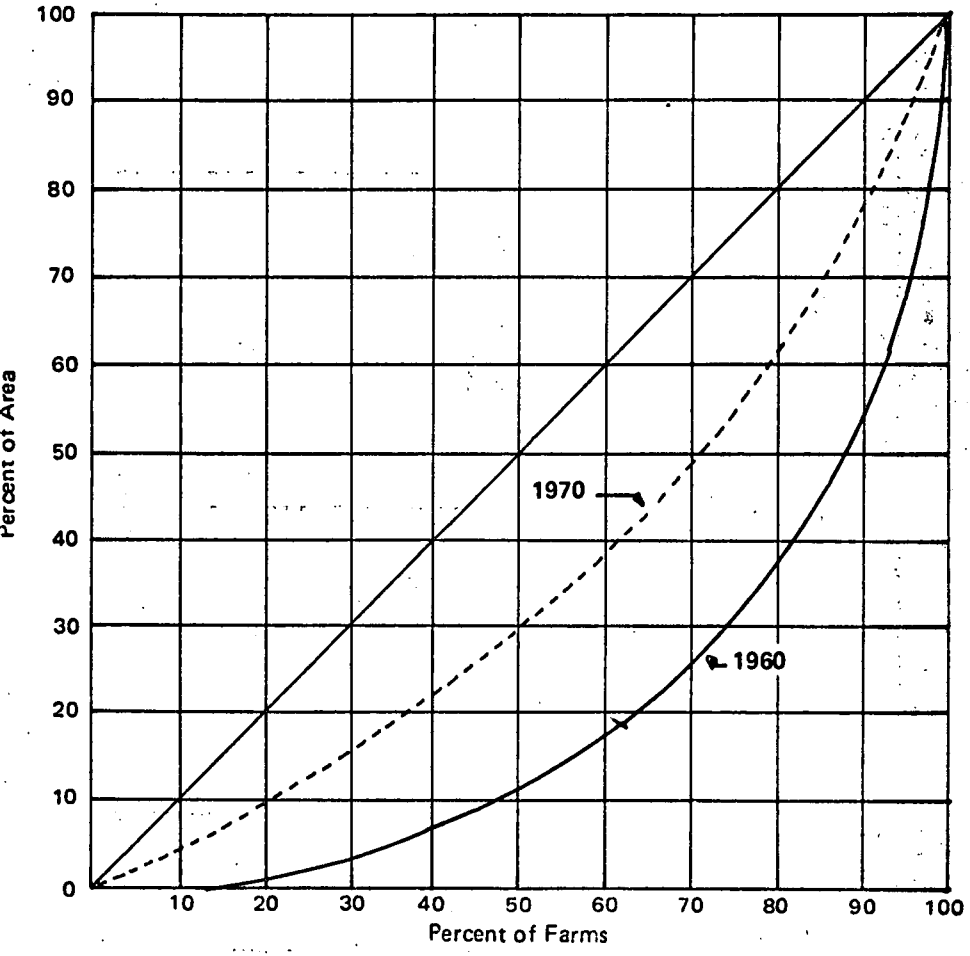


Chart 4.1.

RELATIONSHIP BETWEEN PERCENT OF FARM AND PERCENT OF AREA



4. Social Aspects

3.20. It is important to note that with the attention given to the major concerns on poverty, inequality and unemployment and the traditional concerns on food and nutrition, education and culture, housing and clothing, personal and social security, family planning and social welfare, there is also a shift in emphasis on the statistical approach from point estimation to the estimation of distributions which will indicate not only the levels of poverty but also the extent of inequality by social concerns. The statistical monitoring system (see Section IIIB) will provide a continuing picture on the improvement of poverty and inequality by concern in rural area development schemes. An example on the distribution of land illustrates the concept of the distribution of poverty and the levels of inequality of farm land.

3.21. **Distribution of Land:** Area of Farms. If the farm size is relatively small then the income of the farm household derived from Agriculture would generally be low. The distribution of the number of farm households with the area of farms as influenced by farm size would indicate the extent of inequality in the distribution of farm area. Data from the 1960 World Census of Agriculture were obtained from FAO Report for Bangladesh, India, Indonesia, Malaysia (West), Pakistan, Philippines, Sri Lanka, Thailand and Viet-Nam (South) and after consolidation, the relationships between farm size, per cent distribution of the number of farms and per cent distribution of areas of farms are shown in Table 6. The unequal distribution of land approximates the results if the distribution of income is used. Table 6. shows that about 44 per cent of the number of farms (households) have one hectare or less and this large proportion of total farm households operates only 8 per cent of total area of farms. On the other end of the spectrum, one could see that farms with 5 hectares and over, comprised only about 10 per cent of total farms but operates 47 per cent of total area of farms. These data imply general inequality in the distribution of area of farm holdings in the South and Southeast Asian countries. Chart 4.1. shows the relationship between percentage of farms and percentage of area. The departure from the line of equal distribution of and (45° line) of the actual curve is so marked at this aspect of inequality in the distribution of farm area is considered one of the most important impediments or constraints to effective agricultural development in the Asian region. In fact, the results in Table 6.and Chart 4.1. could be used as one of

the possible statistical frameworks for monitoring any progress which could be made in terms of a more equitable distribution of land area to the farm households in rural Asia. The assumed curve for 1970 in Chart 4.1 will show improvement in this inequality.[1]

5. Impacts on Development

3.22 One may identify six processes in the social system, namely: (1) Production, (2) Consumption, (3) Protection, (4) Learning, (15) Interaction, and (6) Decision. Singly or jointly these processes will generate certain impacts on development which in turn will determine the state or quality of life in the project area. These impacts may be termed as follows: (1) direct, (2) income, (3) industrial, (4) migration (5) public service, (6) negative, and (7) indirect or multiplier effects. While production or the direct impact can effectively be evaluated by economic efficiency through the use of the IRR, the other impacts mentioned in Nos. 2 to 7 above could not be handled adequately by the IRR. One has to develop an empirical relation between inputs (or facilities or use of facilities) and outputs through causal flow diagrams to explain the processes in the social system.[2] Since this is extremely difficult at the present stage of knowledge and too variable for evaluation purposes, the other alternative is to institute a statistical monitoring system with special emphasis to measure the income, industrial, migration, public service, negative and indirect or multiplier impacts. The results of this monitoring system on a time series could be used as inputs or intermediate variables or outputs to derive the empirical bridge for evaluation of similar area development schemes.

3.23. The results of studies on household economies with special reference to specific rural areas could serve as model for flow diagrams and as source of empirical relationships between input, intermediate and output variables which could be used to project trends in the impacts of agricultural and rural area development projects (see Chart 4.2. as illustration).

3.24. Different paths associated with different empirical relations and different initial values (t_0) of the input and in-

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[1] The author applied the concept of Gini Coefficient to the distribution of land. Op. cit. p. 12.

[2] Asian Development Bank. Feasibility Report for the Namgang Area Development Program Project (Phase I), Vol. I, Chapter X. Social Indicators. December 1974. This chapter of the Report was developed with the assistance of the Department of Social Engineering, Tokyo Institute of Technology in consultation with the ADB Social Indicators Committee which was chaired by the author in 1974.

termediate measurements and output variables will generate different output social indicator at target year t_N. The empirical relations will depend not only on the flow diagrams but also on the set of data used to derive the relations. Equally important would be the precision and accuracy of the variables used to derive the co-efficients in the empirical models. For illustration, the derived data in Table 7 utilized empirical models to project the output variables at t_N which were used in turn to evaluate the impacts in a given rural area development project with various alternatives or paths for development.

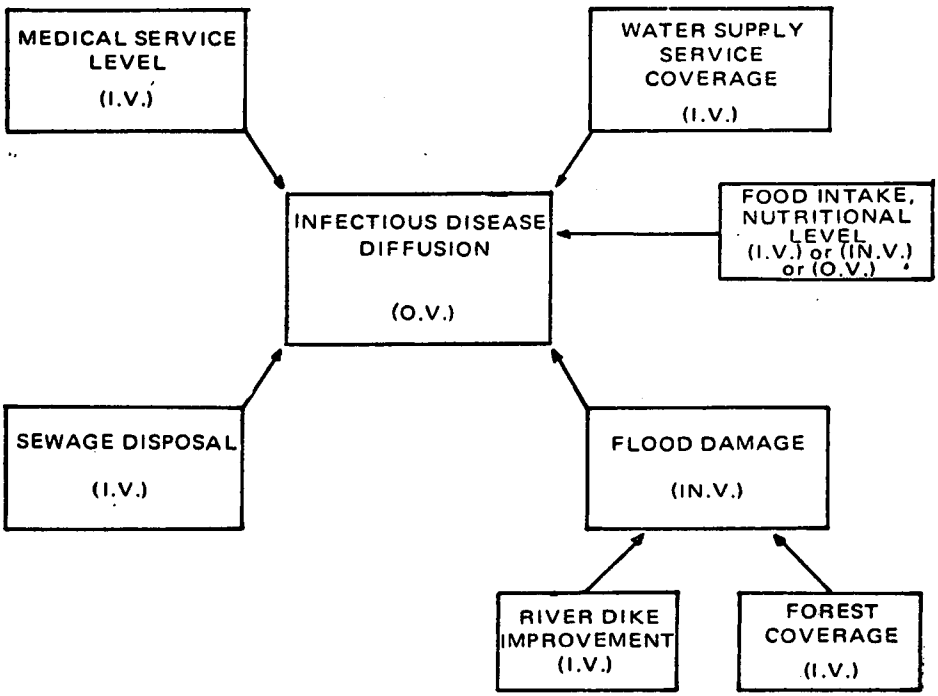
IV. CONCLUSIONS

4.1. The status of Project Monitoring of rural area development projects financed through resources from national, bilateral, regional or international financial development institution is less than satisfactory. Unbiased and objecive data from these project areas are not adequately available for monitoring the progress or development on a continuing basis. These rural areas are pockets of poverty, inequality and unemployment and national governments have designated these development schemes as priority projects. National efforts and considerable amount of funds, both local and borrowed have been concentrated into these depressed areas to improve the quality of life (**Pagpapaunlad Ng Uri Ng Buhay**) which in turn should improve the quality of the rural man (**Pagpapaunlad Ng Uri Ng Taga Bukid**).

4.2. Statistical monitoring system based on sound and scientific sampling procedures could provide the necessary management tools for generating indicators for monitoring progress or development attained in these areas. The cost of the statistical device is extremely minimal as compared to the overall cost of the project, at times reaching more than 100 million US dollars. This cost could be included as a very small component of the cost streams (C). The indicators generated by the statistical system will indicate the constraints to progress. Prompt policy-decision and effective follow-ups to remedy the defects could bring the project immediately under control or along the desired path as envisioned in the plan or appraisal report. The Statistical Monitoring System (SMS) could easily have a pay-off in terms of the capital, employment and benefits (B) foregone, if the project was not brought under control. Thus, the SMS should be an important component of the Project Design.

Chart 4.2.

EXAMPLE OF FLOW DIAGRAM TO INDICATE RELATIONSHIP OF INPUT VARIABLE (I.V.), INTERMEDIATE VARIABLE (IN. V.) AND OUTPUT VARIABLE (O.V.): RURAL AREA DEVELOPMENT PROJECTS



).D. = FUNCTION (I.V., IN.V., O.V.; INTERACTIONS)

Table 7. **Examples of Output Indicators as Indices at t_N (Case II = 100)**

Selected Items	Unit	Initial state (at t_0)	Control	Case I	Case II (=100)	Case III
1. Agricultural Labor Productivity	N.C/person	71	79	98	100	106
2. Agricultural Income per household	N.C.	73	80	98	100	105
3. Value added Manufacturing	NC. Million	55	57	95	100	163
4. Unemployment	Person	90	80	94	100	98
5. Food expenditure	N.C.	85	90	99	100	109
6. Infectious Disease Diffusion	Cases 1000 person	176	166	160	100	97
7. Life Expectancy	Year	99	99	100	100	100
8. Enrollment Ratio High School	%	95	95	98	100	148
9. Working Period per farmer	Hours	117	109	101	100	98
10. Association Participation Ration	%	84	85	93	100	104

Source: Derived Table for Illustrative purposes only. Op cit p. 42.
N.C. = National Currency

4.3. If each agricultural and rural area development project has a built-in statistical monitoring system, then a good picture of the progress attained could emerge for the province, the region and finally at the national level. At this stage, statistical monitoring of rural area development projects becomes an important part of the Statistical System in Food and Agriculture.