STATISTICS AS A COMPONENT OF STRATEGIES FOR AGRICULTURAL PLANNING AND RURAL DEVELOPMENT*

*Burton T. Oñate***
and
*Julia M. Uichanco-Oñate****

I. Introduction

1. Statistics is recognized as one of the decision inputs which may collectively be considered as one or probably the most important single factor in successful decision making. With this recognition, this input should then be managed in a manner similar to how labor, capital, and physical assets are handled. But the application of effective management for the monitoring, collection, storage and retrieval of statistics is at best a long-term goal.[1] To attain this objective, there must be effective dialogue between the users of information such as managers, researchers and planners and the producers such as statistical agencies at both national and international levels.[2] There are many dimensions to the solution of this problem.

II. Statistics for Planning and Development

2. There is also a general recognition in the Asian region of the important role of reliable statistics, obtained on a sound scientific basis, in the circular process of planning, implementation and evalua-

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**Member, Board of Directors, PAEDA, 1979/80 and Member, The Uichanco Foundation, Inc., Calamba, Laguna, Philippines.

***Member, The Uichanco Foundation, Inc. and Instructor, U.P. at Los Baños.

1. Cox, K. K. and B. M. Enis. The Marketing Research Process. A Managerial Approach to Purchasing Relevant Information for Decision Making. Goodyear Publishing Co., Inc., Pacific Palisades, California, 1972.

2. Oñate, B.T. Partnership Between Producer and User of Marketing Information: Role of International Agencies. Phil. Stat. Vol. XXIV, Nos. 3 & 4. 1975.

tion of economic and social developmental projects. A sound statistical framework for the agricultural and rural sector is a basic requirement in the process of providing guides for the strategy and direction of agricultural planning as an economic sector of the economy and rural development at the project site. The statistical system should consist of: (a) the statistical organizations or agencies responsible for the collection, collation and publication of statistical information; (b) the statistical program; and (c) the statistical personnel. There is no ideal statistical system. A given system will operate efficiently on the basis of how it interacts with various factors in the country's social, political, economic and cultural matrix.[1] The criteria of *objectivity, integrity* and *independence* must be the basic guidelines of any form of statistical system. There is a need for the developing member countries (DMCs) in the region to develop useful, reliable, timely and consistent statistics as a major requirement for effective programs, implementation and evaluation of agricultural planning and rural development. These statistics will provide the necessary guide posts in planning and will also be useful in providing standards for measuring or assessing the actual progress achieved. Lack of these statistics is a serious constraint in the circular process of planning and development.[2]

3. While there exists a recognition of the important role of statistics in the process of development, there are two basic constraints which hinder the development of national statistical systems, namely: (a) lack in quantity of technical competence in the statistical sciences, and (b) little or no continuing administrative support which includes funds for the development of an effective statistical program. Existing vehicles are available for achieving progress in the field of statistical development in the region. Progress could be achieved along the following lines:

(a) *Improving the methods and techniques in the different subject matter fields of statistics.* Most, if not all, of the DMCs of the region utilize national accounts for economic

1. Oñate, B. T. Statistical Framework for Agricultural Planning and Development. Asian Agricultural Survey. Asian Development Bank (ADB), 1969. See also pages 316 and 317, ADB Asian Agricultural Survey 1976 published as "Rural Asia: Challenge and Opportunity", August, 1977.

2. _____. Improvement of the Quality of Current Statistics in the Asian Region. Occasional Papers No. 5. Asian Development Bank, May 1971. Revised June 1978.

planning and growth framework. Because of this, the national economic accounts can become an excellent framework for the development of statistics. The various subsectors of agriculture are important building blocks of the Production Accounts in Agriculture (PAA) and therefore of the national accounts. Thus, each country can build the level of statistical coverage for each crop (rice, maize, wheat, commercial crops, etc.), each type of livestock (cattle, water buffalo, swine, etc.), each type of poultry (chicken, duck, etc.), fishery and forestry. Each subsector can be developed on the basis of its importance and priority. This approach can easily be applied also to the non-agricultural sectors of the national accounts.

(b) *Development of a basic statistical system for economic and social development planning.* To achieve this, the DMCs should include statistical development in the national plans and adequate funds should be allocated for this purpose. The needed amounts should be minimal, since already existing agencies could be tapped to implement this program. Some countries have started to reflect this development in their plans. More administrative support is needed for the maintenance of this statistical framework. Growth and development of the national economy is interlinked with the growth and development of the statistical system. In almost all DMCs in the region, there are national or even country regional development plans which depend upon a statistical framework for their planning, execution and evaluation. One can use the growth and development of a nation's statistical system as a gauge of the level of social and economic growth and development of the country. Often, if not always, the financial support for the developmental growth of the statistical system is left out of the national or regional plan. This contemplated growth of the statistical system must be reflected in the plan, so that the necessary financial and technical requirements are met. In the absence of plans for statistical development in the field of food and agriculture, the existing administrative set-up is used for the collection of statistical information with often disastrous results.

4. In the region, there is a general understatement of agricultural production. Statisticians in most countries are aware of this deficiency. In some countries, efforts have been made to develop a more complete enumeration of agriculture by adjusting national data on the basis of several factors. After application of these selected adjustment factors, the general level of production and value added in many sectors of the national accounts changed and these changes brought about corresponding shifts in the structure of the economy.[1, 2] These adjustments also generated changes in the components of the Food Balance Sheet (FBS) such as the per capita food intakes and per capita nutrient levels.

5. The quality of current agricultural statistics in the region may be compared to the standard imposed on the "product" of industry. Quality controls are imposed on the raw materials of industry, on each item at various stages of the industrial process, and then on the final "product". Similarly, agricultural statistics produced by the statistical system must also meet certain specifications before these data are considered useful for planning, policy formulation and implementation of programs on rural development. Good and sound statistical information must be relevant, accurate and reliable, consistent and comparable, timely and useful. Broadly, the quality of statistics may be assessed on the basis of the methods used in its collection. A total of ten methods were applied as possible criteria in the assessment of the quality of agricultural information (see description of methods, Table 1.1). On the basis of this coding system, the World Survey of some selected data published annually by countries in the Asian region are shown in Table 1.2. One will note the preponderance of Code 7 (eye estimates, etc.) in Table 1.2 as a method used prior to or around 1970 not only in the Asian region but in the rest of the world. Some countries have applied Code 1, sample surveys or probability sampling which is the accepted scientific method. However, more information will be needed about the suitability of a particular method in order to assess the quality of the data with regard to accuracy and reliability of the resultant series. This scheme on "methods" will be useful

1. Op. cit. p. 2, footnote 1.
2. Oñate, B. T. Evaluation, Analysis and Uses of National Accounts in the Asian Region. International Association for Research in Income and Wealth. Asian Regional Conference. Manila, April 1977.

in assessing also other statistical series collected from the other economic sectors.

6. Since 1946 or a period of 31 years, the World Bank has lent US$8 billion for agricultural and rural development.[1] 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. Similarly, the Asian Development Bank (ADB) approved during the period January 1968 to end April 1979, 120 projects amounting to US$1.414 billion in agriculture and agro-industry.[2] The introduction and importance of a sound statistical framework for project monitoring is not yet well recognized nor appreciated. This framework involves the setting-up at time of appraisal very precise key objectives during its project life, in the form of key indicators which could be checked through a sound monitoring devise on a regular or periodic basis by the generation of current values of these indicators for comparison with the projected values (benefit streams) in the appraisal reports. The implications of these comparisons in terms of necessary policy decisions could be easily perceived. There are other uses of the micro data or indicators obtained from agricultural and rural area development schemes such as the source 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.[3]

III. Statistical System in Food and Agriculture (SSFA)

7. The types of information collected by the statistical system may either be macro or micro. However, the system must also consider the analytical studies on statistical methodology and other required components generated by research institutions as well as special approaches applied to and results derived from agricultural area development schemes which are funded by resources from national, bilateral and multilateral resources. Macro-statistics refer

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

2. ADB Loan and Technical Assistance Approvals as of 30 April 1979. No. 79/4, 1 May 1979.

3. Oñate, B. T. Benefit Monitoring as a Component of the Statistical System in Food and Agriculture. Contributed paper to be presented at the International Statistical Institute Conference to be held in Manila on December 1979.

TABLE 1.1
QUALITY OF SOME AGRICULTURAL STATISTICS

Code	*Description of Method*
0	Complete enumeration census
1	Sample Survey
2	Quota Survey
3	Survey based on some non-random sample. An example is the distribution of questionnaires to some number of agricultural holdings and the preparation of estimates on the basis of the response made available on some particular date no matter to what percentage of units it refers to.
4	Figure taken from some records kept for a variety of purposes. In this category data on the listed characteristics which come from the socialist countries are included. The relevant records are kept on collective holdings primarily for management and payroll purposes. Statistics are also included here on animal slaughter as reported by the slaughter houses, milk production as reported by the dairy establishments, etc.
5	Estimates based on data for the same characteristics as collected at some earlier date. This class includes the extrapolations from time series. Another example is the adjustment of data from earlier censuses obtained from the application of some correction factor that allows for changes.
6	Estimates based on data from some other characteristics that may be expected to be correlated with the one concerned. This class includes the estimates of the production based on the information about area harvested, estimates of milk production based on the number of cows, estimates of number of eggs based on estimated number of laying fowls, etc.
7	Eye estimates of all kinds such as office guesses, estimates of the area and yield of various crops as reported by the extension work personnel, crop reporters in various villages or districts, reports of the veterinarians about the number of livestock, etc.
8	Figure of unknown origin such as information taken from newspapers, various speeches and reports. In all these cases no indication is made of the source of the information.
9	No information available about the figure published.

Source: FAO *Statistics Advisory Committee of Experts.* Rome. September 1969.

TABLE 1.2

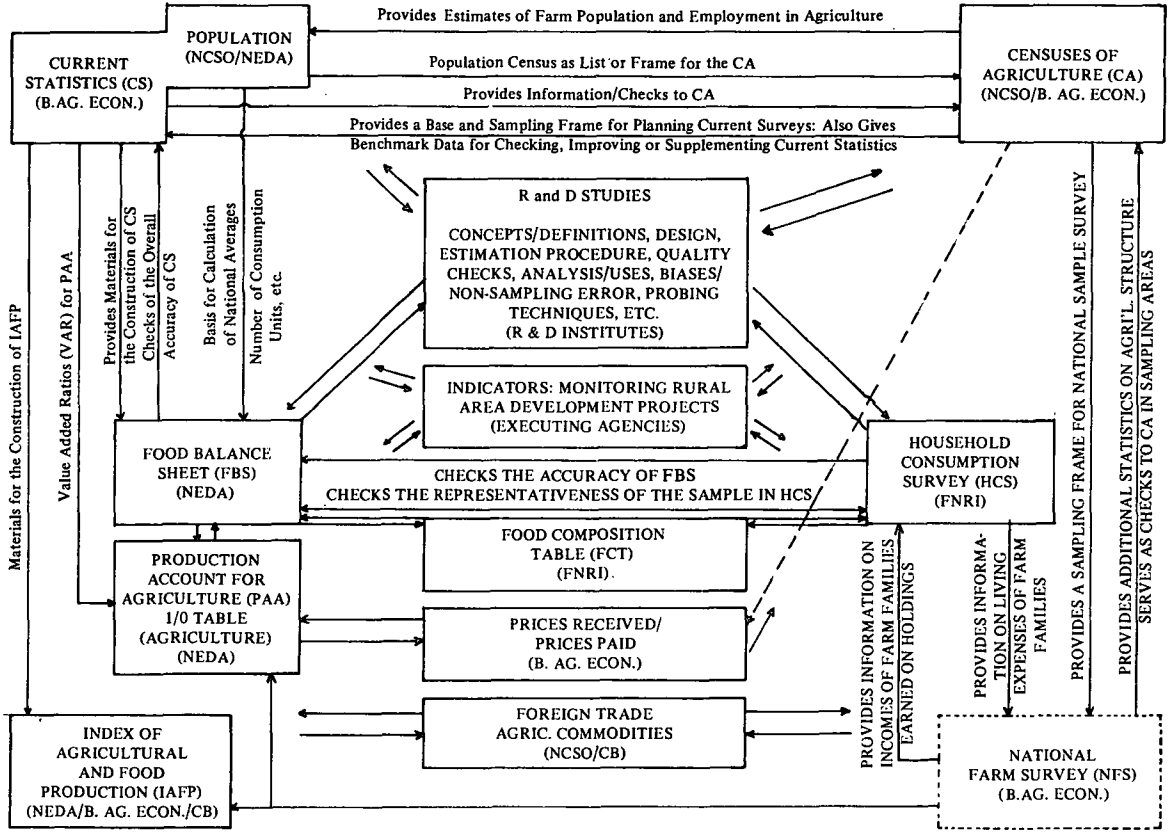
METHODS USED IN THE COLLECTION OF SELECTED BASIC DATA ON AGRICULTURE FROM ESCAP COUNTRIES

ESCAP Countries	*Wheat/Rice*		*Maize*		*Cattle*	*Milk*
	Area	*Yield*	*Area*	*Yield*	*(Number)*	*Production*
Afghanistan	7	7	7	7	7	7
Burma	7	7	7	7	7	7
Cambodia	7	7	7	7	7	7
Sri Lanka	7	7	7	7	7	7
China (Republic of)	7	7	7	7	7	7
India	1	1	7	7	1	7
Indonesia	7	7	7	7	7	7
Iran	7	7	7	7	7	7
Japan	1	1	1	1	1	1
Korea (Republic of)	7(1)	7(1)	7	7	7	7
Lao P. D. R.	7	7	7	7	7	7
Malaysia	7	7	7	7	7	7
Nepal	7	7	7	7	7	7
Pakistan	7	7	7	7	7	7
Philippines	1	1	1	1	1	7
Thailand	7(1)	7(1)	7	7	7	7

Source: FAO Statistics Advisory Committee of Experts, Quality of some agricultural statistics. Rome. September 1969. (Numbers in table refer to methods described in Table 1.1). Participants to the Advanced Course for the 1980 Census of Agriculture held at the Statistical Institute for Asia and the Pacific (SIAP), Tokyo from May to June 1977 informed that many of the DMCs mentioned in Table 1.2 have already utilized Code 1, "Sample Surveys", in their collection of agricultural statistics.

to estimates of national totals or averages while micro-statistics are estimates of the contribution of individual units or sub-components to the total. The classification may also use the terms "basic" sources while the other components of the SSFA are considered as "derived" statistics. This dichotomy in the SSFA is shown below. Chart 1.1 elaborates on the flows of information from component to component in the SSFA in the Philippines.

CHART 1.1. STATISTICAL SYSTEM IN FOOD AND AGRICULTURE (SSFA): INTER SECTORAL FLOWS*, PHILIPPINES



*NOTE: AGENCY RESPONSIBLE FOR COMPONENT IS INDICATED IN EACH CELL.

DICHOTOMY IN SSFA

Level	Use: Basic	Use: Derived
Macro	Current Analytical Studies	Food Balance Sheet Production Accounts Index of Agriculture and Food Production Analytical Studies
Micro	Census Household Consumption National Farm Economic Survey Indicators for Monitoring Analytical Studies	Indicators for Monitoring Rural Area Development Projects Analytical Studies

A. *Macro-Statistics*

1. *Current Statistics*

8. Current statistics usually refer to national, regional or state (provincial) aggregates on production of and areas under different crops, quantities exported, imported and consumed and similar estimates for livestock, poultry, fishing and forestry. Admittedly, the coverage of crops, etc. is not complete and a number of DMCs still rely on eye-estimates and on rather subjective methods rather than on sampling techniques. Current statistics will generate the index numbers of total agricultural and food production while the combination of current statistics and population will give rise to estimates of indices for per capita agricultural and per capita food production. The weights are, however, obtained generally from the Census of Agriculture. The current statistics collection system could be used as vehicle or rider in the generation of essential statistical series on food and agriculture such as items on cost of production, capital formation, credit and savings, income and expenditure, land reform and other series.

2. *Food Balance Sheet (FBS)*

9. FBS shows the food supply in a country at retail level as measured by total production adjusted for trade, changes in stocks,

quantities used for animal feed, seed, manufacturing or utilization and amounts wasted during distribution up to retail levels. Extraction rates are important statistical components of the FBS and these estimates are usually made available as by-products of efforts from research institutions or as separate ad hoc studies by the statistical system. The preparation of Food Composition Tables (FCTs) requires certain statistical bases which could be met only through joint cooperative effort between research institutions and the statistical system. The estimation of calories, protein and fat of each of the numerous food and agricultural commodities should be based on good samples which are adequately weighted or represented in the materials studied in the laboratory or research stations.

10. The "Commodity Balance"[1] may include all commodities emanating from the agricultural, mining and manufacturing industries. The basic idea is to integrate commodity classifications of data on production and trade and to calculate "Available Supply" on the basis of the following initial structure:

Production + Import – Export = Balance (Available Supply)

After this initial phase, the second stage will include the estimation of the distribution of "Available Supply" or the "Balance" of the right side of Equation (1). These approaches will also evaluate the quality of production, trade and other related statistics which will give the so-called "Balance Sheet" as follows:

Food Products

Production + Import-Export = Stock + Feed + Seeds + Processing + Depreciation (waste) + Food (gross) (Eq. 2)

Mining and Manufacturing

Production + Import-Export = Stock + Fixed Capital Formation + Processing Materials + Depreciation + Consumption (Eq. 3)

11. In the case of food products (Eq. 2), the 'Balance Sheet' is similar to that of FAO's Food Balance Sheet. This proposed project will seek for the cooperation of the countries in the Asian region. The completion of the components in Eq. (2) as a "Food

1. Statistical Applications of Commodity Balances are: a) Index Numbers of Food and Agricultural Production; b) Economic Accounts for Agriculture; c) Food Balance Sheets: Supply/Utilization Balances for Agriculture; and d) Consistency Checks.

Balance Sheet", would not only improve the current statistics in the FBS of countries already reporting to FAO but would afford an opportunity for those countries not yet reporting to FAO to make available this kind of information to FAO through the structure of the Commodity Balance Sheet. One of the important problems which will be met would be the evaluation and possible improvement of statistics on production and then, on trade. Thus, the calculation of "Available Supply" will look into this problem of reliability of statistics on production, the accuracy of data on trade, and also on estimates for the various items in Eqs. 2 and 3. The discrepancy in each component on both sides of the equations will be one of the primary concerns of the Commodity Balance Sheet.[1]

12. In Thailand, the collection of current agricultural statistics is located within the Ministry of Agriculture. Area sown, damage and production are obtained from farm households in each village (mauban) for each crop by the village headman (phuyiaban). Area and production of annual crops, perennial crops, number of Livestock and poultry are also obtained at the village level. The local officials may frequently require training in the proper use of concepts and methodology to be followed in the collection of statistical information. For example, in the Second National Economic and Social Development Plan, 1967-71, the production target for "paddy" in 1971 was set at a level of 13.7 million m.t. In 1965, this crop accounted for about 12 per cent of the Gross National Product and rice was the leading export earner accounting for more than one-third of total exports. Since this commodity flows from the agricultural to the other sectors, moderate to large changes in the production levels for "paddy" in the national accounts would also generate changes in the levels in the other sectors. Since the national accounts are used as statistical framework of the macro-development plan, such changes would definitely affect the entire plan for, say, 1967-1971. The National Statistical Office (NSO) on the basis of accepted statistical collecting framework estimated paddy production in 1966/67 at 13.5 million m.t. or almost equal to the production target of 13.7 million m.t. set for 1971 in the national plan. This estimate of NSO

1. The Regional Commodity Balance Sheet (CBS) is a joint effort of the ADB, ESCAP, IDE, FAO and six cooperating DMCs of ADB, namely: Indonesia, Malaysia, Philippines, Thailand, Singapore and Korea (Rep. of). A Technical Manual on the preparation of the CBS was distributed to ESCAP member countries in mid-'77.

has an acceptable level of reliability although from the point of accuracy it may be considered as an underestimate since the definition of a farm was set at a minimum of 2 rai (or 0.32 ha.). There are several sources of data, each reporting a different production level of paddy. The revised national accounts of Thailand for 1960-1969 indicated that the paddy production levels have been revised as per NSO estimates and consequently value added of the agricultural sector as well as manufacturing, trade and changes in inventories had to be revised in order to maintain consistency. The new revisions resulted in a value added estimates for rice output of about 9 per cent higher than the previous agricultural sector estimates at current prices for 1966 and 1967 and about 5 per cent higher for 1968.

13. On the basis of new but higher consumption data also derived from NSO statistical programs in 1966/67, it was estimated through sampling procedures that total personal consumption accounted for 8.5 million m.t. About 0.5 million m.t. is for feed and industrial uses and another 0.5 million m.t. for seeds. Of the remaining 4.0 million m.t., 3.4 million m.t. is non-glutinous and 0.6 million m.t. glutinous. The stock reserve of the non-glutinous is 10 per cent or 0.3 million m.t. which leaves about 3.0 million m.t. for export. With recovery rates of 66 per cent and 60 per cent, the exportable rice surplus will be 2.0 million m.t. and 1.8 million m.t., respectively for the two types of rice. In 1965, the country exported 1.9 million m.t. of rice. To arrive at a figure for the exportable surplus, one needs accurate estimates of production, seed requirements, industrial and other uses, carry over stocks, wastes, conversion rate, and population figures. This is a Food Balance Sheet (Commodity Balance) approach. In the former series, production and consumption were both understated while the other components were assumed to have remained constant. Thus, the exportable suprlus obtained from the two series was about the same. The details of the production/utilization/trade flows for paddy for 1966/67 are given in Table 1.3. By and large, these series will provide either sound or faulty decisions depending upon the quality of the component parts. The consistency of sectoral data may be tested with the use of the production/ utilization/trade framework. These experiences point to the need of considering a systems approach for the data collection and data production on the food and agricultural sector in general.

14. Regional and international institutions have joined the developing world in assessing the problems of food wastes and in implementing policies toward the reduction of depreciation or waste as a component in the Food Balance Sheet. Waste occurs at all points of the food flow as indicated in Chart 1.2.[1] It is, therefore, not surprising that educated guesses of post harvest losses have ranged from 10 to 30 percent of the output level. Even if the level of losses or wastes could be reduced by only 5 percent, the implications of this policy could be sector-wide. Food losses in households appear to be the most important component which further reduce the food finally consumed by household members (see Chart 1.3).[2] The SSFA must provide the necessary framework in the statistical assessment of the level and direction of losses/ wastes at each point of the commodity food flow (Chart 1.2). These efforts will improve the contents or components of the Food Balance Sheet.

3. *Production Accounts for Agriculture (PAA)*

15. Production (Economic) Accounts for Agriculture (PAA) as recommended by FAO is part of the Economic Accounts compiled by the DMCs. In terms of local currency and at current prices, the PAA shows (a) values of gross agricultural products (agricultural goods, livestocks, fishery and forestry products, own-account capital formation and change in stocks), (b) values of intermediate products used for agricultural production (agricultural goods and services and non-agricultural commodities), and (c) the value of net indirect taxes. By deducting (b) and (c); from (a), the *Gross Domestic Product* (GDP) at factor cost for the agricultural sector is obtained. If we deduct from GDP the "provision for consumption of fixed capital", we derive *Net Domestic Product* (NDP) at factor cost. The format of the Production (Economic) Accounts for Agriculture is shown in Table 1.4a while the assumed consolidated production account for a given crop is given in Table 1.4b. The definitions of Gross Value Added Ratio (G VAR) and Net Value Added Ratio (NVAR) are also given at the bottom of Table 1.4b.

1. Oñate, B.T. and L.U. Oñate. Food and Nutrition in Southeast Asia: Issues and Policies. Phil. Jour. Nutrition. Vol. XXXI, No. 3. September 1978.

2. Oñate, L.U. Reduction of Foodgrain Losses in the Home. Phil. Jour. Nutrition. In press. 1979.

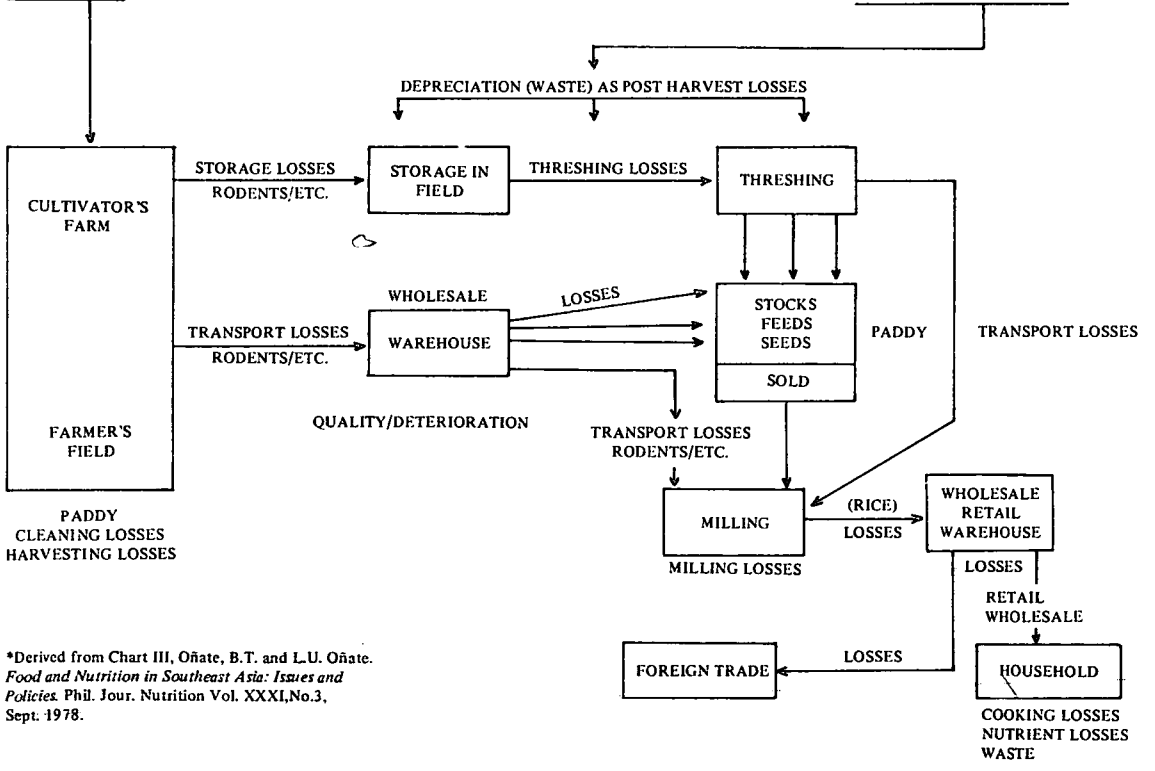
TABLE 1.3
PRODUCTION/UTILIZATION OF PADDY 1966/67. THAILAND
(Million Tons)

Region	*Production*	*Consumption*	*Seed Requirement*	*Production Minus Utilization*	*Remarks*
N	3.70	2.00	0.10	1.60	About 10% of 4.50 mt or 0.5 mt is for feed and industrial uses. Stock Reserve is 10% of 3.35[b] or 0.34 mt. Thus leaving 3.01 for export. The recovery rates ranged from 60 to 66%. The amount left for export is estimated to be from 3.01 x 0.66 = 1.99 to 3.01 x 0.60 = 1.81 million tons of rice. The actual export levels are as follows: 1965 – 1.89 million tons 1966 – 1.51 million tons 1967 – 0.96 million tons First six months
NE	4.70	3.20	0.20	1.30	
C	4.30	2.40	0.15	1.75	
S	0.80	0.90	0.05	–0.15	
Total Estimate Whole Kingdom	13.50	8.50	0.50	4.50	

a. Source of basic data: National Statistical Office. Thailand.
b. 0.65 million tons represent the glutinous variety while 3.35 million tons refer to the non-glutinous.

CHART 1.2 DEPRECIATION (WASTE) IN THE FOOD BALANCE SHEET*

PRODUCTION + IMPORTS – EXPORTS = STOCKS + FEEDS + SEEDS + PROCESSING (INDUSTRY)+ DEPRECIATION (WASTE) + FOOD (GROSS)



*Derived from Chart III, Oñate, B.T. and L.U. Oñate. *Food and Nutrition in Southeast Asia: Issues and Policies.* Phil. Jour. Nutrition Vol. XXXI,No.3, Sept. 1978.

CHART 1.3

FOODGRAIN BALANCE SHEET FOR THE HOME*

FOODGRAINS BROUGHT INTO HOMES	—	FOODGRAIN LOSSES	=	FOODGRAINS OF GOOD SENSORY, NUTRITIVE AND SANITARY QUALITY THAT ARE AVAILABLE FOR CONSUMPTION

A. Bought

B. Home-produced

C. Given by friends

A. Physical losses (spillage) due to
   (1) Discarding of edible foods
      a) Losses in food preparation
      b) Cooking losses
      c) Kitchen and plate waste
   (2) Action of insects and rodents as in storage
   (3) Other physical losses

B. Chemical losses (spoilage) due to
   (1) Enzymes
   (2) Microorganisms
   (3) Exposure to air and heat

C. Other losses
   (1) Antinutritional factors
   (2) Action of active metal of cooking vessels

*Derived from Fig. 2, L. U. Oñate. *Reduction of Foodgrain Losses in the Home.* In Press. Phil. Jour. Nutrition, 1979.

16. *Use of Fixed Ratio in PAA.*[1] A common usage in the GNP estimation is the assumption of a fixed value added ratio (v.a.r.)[2] in some or in many sectors of the production accounts. This ratio may have been derived from a census year or from a survey conducted several years previously. The use of a fixed ratio to measure year-to-year changes may produce dubious results especially if the ratio is a function of total output (patterns), technology, capital intensity, relative wages, interests, profit rates and prices. For instance, in the agricultural sector, it is observed that as productivity rises due to the use of advanced technology and other technical inputs, the level of the v.a.r. slowly declines from, say, a high of 0.95 under subsistence agriculture to a low of 0.60 to 0.70 with highly commercialized farming. Climatic and other factors may affect total output and/or technical input patterns. An assumption of a fixed ratio for a given crop may understate or overstate the value added contribution depending on which of these factors predominate in a given year. Because of this situation, the economic studies based on fixed ratios and the resultant policy decisions based on these analyses may be quite misleading. (See Charts 1.4a, 1.4b and Table 1.5 as examples). Future plan of work for standardizing and developing production accounts for agriculture (PAA) in the DMCs of the Asian region should also give special attention on the quality of basic statistics used. This quality requirement should also be applied to the basic statistics derived from the cost of production, farm management, farm household economy and similar surveys in agricultural or rural area development projects financed from national, bilateral and/or multilateral resources. Benefit monitoring of rural area development projects could be a good source of value added ratios in agriculture.

4. *Index of Agricultural and Food Production*

17. The index of agricultural and food production is one of the most important macro-statistics generated by the statistical system in food and agriculture. With population data, the index of per capita production will show whether agricultural and food availabilities on a

1. Oñate, B. T. Improvement of the Quality of Current Statistics in the Asian Region, ADB Occasional Papers No. 5, May 1971, p. 8 Revised 1977.

2. Gross Value Added at Market Prices Equals Total Output Minus Intermediate Products.

TABLE 1.4a
FORMAT OF PRODUCTION (ECONOMIC) ACCOUNTS FOR AGRICULTURE

1. Gross Product (1.1 + 1.2 + 1.3)
   - 1.1 The Harvest production of agricultural goods
     - 1.1.1 Crops
     - 1.1.2 Livestock products
   - 1.2 Gross output of livestock
   - 1.3 Gross output of non-agricultural goods
     - 1.3.1 Fishery products on holdings
     - 1.3.2 Forestry products on holdings
     - 1.3.3 Own-account fixed capital formation

2. Intermediate Consumption (2.1 + 2.2 + 2.3)
   - 2.1 Use of agricultural goods
     - 2.1.1 Seed, etc.
     - 2.1.2 Feed
     - 2.1.3 Other
     - 2.1.4 Waste on holdings in transport and storage
   - 2.2 Use of agricultural services
   - 2.3 Use of non-agricultural commodities
     - 2.3.1 Fertilizers
     - 2.3.2 Pesticides
     - 2.3.3 Fuel, lubricants, electricity and other energy
     - 2.3.4 Maintenance and minor repairs of fixed capital assets
     - 2.3.5 Irrigation costs
     - 2.3.6 Rental of machinery and equipment
     - 2.3.7 Overhead and other miscellaneous costs

3. *Gross domestic product at producers' values* (1-2)

4. Indirect taxes (–)

5. Subsidies (+)

6. *Gross domestic product at approximate factor values* (3-4+5)

7. Provision for consumption of fixed capital (–)

8. *Net domestic product at approximate factor values* (6 – 7)

9. Expenditure on gross domestic product at producers' values (9 = 3)

TABLE 1.4b

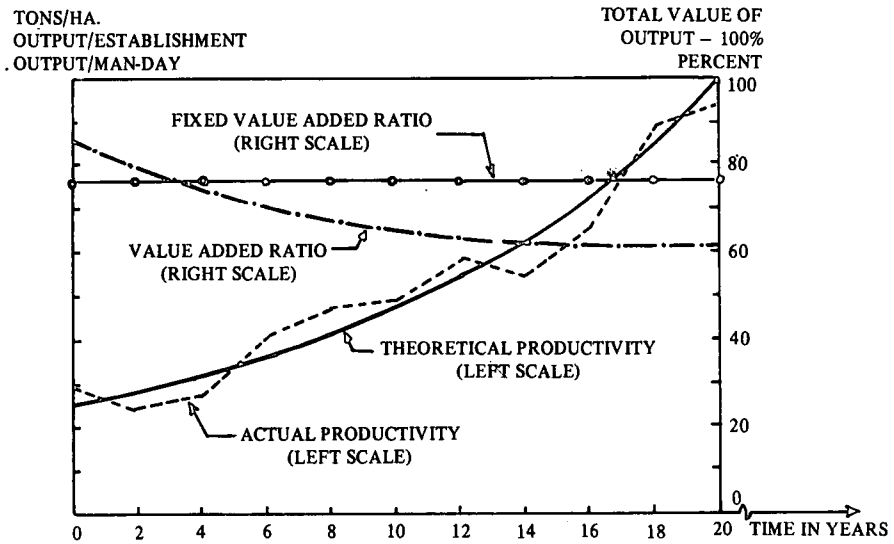
ASSUMED CONSOLIDATED PRODUCTION ACCOUNT OF A GIVEN CROP

Input	*Output*
I. Intermediate product (products brought from other sectors and used in the process of production during the period).	V. Sales
1. Seeds	VI. Own consumption
2. Fertilizers, Insecticides, etc.	VII. Changes in stock
3. Irrigation fees, electricity	
4. Others	
II. Depreciation (Allowance for consumption of fixed capital)	
III. Indirect taxes (net of subsidy from government)	
IV. Factor income payments (compensation to factors of production)	
1. Wages & salaries (compensation of labor, actual and imputed)	
2. Rent (compensation of land)	
3. Interest (compensation of capital)	
4. Profit (compensation of entrepreneurship)	
Total Input	*Total Output*

Some Principal Relationships:

1. Total Input = Total Output = I + II + III + IV
2. Total Output – I = Gross value added at market prices (GVA mp)
3. Total Output – (I + II) = Net value added at market prices (NVA mp)
4. Total Output – (I + II + III) = Net value added at factor cost (NVA fc)
5. GVA mp/Total Output = Gross value added ratio
6. NVA fc/Total Output = Net value added ratio

CHART 1.4a. USE OF FIXED RATIO IN PAA*
(THEORETICAL)



*Source: Oñate, B.T. Improvement of the Quality of Current Statistics in the Asian Region. ADB Occasional Papers No. 5. May 1971.

TABLE 1.5

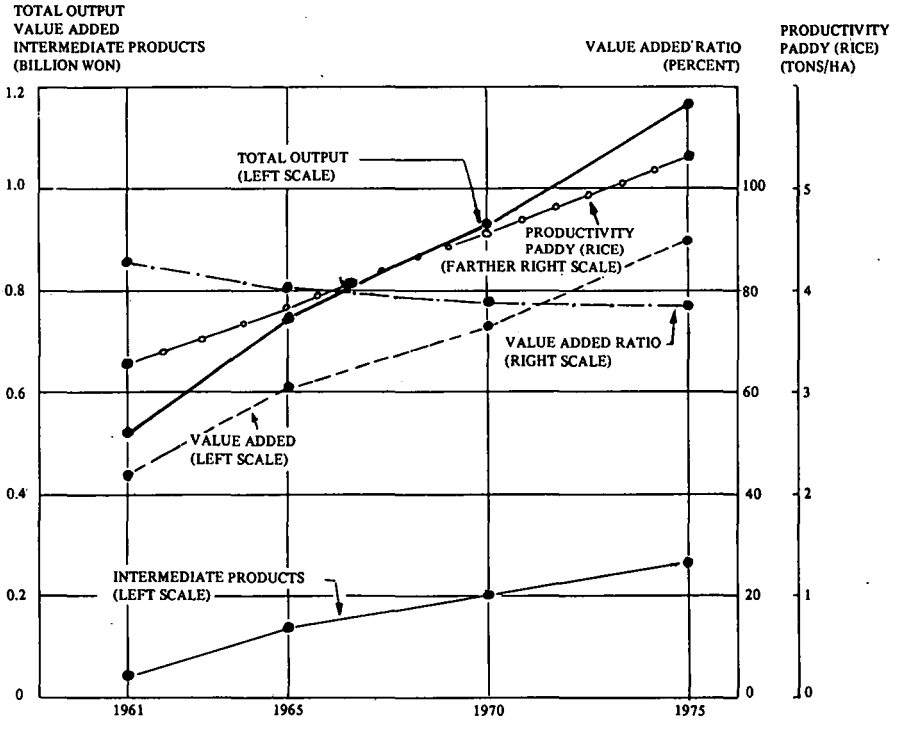
VALUE ADDED RATIOS OF SELECTED AGRICULTURAL CROPS
PHILIPPINE NATIONAL ACCOUNTS: 1955/1961-1970*

Crop	*1955*	*1961 to 1970*
Palay (Padi)	0.95	0.9296
Corn	.98	.9646
Pineapple	.98	.7350
Coconut (and Copra)	.81	.9994
Sugar Cane	–	.8287

*Source: National Economic Council (now NEDA) Philippines, 1971. Recent workshops on National Accounts have placed emphasis toward improvements of these ratios.

CHART 1.4b

TOTAL OUTPUT, VALUE ADDED, INTERMEDIATE PRODUCT AND VALUE ADDED RATIO IN THE PRODUCTION ACCOUNT FOR AGRICULTURE: REPUBLIC OF KOREA, 1961-1975*
(ACTUAL)



*Source: Ofiate, B.T. and H.K. OH. Statistical System in Food and Agriculture: Republic of Korea. July 1977.

per capita basis are improving or not.[1] Similarly, the index of prices received and the index of prices paid by farmers will indicate the so-called terms of trade of the farmers vis-a-vis the non-farm sector. The weights of the corresponding components in terms of output or quantity of these indices are obtained, by and large, from the Census of Agriculture (CA). The prices are either obtained from the CA or from independent price collection system in agriculture or outside of agriculture.

1. FAO Index numbers of Agricultural Production are not comparable with the national index numbers. There are differences in concepts of production, coverage, weight, time reference, and calculation methods. See FAO's 1976 Production Yearbook, Vol. 30, p. 5, 1977.

B. *Micro-Statistics*

1. *Dicennial Census of Agriculture (CA)*

18. By and large, the 1970 and/or 1980 World Census Programs of Agriculture considered or will consider the following topics:

0 – Holding, holder, tenure and type of holding
1 – Land utilization
2 – Crops
3 – Livestock and poultry
4 – Employment in agriculture
5 – Farm population
6 – Agricultural power and machinery and general transport facilities
7 – Irrigation and drainage
8 – Fertilizers and soil dressings
9 – Wood and fishery products (depends on DMC's)
10 – Association of agricultural holdings with other industries

The 1980 Census plans of DMC's in the Asian Region are presently underway and it is anticipated that there will be active regional participation to this World Census Program. The planning and execution of censuses need the help of expertise from all sectors, research and related agencies and the statistical system. The contents and scope of CA should consider the needs not only of the components of SSFA but also the needs of other users such as planners, researchers and policy makers.

2. *Household Consumption Survey (HCS)*

19. This statistical endeavor will estimate the incidence of hunger and malnutrition through the information gathered on the distribution of households in terms of intake of calories and nutrients. There is uneven distribution of the overall food supply from FBS due to factors such as incomes, rural/urban differential, customs, climate, etc. These details are shown in the results of the HCS. Again, Food Composition Table (FCT) is needed in the conversion of food into calories and nutrients. The role of research centers in filling the gaps for a sound statistical system in food and agriculture is illustrated not only in the development of methods

for the collection of HCS data but also in terms of the development of statistical efficiency of the sampling framework such as size of sample households, number and location of sample areas and related statistical variables. The Food and Nutrition Research Institute is now using a one-day visit instead of the usual three or more days to weigh the food consumed and wasted by household members. Periodic empirical research will be needed to improve the efficiency and economy of these components of the SSFA.

3. *National Farm Survey (NFS) or General Economic Survey of Agriculture (GESA)*

20. The economic aspects of agricultural holdings such as income and its components, expenditures and general farm management indicators are not in general available from censuses or current surveys. Thus, there is a need for national farm surveys (NFS) or general economic survey of agriculture (GESA).[1] Some form of integration and/or coordination may have to be devised in order that these requirements could be considered in a general systems approach to the data collection and production in food and agriculture. The type of information to be collected by the GESA should be related to the structural, operational and economic aspects of agricultural holdings and should include: (a) geographical features of the holdings and availability of irrigation facilities, (b) distance of markets, (c) types of farm and cropping patterns, (d) size of holdings, scale of operation, degree of mechanization, fixed assets, flowing assets, etc., (e) cost of operation and its breakdown, (f) inputs-produced within the farm, within the agricultural sector and bought from the non-agricultural sector, (g) employment, number actively engaged on farm and number subsisting on farm, (h) cost of production of principal crops. A form of integration and/or coordination in the collection of statistics is therefore indicated. At this stage, it would be worthwhile for the DMCs to study the possibilities of utilizing already existing national sample survey of households as possible vehicle of current agricultural statistics, household food consumption, GESA and the various requirements of the Food Balance Sheets (FBS) and various components of the Production Accounts in Agriculture (PAA).

1. National Farm Survey or General Economic Survey of Agriculture. Asia and the Far East Commission on Agricultural Statistics. Third Session. Bangkok, Thailand. 1970.

4. *Indicators for Monitoring Rural Area Development Projects*[1]

21. 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, cost of production and 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, and security and family planning would indicate the project's social impacts on the rural man.

22. Major movements are geared toward measuring development at the national level. Since progress must initially emanate from depressed areas which have been selected as priority projects for development, the indicators must refer to agricultural and rural area development schemes and must be site-specific. 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 remove the constraints so that progress as envisioned in the Appraisal Report could move back to its desired path. Rural area development schemes have become an important component of food and agricultural development. If so, the indicators for monitoring these schemes must also be considered as a component of the SSFA.

23. R and D studies on design of surveys for rural area development schemes have indicated that paper stratification in terms of size of farm (small, medium and large) as based on the land reform cut-off area of 7 hectares will provide optimum allocation (o.a.) with equal take in each stratum. The efficiency of the design in terms of lower variance is attained with an equal take criterion

1. Oñate, B.T. Indicators for Monitoring Rural Area Development Projects. Programs for Rural Development. University of the Philippines at Los Baños. 23-24 June 1977. See also The Philippine Statistician, Vol. XXVI. Nos. 3-4. pp. 42-84. July-December 1977.

which implies a simplified field procedure. The relationship is approximately equal to the following:

$$n_i = n\, N_i S_i / \Sigma N_i S_i = \text{constant}$$

for the three characteristics, namely: total area in farm, area under paddy rice and number of chicken. By ignoring the villages or barangays in each river irrigation project (RIP), the efficiency of o.a. with equal take was the highest[1]. With lower variance the size of sample could be reduced from 70 to 100 households per RIP for the three (or more characteristics) with coefficient of variation of estimate [(CV ($\bar{x}$)] ranging from 5 to 10 per cent. Of course, the objectives are efficient point estimators and equally efficient estimators of frequency distributions since the main concerns of rural area development schemes are to alleviate poverty, generate employment and reduce social inequalities. These concerns could generate an R & D multi-variate approach appropriate to the problem of rural area development projects at the village or township level.

24. The results obtained by Oñate (1979)[2] are quite interesting. For these river irrigation projects (RIP), the barangay is not an efficient factor for stratification. It adds very little to the relative efficiency (R.E.) as compared to simple random sampling. Size of farms (ignoring barangays) appears to be quite efficient and this form of stratification generated a R.E. of *4564* per cent with random sampling as standard (100%) and a R.E. of *300* per cent if barangays are used for stratification with optimum allocation as standard for total area in holdings. The results of these R & D studies for total area, rice area and number of chicken are shown in Tables 1.5a, 1.5b and 1.5c, and the findings could serve as valuable inputs to efficient and economical survey designs for project benefit monitoring of rural area development schemes.

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1. Oñate, J. M. U. Statistical Research and Development (R & D) in Integrated Rural Area Development Schemes. Dept. of Statistics. College of Arts & Sciences. U.P. at Los Baños. March 1979.

2. Op. cit. p. 25, Para. 23.

TABLE 1.5a

VARIANCE AND RELATIVE EFFICIENCY (R.E.)
OF ESTIMATOR FOR TOTAL AREA IN HOLDINGS*

Estimator	*Variance*	*Relative Efficiency (R.E.) %*		
Random Sampling	56227	100	99	7
Stratified (Proportional)				
Barangays as Strata	55787	101	100	7
Sizes as Strata	9334	602	598	40
Barangay x Size	9650	583	578	38
Stratified (Optimum)				
Barangays as Strata	3690	1524	1512	100
Sizes as Strata	1232	4564	4528	300
Barangay x Size	1209	4650	4613	305

*Oñate, J. M. U. Statistical Research and Development (R & D) in Integrated Rural Area Development Schemes. Dept. of Statistics. College of Arts& Sciences. U.P. at Los Baños. March 1979.

TABLE 1.5b
VARIANCE AND RELATIVE EFFICIENCY (R.E.)
OF ESTIMATOR FOR TOTAL RICE AREA*

Estimator	*Variance*	*Relative Efficiency (R.E.) – %*		
Random Sampling	9714	100	99	86
Stratified (Proportional)				
Barangays as Strata	9608	101	100	87
Sizes as Strata	3097	314	310	268
Barangay x Size	3704	262	259	225
Stratified (Optimum)				
Barangays as Strata	8322	117	116	100
Sizes as Strata	2286	425	420	364
Barangay x Size	2081	467	462	400

TABLE 1.5c
VARIANCE AND RELATIVE EFFICIENCY (R.E.)
OF ESTIMATOR FOR NUMBER OF CHICKEN*

Estimator	*Variance*	*Relative Efficiency (R.E.) – %*		
Random Sampling	81553	100	96	93
Stratified (Proportional)				
Barangays as Strata	78472	104	100	96
Sizes as Strata	14932	546	526	506
Barangay x Size	14372	567	546	526
Stratified (Optimum)				
Barangays as Strata	75526	108	104	100
Sizes as Strata	12297	663	638	614
Barangay x Size	11756	694	667	642

*Oñate, J. M. U. Statistical Research and Development (R & D) in Integrated Rural Area Development Schemes. Dept. of Statistics. College of Arts & Sciences. U.P. at Los Baños. March 1979.

5. *Research and Development (R & D) Studies*

25. Pertinent statistics on food and agriculture in the DMCs of the Region are usually collected either as by-product of administrative functions, directly by statistical units of some ministries or a combination of these two methods. There are distinct advantages from the standpoint of *objectivity, integrity* and *independence* that through the process of transitional stages, the primary responsibility of the collection, tabulation and publication of statistical information be located in statistical agencies or statistical units of subject matter or line agencies. Even with this suggested future framework, there are many areas of statistical development where research institutions such as experiment stations, research institutes, food and nutrition research centers and similar agencies may contribute to the establishment of a sound statistical system in food and agriculture. Also, this cooperation will be important since the regular statistical agencies are not necessarily geared to establish and maintain a research and development (R & D) section within the statistical unit. Some of these areas of common concern are described to illustrate the role of R & D studies as an important component of the SSFA.

a. *Input/Output Relations*

26. Agricultural experiment stations must necessarily be the centers of agricultural development in the DMCs of the Region.[1] Modern varieties (MVs), new techniques and innovations and information on their economic feasibilities and efficiencies must emanate from research stations. As these new technologies are initially applied to the surrounding areas, basic data on input-output relationships are generated. The research or experiment station and the farmer's fields are two sources of input-output data which may be consolidated for the planning and development of agricultural regions or larger areas.[2] These input-output models can also be used as basic framework in assessing the direction of development.

The response of crops to fertilizer applications is a good example of this type of I/O models. Simulation computer models could be applied which integrate many crops, farm sizes, irrigation conditions, irrigation units, market and accounting prices, farming methods and different soil bodies to minimize capital investment and credit and to maximize employment and net returns. The results could give development authorities a core of implementation options.[3] Statistical competence must also be developed in these areas for agricultural planning and rural development. The Agricultural Research System must follow-up these developments from the experiment station, to the cooperative trials, the farmer's fields and finally at the rural area development projects.

b. *Research on Methodology and Other Components*

27. In addition, the statistical unit in these stations can develop new techniques in objective methods of sampling for crops, livestock, fishery, forestry and household consumption data. Many important statistical components in the preparation of the Food Balance Sheet (FBS) can be developed and maintained in these stations as for example those on seeding and conversion rates, waste and losses in quantity and in nutrient levels during harvesting, storing and warehousing, marketing and cooking. Other series on production, imports

1. Oñate, B. T. Statistical Framework for Agricultural Planning and Development. Asian Agricultural Survey. Asian Development Bank, pp. 683-693. September 1969.

2. Pilot areas are usually incorporated into the agricultural area development schemes funded by national, bilateral and/or multilateral funds.

3. Nelson, H. S. A Systems Analysis of Development Alternatives. Lam Pao Project. Royal Thai Government, UNDP and FAO. Kalasin, Thailand. June 1975.

and exports, stock positions and population can be handled by the major statistical collecting agencies in agriculture. The Food Composition Tables (FCT) are prepared by the Food and/or Nutrition Research Centers in most DMCs. The research agencies can cooperate with the central statistical collecting agencies and the former can act as centers of these studies. Also, interviewing in depth can be more effective in obtaining total production than crop-cutting with an area survey. The approach to use will depend upon the particular policy to be implemented. Each component such as landlord share, tenant share, seed, harvester share, payment of debts, gleanings, gifts, biases in sharing, etc. can be accounted for. This technique can account for most, if not all of the harvest or output. Such statistical research will be in addition to the advice, consultation and instructional responsibilities of the statistical component in these research stations. An Institute of Agricultural Statistics Research (IASR) could be organized within the Philippine Council for Agriculture and Resource Research (PCARR) for initiating an integrated and coordinated approach to statistical research in food and agriculture.[1]

28. The survey of PCARR's commodity groups indicates that there is no statistical program to generate sound data which could be used as guides for standardization of sampling procedures by type of characteristics within each commodity. This component is one of the basic requirements for a sound and effective research system. Also, the levels of productivity and the precision of the estimates must be followed through by the research system from the experiment station until the commodity is utilized in rural development projects or industry.[2]

c. *Productivity Path from Experiment Station to Integrated Rural Area Development Schemes*

29. The productivity path is a measure of the level of the technological mix made available at the specific research site. This path moves from a relatively high plane in the experiment stations to successively lower levels as the "research" is applied to cooperative regional trials, farmers' field and eventually in larger areas devoted to integrated rural area development projects. Each of these phases

1. An IASR is a component of the Indian Council for Agricultural Research.

2. Oñate, B. T. Op. cit. (*) p. 1 – see pages 84 to 87 on "Phases of Agricultural Research and Rural Development".

may take 3 to 5 years or longer. At the last stage, the project life may range from 15 to 40 years depending on the gestation period of the project (Chart 1.5). By and large, the project life could be divided in terms of the following periods:

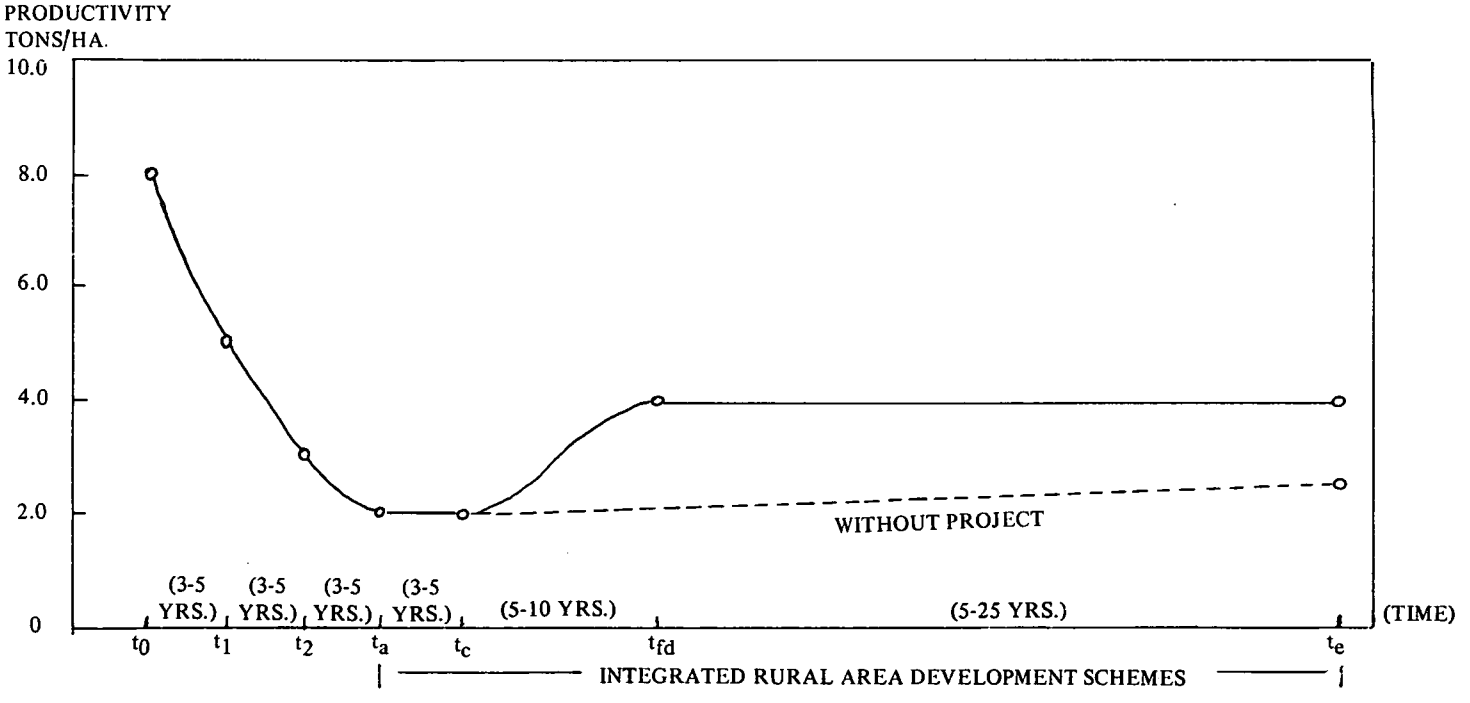
Periods	*Number of Years*
Appraisal (t_a)	Start
Completion or Post Evaluation (t_c)	3 to 5 years after t_a
Full Development (t_{fd})	5 to 10 years after t_c
End of Project (t_e)	5 to 25 years after t_{fd}
Total years	*About 15 to 40 years*

30. The National Research System (say, PCARR) should be able to trace this productivity path and its frequency distribution for each critical period for each commodity in order to ensure a more objective presentation of the growth pattern which is the foundation indicator used for measuring the benefits generated by the project. With the frequency distribution at each period, appropriate probabilities could be assigned at different but appropriate ranges of productivity for more objective and effective sensitivity tests in Project Appraisal. Weights in terms of proportions of total production sold including consumption could be assigned the corresponding producer's price or shadow prices which predominate during the year. These weights and farm gate prices could be obtained from well-designed sample surveys which serve as components of the Benefit Monitoring Schemes of rural area development project. As guide, some observed errors in the IBRD projections of price of Thai rice are shown in Table 1.6. This will serve as an example of monitoring projections of international prices which serve as basis for shadow pricing.

31. Appraisal of Research Projects should include a portion of the project life of Integrated Rural Area Development Schemes – perhaps, the period from Appraisal Time (t_a) to Full Development (t_{fd}). This inclusion assumes that the results of research findings on the biological, hydro-chemical and mechanical technology have been applied to area development schemes.

CHART 1.5

PRODUCTIVITY PATH FROM EXPERIMENT STATION TO INTEGRATED RURAL AREA DEVELOPMENT SCHEMES



t_0 – EXPERIMENT STATION t_1 – COOPERATIVE TRIALS t_2 – FARMER'S FIELDS

t_a – APPRAISAL TIME t_c – COMPLETION (t_{fd}) – FULL DEVELOPMENT t_e – END OF PROJECT

TABLE 1.6

IBRD PRICE FORECASTS AS COMPARED TO ACTUAL PRICES FOR THAI RICE
5 PERCENT BROKENS, FOB BANGKOK, 1972-78
(US Dollars/Metric Ton)

Year of Forecast	*Unadjusted Forecasted Rice Price*[1]	*Actual Current Price*[2]	*Adjusted Forecasted Rice Price*[3]	*Current Actual Price at Constant 1978 $*[3]	*Implied Shadow Price of Unmilled Rice*[4]	*Actual Shadow Price*[4]	*Difference Between Forecast and Actual US 1978 $*
	(1)	(2)	(3)	(4)	(5)	(6)	(6) – (5) (7)
1972	130	147.1	268	302.7	134	151	+ 17
1973	140	350.0	240	598.9	120	300	+180
1974	265	542.0	363	741.5	182	371	+189
1975	240	363.1	284	429.9	142	215	+ 73
1976	295	254.5	346	298.5	173	149	– 24
1977	390	272.2	417	291.3	209	146	– 63
1978	308	374.1	308	374.1	154	187	+ 33
1979	357						
1980	405						
1981	439						
1982	486						
1985	620						

1. Rice price expressed in terms of US$ as of the year in which the forecast was issued. Sources: IBRD, Price Prospects for Primary Commodities, 1972-1978.

2. IBRD. Commodity Price Data, Dec. 18, 1978 for Current Prices.

3. Expressed in terms of 1978 constant US$ by multiplying the "Unadjusted Forecasted Rice Price" or "Actual Current Price" by an inflation adjustment coefficient as follows: (1972, 2.06; 1973, 1.71; 1974, 1.37; 1975, 1.18; 1976, 1.17; 1977, 1.07). From the World Bank Index of Inflation.

4. The shadow price of unmilled price of recently completed ADB appraisal reports for irrigation projects in Indonesia and the Philippines is about 50 per cent of the forecasted world market price of rice f.o.b. Bangkok, 5 per cent brokens. This takes into account factors such as a 20 percent quality discount, milling recovery rates, international and local transportation, etc.. The implied shadow price of unmilled rice in the project area is considered to equal 50 percent of the forecasted world market price of rice.

d. *Estimates from Cooperative Regional Research*

32. Cooperative trials in farmers' fields can be designed properly so that the results can be integrated with the experiments conducted over several places or locations and over time. Also, one can integrate into these regional trials studies for objective assessments of the damage due to insects, pests and weather.[1] While crop-cutting is usually referred to as the "objective" method, there are many technical problems which must be solved before this method can be used in larger areas such as the sub-region or province within a given country. The biases connected with the size and shape of cut by crop, the number of parcels or paddies to sample within a farm, moisture contents, and the correlations between factors must be thoroughly studied. Also, the field staff must be trained on many technical aspects of the crop-cutting survey. These requirements for crop-cutting are more rigid than those for the interview survey method.

33. The statistical component of projects or programs in agricultural area development schemes must be kept in mind. A good example is the development of a suitable statistical framework for statistical monitoring system established in 1978 for ADB Agusan II Project in Mindanao under the National Irrigation Administration (NIA)[2] .

e. *Analytical Studies: Systems Approach*

34. Efficient statistical operations are fundamental to a country's efforts in producing statistics with the qualities of validity and reliability, consistency and timeliness and in the desired form useful to consumers.[3] To be valid and precise, the data collected must have as little bias as possible and that the estimates must possess the desired level of precision. Thus, in a simplified form, the requirements are:

(a) X (collected) – X (actual) = zero or as small as possible, i.e., the bias is small or estimate is accurate.

1. Oñate, B.T. Statistics in Southeast Asian Agriculture SEARCA. November 1976.
2. An R & D study was conducted by Julia M. U. Oñate in 1979 on the design of survey of this Project (see p. 25).
3. Oñate, B. T. The Role of Statistics in Philippine Development. The Philippine Agriculturist 49 (6-7), pp. 450-498, 1965.

(b) CV (X = estimator) must be small, say, 5 per cent or less
= precision or reliability is high.

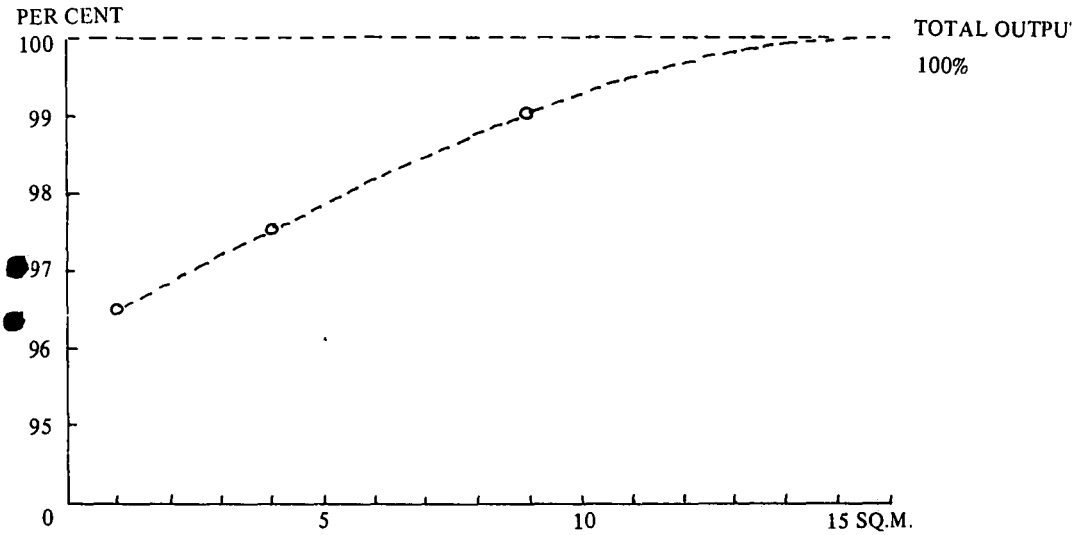
To accomplish these feats will require the cooperation of the administrator, statistician, supervisor and the field staff including the interviewers. The research and development (R & D) efforts must necessarily follow a systems approach in order to achieve the objective of improvement in the collection of agricultural statistics. This approach was illustrated during the ASEAN Workshop on the Improvement of Agricultural Statistics (see Table 1.7) and described also in the National Seminar on Uses of Census Information in Thailand last March 1977 and which will need also research findings about crop cuts, memory biases and the probing techniques to obtain all the components of the harvest or output. The proposed CA in Thailand for 1978 will not collect output data of important export crops such as rice, maize, tapioca, jute and sugar cane. It is expected that relatively good data on hectarage will be obtained and on the basis of some stratification criteria, appropriate crop cuts will be obtained which could then be used with the area data to generate output figures. Thus,

Output = Area x Productivity (from crop cuts)

34. *Crop-cutting.* Crop-cutting is a very sophisticated technique which requires not only highly trained technical personnel but also certain special equipment. A knowledge of the interactions of size and shape of cuts, area and output must be available before a particular size and shape of cut used to derive Output from (Area x Productivity) could be fully assessed. The findings by Oñate (1970) indicated that as the size of a square cut approaches 16 sq.m. then the bias of the cut vanishes.[1] A square cut is more convenient to use in the field specially if the paddy field is not planted in a uniform manner. Graphically, the bias will assume the following form:

1. Oñate, B. T. New Findings in the Collection of Agricultural Statistics, FAO, AFCAS Periodic Report No. 11. April 1970. Bangkok, Thailand.

CHART 1.6. BIAS BY SIZE OF CUT



The kind of crop and type of culture will definitely have bearings on this interaction of size and shape of cut and its relation to total output.

36. *Memory Bias.* Due to many technical and field difficulties of applying crop-cutting, many DMCs will naturally apply the interview or the enumeration method in obtaining output data. Again, the policy of increase in total output or increase in productivity will dictate the method to be applied in the field. There are memory biases associated with this interview approach. The senior author[1] reported that the interview yield conducted six to nine months after harvest from 28 sample farms in two villages in Laguna, Philippines was about three per cent understated as compared to the actual yield. This result implies that memory biases will creep into this statistical collection after a lapse of time, say, six or more months after harvest. In the case of the censuses, the lapse will be a maximum of about 12 months or one year. For Thailand, the reference period will be 1 April 1977 to 31 March 1978 and the collection period (census date) will be about four weeks starting from 1 April 1978. Thus, the holder or farmer will apparently

1. Oñate, B. T. Non-sampling errors in Philippine field surveys. Philippine Statistician 6 (2). 1957.

TABLE 1.7

A POSSIBLE SYSTEM OF RICE AND AGRICULTURAL STATISTICS

Farm Level	*Farm/Outside Farm*	*Farm/Outside Farm*	*National or Regional*	
Paddy	Paddy → Rice	Paddy and Rice		
Production Farmers' Other components	Conversion Ratio Rice & By-Products	Households Domestic Trade External Trade Mills Warehouses Industry Feeds Transport	Household Food Consumption Surveys Consumer Price Index: Weight of Rice as a Commodity from Income/Expenditure Surveys Population Data	Food (Rice) Balance Sheets Available Supplies = changes in stocks + production + imports − exports Domestic utilization = feed + seed + waste + processing + final consumption (food & non-food) National Accounts
Area Sown Harvested Main T HYV Others B Secondary T HYV B Others Lowland, irrigated Lowland, not-irrigated Upland				
Yield (Productivity) Same as Area classification				
Inputs Seeding Rates Fertilizer, insecticide, etc. Water, Capital Equipment, Credit	Prices (wholesale) (imputed) Rice By-Products	Prices Wholesale Retail	Relevant data from Research and Experiment Stations and National Regional Cooperative Yield Trials. Findings from Agricultural Colleges and Universities.	
Land Labor Tenancy Prices Received Prices Paid			International Prices	

remember the large transactions such as the shares of the landlord, tenant and harvester and the amount set aside for seeds but will slowly forget smaller items such as expenses for irrigation fees and other accounts payable, amounts given to relatives and friends, gleaning and others. Martinez (1978) reported that in the Philippine rice surveys, the extent of variation in responses from one round to another depends on the item or characteristic (area/production), the farm household, and the length (months) of the interview rounds.[1]

37. *Probing Techniques.* A probing technique becomes necessary – to account for all the component. A complete accounting of all components of rice production was attempted during the 1966 crop year in the province of Laguna. The results are shown in Table 1.8. If expenses, amount given to friends and relatives, gleaning and the heaping share or "paulo" are not accounted for by deeper probing during the interview period, then it is estimated that there will be an under reporting of production by 4.1 per cent. The "paulo" will account for one per cent of overall production. Thus, if 99 million cavans were reported minus the "paulo", then another million cavans must be added to the 99 million in order to account for this component. A more efficient statistical operation will be necessary in order that these components are accounted for by the survey. Analytical studies from research institutions are therefore indispensable components of the statistical system in food and agriculture.

38. *Improved Data Collection System.* The Philippines estimated "palay" or rough rice production in crop year 1970 at 5.24 million metric tons (about 119 million sacks of 44 kilograms). This production represents an increase of about 18 per cent over that of the production of 4.4 million metric tons (101 million sacks) in crop year 1969. The estimated area under this crop in 1970 was 3.1 million hectares as compared to 3.3 million hectares in crop year 1969, a decrease of about 7 per cent. Thus, the yield per hectare would be 1.68 tons/ha. in 1970 as against 1.33 tons/ha. in 1969, an increase of about 25 per cent in productivity – a very splendid achievement. Information from the Philippines Bureau of Agricultural Economics seem to indicate that during crop year 1970, the Bureau implemented new statistical programs for the improvement of data collec-

1. Martinez, B. F. A Study of Response Errors in Rice Surveys. First National Convention on Statistics, PICC. Manila. Dec. 1978.

TABLE 1.8

COMPONENTS OF RICE PRODUCTION AND CUMULATIVE PERCENT DISTRIBUTION BY CULTURE, LAGUNA. CROP YEAR 1966

Culture[a]	*Components of Rice Production in Cavans and Cumulative Percent Distribution*								*Total Production*[d] *(ca.)*
	Tenant Share	*Landlord Share*	*Harvester Share*	*Seeds*	*Expenses*[b]	*Relatives & Friends*[c]	*Gleaning*	*"Paulo"*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
I. 1st crop, L, I									
Production (ca.)	13928	13155	5217	525	511	170	184	288	33978
Cumulative % dist'n	41.9	79.7	95.1	96.6	98.1	98.6	99.2	100.0	
II. 2nd crop, L. I									
Production (ca.)	6878	4969	2300	246	177	84	131	222	15007
Cumulative % dist'n	45.8	78.9	94.2	95.8	97.1	97.7	98.5	100.0	
III. 1st crop, L, NI									
Production (ca.)	2435	2389	985	127	369	72	37	60	6474
Cumulative % dist'n	37.6	74.5	89.7	91.7	97.4	98.5	99.1	100.0	
IV. 2nd crop, L, NI									
Production (ca.)	29	11	5	0.75	0.25	–	–	–	46
Cumulative % dist'n	63.0	86.9	97.8	99.4	100.0				
V. Upland									
Production (ca.)	1632	334	569	41	–	8	26	22	2632
Cumulative % dist'n	62.0	74.7	96.3	97.9	97.9	98.2	99.2	100.0	
Prov. Total Prod'n (ca.)	24902	20858	9076	940	1057	334	378	592	58137
Cumulative % dist'n	42.8	78.7	94.3	95.9	97.8	98.3	99.0	100.0	

[a]L means lowland; I, irrigated; and NI, non-irrigated.
[b]Includes irrigation fees and other accounts payable.
[c]Includes weeder and thresher shares.
[d]Does not include standing crop.

tion. These efforts consisted in the use of better planned questionnaire, well-trained personnel, and a better supervised field force. The probing technique resulting from these efforts accounted for a portion of the apparent increase in total and per hectare output.[1] On the other hand, some studies indicate that there may be possible overstatement of areas (or yields) reported, specially those obtained from small fields, say, 2 to 3 ha. in area.[2] The net effect of better and improved data collection would be an increase in production and probably a decrease in the area reported. While the same farms may have been enumerated, the concepts of "space" differed quite substantially in terms of reporting both production and area. If two periods of time are involved, the total yields would reflect the interaction of such factors as the methods of statistical collection, the prevailing climatic conditions, and program efforts. The analysis of the effects of the developmental efforts would be totally misleading if the possible effects of improved data collection methods are not fully considered in the evaluation.

39. David (1978)[3] showed that a comparison of interview data from 894 barangay (village) captains and complete enumeration of households in the same barangay revealed gross differences between the two sources of data. These results indicate that at the present stage the barangay captains cannot be used as primary source of data for agricultural surveys in the Philippines. It is important that the barangay captains should be given extensive training programs before they could be used as sources of information. This situation points strongly to the need for a systems approach to be implemented in stages. At the first stage, the statistical system with well trained full time interviewers and closely supervised field operation will take over

1. Objective studies seem to indicate that previous "palay" production was understated by amounts ranging from 5 to 20 per cent of the reported figure. See *New Findings in the Collection of Agricultural Statistics. FAO Commission on Agricultural Statistics for Asia and the Far East.* Periodic Report No. 11, pp. 1-7, April 1970.

2. One of these studies is entitled Response Bias in the Collection of Rice Statistics. The Philippine Agriculturist Vol. LII, February-March 1968, pp. 602-613. Of 68 sample farms in 17 villages, the interview method was on the average of 5.6 per cent higher than actual sown area. Large positive biases were observed for farms smaller than 2 hectares while smaller biases were found for farms larger than 2 hectares. The Post Evaluation Survey (PES) of the Philippine Agricultural Census of 1971 will provide more evidences about the nature and direction of these biases.

3. David, I. P. Non-sampling Errors in Agricultural Surveys-Review, Current Findings and Suggestions for Future Research. The Phil. Stat. Vol. XXVII, Nos. 1 & 2, 1978.

the responsibilities of collecting information from the source. This requirement is needed to minimize and reduce non-sampling errors. As the barangay captains become better trained, they could slowly be integrated into the statistical system as the primary source of data. At the last stage, the barrio captain could become the primary source but still under the direct supervision of the statistical system. The FAO approach to generate community level statistics must consider this systems approach to be implemented on a stage to stage level as indicated. If not, the results as shown in the Philippines experience will provide gross inaccuracies and large biases of data from interview surveys using barangay captains or village chiefs as the primary source of data. Another dimension of this systems approach will be to find the optimum combinations between the "objective" method and the "interview" method depending upon the location, crops and area, and the interaction with regard to the barangay captain and statistical system as source of primary data. These dimensions for the improvement of the statistical system and the data generated by the SSFA should constitute the basic core of the Research and Development (R & D) studies which must be implemented if the SSFA will be able to meet the new challenges and opportunity called for by the emerging strategies for agricultural planning and rural development.[1]

f. *Post-Enumeration Survey (PES): 1971 Census of Agriculture, Philippines*

40. In May 1970, the Philippine Bureau of the Census and Statistics [now the National Census and Statistics Office (NCSO)] conducted a nationwide listing of farms which could serve as a complete and reliable frame for the 1971 main Census for Agriculture. The original plan was to use this frame immediately after the 1970 Census of Population and Housing, but because of administrative difficulties, the actual enumeration for the Census of Agriculture (CA) was undertaken in April 1971. For an operation as extensive as the Censuses, it was expected that certain imperfections would be found in the frame. There would be omissions, erroneous inclusions and misclassifications of farms. Also, because of the time gap of

1. Oñate, B. T. and P. U. Oñate. Agricultural and Rural Development Issues and Strategies: An Overview for Asia. The Philippine Agricultural Economics and Development Journal. In Press. 1979.

almost one year from the listing period to the time of interview, the farms in the frame may have shifted, migrated, or have ceased in their farming activities. To be able to monitor changes, a Post-Enumeration Survey (PES) was undertaken a week after the main CA operations with the use of a relatively small sample. The PES could identify the nature and extent of the aberrations in the listing and the changes which took place in the frame, and could provide ways and means of evaluating the census results including the census coverage.

41. The PES is a simple experiment but with a complex sampling survey content designed to compare two groups, the CA proper and the PES. For a given characteristic, the bias or difference is

$$B_{ij} = P_{ij} - C_{ij}$$

where

P_{ij} refers to a measurement or count generated from the PES, and

C_{ij} refers to a measurement or count from the CA proper.

The subscript i may refer to the village or barangay in a given stratum while j refers to the farm household (holding) in the ith village. With PES as the standard operation, B_{ij} will measure the bias or difference in a paired group experiment.[1] Additional efforts were expended in the following survey requirements which could result in the PES generating more accurate and precise results:

(a) Selection of the best available enumerators from among the census enumerators to serve as enumerators for the PES;
(b) More intensive training of these high caliber enumerators than was given during the main Census;
(c) Use of a simplified listing questionnaire (CAF-1B) and the PES was limited to detailed investigation of few items for survey purposes;
(d) Use of more intensive canvassing and screening procedures to identify farm operators from non-farm operators, and

1. Paired group comparisons could easily be handled by the use of a t-test with n pairs of observations. An analysis of variance can also be used to remove other sources of variations such as size of farm, location, etc.

agricultural operations from non-agricultural operations; and

(e) Use of specially trained personnel to process the data.

42. A stratified, two-stage cluster sampling procedure was employed. Municipalities served as primary sampling units (PSUs) and barrios as secondary sampling units (SSUs). Sampling was independent from province to province except for small provinces which were grouped together to form one bigger "province" or stratum. In a stratum, the sample PSUs were drawn systematically with probability proportional to their number of large farms as reported in the 1960 Census of Agriculture. In each sample PSU, one SSU or barrio was drawn with equal probability. Generally, the sample allocation consisted of 5 PSUs per stratum and one SSU per PSU. The actual sample sizes were 299 sample PSUs or a 20 per cent sampling rate, and 299 sample SSUs or a sampling rate of 1 per cent drawn from 1,503 PSUs and 38,553 SSUs, respectively. A week after the main CA operations, the survey for coverage check started. A complete re-enumeration of household heads and independent farm operators residing with such households was done in each sample barrio (village) of SSU.

g. *Bias in Reporting of Census Items by Size of Farm*

43. The results of the comparison between the PES and the Census data for area, production and productivity seem to confirm earlier research findings. In general, there are moderate to large over reporting of area for small farms while there are moderate to large under reporting of area for large farms. The interaction between small and large farms will indicate the level and direction of under or over reporting by holding and by crop. For paddy, corn and sugar cane, moderate to large over reporting of production were observed for small farms and large under reporting for large farms. For coconut, small to large under reporting was indicated for both sizes of farms. The productivity will increase by a given amount depending upon the level and direction of the biases in reporting production and area (see Table 1.9). This PES indicated that there will be small to large upward adjustments in the productivity by size of farm and by crops. The results of these R & D studies on the CA show the urgent need of continuing research toward the improvement of the accuracy and precision of data for sound decision making. If pos-

TABLE 1.9
R & D – BIAS (DIFFERENCE BETWEEN POST ENUMERATION SURVEY (PES) AND THE CENSUS RESULTS) IN THE REPORTING OF AREA AND PRODUCTION BY SIZE OF FARM AND BY CROP. AGRICULTURAL CENSUS, PHILIPPINES. 1971*

Item: *Size of Farm* \ *Crop*	*PADDY*	*CORN*	*SUGAR CANE*	*COCONUT*
AREA				
Small	oo**	ooo	ooo	ooo
Large	uu	uuu	oo	uu
Total	o	uu	oo	u
PRODUCTION				
Small	oo	ooo	ooo	u
Large	uuu	uuu	uuu	uuu
Total	uuu	uu	uuu	uuu
PRODUCTIVITY				
Small	+	+	[out of control]	+++
Large	+	+	+++	+++
Total	+	+	+++	+++

*Source of data: National Census and Statistics Office (NCSO), Philippines.
**Legend:

o	–	Small over reporting	u	–	Small under reporting	+	– Small increase in productivity
oo	–	Moderate over reporting	uu	–	Moderate under reporting		
ooo	–	Large over reporting	uuu	–	Large under reporting	+++	– Large increase in productivity

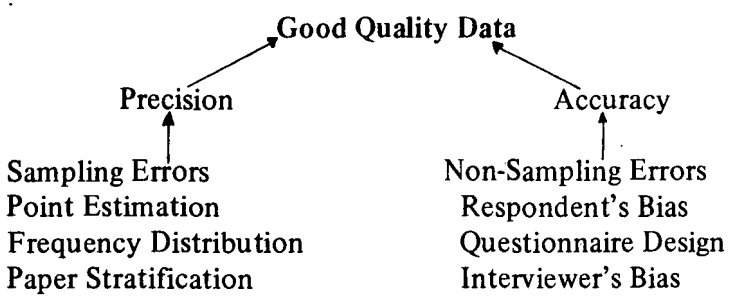
sible, every data collection system, whether censuses or sampling surveys must be accompanied by quality checks such as the PES.

44. It is now apparent that R & D is an important component for improvement of statistics needed in agricultural planning and rural development. This component should be a joint project of statistical agencies, research institutions and interested parties. As illustrated, there are many dimensions of R & D and each dimension must be fully identified for each statistical program, so that the needed resources could be properly allocated. As mentioned earlier, the National System in Agriculture and Resources Research is also called upon to contribute its share in providing the gap of knowledge toward the problem of producing good quality data for strategies in agricultural planning and rural development.

IV. New Challenge and Opportunity for the SSFA

45. With man as the central concern of agricultural planning and rural development and with an environment of poverty, inequality and unemployment, the SSFA is faced with a new challenge and opportunity in providing a sound statistical framework for relevant and effective strategies toward the improvement of the quality of life of the rural poor.

46. The role of Research and Development (R & D) assumes an important dimension in the production of quality data from the SSFA. The diagram below will indicate the complexity of the task to generate accurate and precise data useful for agricultural planning and rural development. Precision will consider sampling and related errors on point estimation and in the estimation of frequency distribution while accuracy will consider non-sampling errors which could be a more serious problem than sampling errors in the production of good quality data.



Multi-dimensional
Multi-variate
Variance-Covariance
Matrix

Time Series
Rotation of Sample
Change of Design
Other Techniques
Estimation Procedures