PD-AAJ-825
ISN 1420
931 0533 00 / 53

AGRICULTURAL DIVERSIFICATION AND MARKETS IN THE PHILIPPINES

(PROJECT ADAM) NSDB–BAECON 7202Ag

Project ADAM TECHNICAL PROGRESS REPORT

"RESEARCH"

(FEBRUARY 1, 1974 – JUNE 30, 1974)

AN NSDB/USAID–ASSISTED JOINT RESEARCH UNDERTAKING OF THE
BUREAU OF AGRICULTURAL ECONOMICS (DANR), COLLEGE OF AGRICULTURE (UPLB),
AND THE ECONOMIC RESEARCH SERVICE (USDA)

BEST AVAILABLE DOCUMENT

TECHNICAL PROGRESS REPORT

(February 1, 1974 to June 30, 1974)

Republika ng Pilipinas
Kagawaran ng Pagsasaka at Likas na Kayamanan
KAWANIHAN NG EKONOMIYA SA PAGSASAKA
(Bureau of Agricultural Economics)
Casman Bldg., Quezon Boulevard Ext.
Lungsod ng Quezon

June 28, 1974

The Chairman
National Science Development Board
Bicutan, Taguig, Rizal

S i r :

In compliance with the General Instructions in Implementing NSDB-Assisted Projects, we are pleased to submit herewith the Technical Progress Report on NSDB-BAEcon7202Ag project on Agricultural Diversification and Markets in the Philippines for the period February 1, 1974 to June 30, 1974.

Very truly yours,

LEONARDO A. PAULINO
Director

Enclosed: As stated

THE PROJECT ADAM STAFF

Project Director

DR. LEONARDO A. PAULINO

Project Leader

ASST. DIRECTOR JESUS C. ALIX (BAEcon)

Co-Project Leaders

DR. L. JAY ATKINSON (USDA)
DR. AIDA RECTO-LIBRERO (UPLB)

Asst. Project Leaders

RAMON C. ALCACHUPAS (BAEcon)
DAVID E. KUNKEL (USDA)
NARCISO R. DEOMAMPO (UPLB)

Project Consultants

AMANDO M. DALISAY
JOSE E. ENCARNACION
RICHARD J. FOOTE
RODOLFO T. YAPTENCO

Research Associates

Florentino M. Atienza
Victor B. Reyes
Gil R. Rodriguez, Jr.
Porfirio B. Tunque

Senior Research Associates

Quintin M. Balagot
Ismael P. Getubig, Jr.
Leonardo M. Gonzalez
Rebecca R. Gabutero
Moises L. Sardido

Senior Researchers

Aida C. Alcasid
Delia P.G. Aquino
Elizabeth C. Berdin
Isabelita C. Bulacan
Rebecca R. Coroza
Erlinda M. Elizon
Aleli R. Funtanilla
Rodolfo M. Garcia
Francisco P. Javillonar
Cecilia M. de Leon
Venus P. Orogo
Juanita M. Receno
Cielo Gracia G. Tutaan
Josefina B. Sison
Josefina Sidiangco

Research Assistants

Carmelita S. Abad
Imelda B. Aguas
Carolina E. Belen
Guillermo C. Bella
Josefina R. Decquino
Santiago M. Flores
Robert D. Gerochi
Moises B. Malabanan
Filomena M. Almario
Erlinda S. Maulit
Neriza D. Mendoza
Emelina N. Presa
Emelina G. Solano
Marina M. Velasco

Science Aides

Teresita L. Agbay
Julita B. Cabatbat
Corazon T. Camaya
Zenaida G. dela Cruz
Josefa A. Duque
Rosa Maria C. Estrellado
Maura P. Maloma
Virginia F. Matel
Fatima V. Moneda
Marta M. Moyano
Estor A. Ocsan
Simplicia F. Panganiban
Myrna B. Pasagui
Florita A. Tañido
Amelia G. Villaluna
Fe Valdez
Jose R. Fabros

CONTENTS

Title of Project	1
General Objectives	1
Brief History	2
Funding	3
Personnel	4
Analytical Approach	5
Activities	7
Agricultural Planning Model	7
Project ADAM Evaluation	8
Accomplishments	9
Development of a Programming Model	9
Micro-Level Studies	10
Evaluation of Potential Demand	12
UPLB-Project ADAM Activities	12
Land Capability Study	13
Project ADAM Published Research Output	13
Research Linkages	15
Problems and Possible Solutions	17
Staff Turnover	17
Budget	20
Computerization	21
Middle-Level Personnel Constraint	21
Data Gaps	22
Conclusion	23

List of Appendices

Appendix		
A	Proposal for financial assistance	25
B	Memorandum of agreement	31
C-1	Proposed funding program, first year	35
C-2	Proposed funding program, second year	36
C-3	Proposed funding program, third year	37
C-4	Budgetary requirements	38
C-5	Project line-item budget, FY 1972	39
C-6	Project line-item budget, FY 1973	40
C-7	Project line-item budget, FY 1974	42
D-1	Letter of Dr. L. A. Paulino to the NSDB Chairman on the termination of the second project-year	44
D-2	Letter of the NSDB Chairman to Secretary A.R. Tanco, Jr. on the approval of the third project-year	46
D-3	Letter of Director J.C. Alix to the NSDB Chairman with attachments: Project ADAM's proposed re-structured line-item budget; and financial quarterly plan for FY 1975	48
E	Organization chart, Project ADAM	52
F-1	Project ADAM administrative staff	53
F-2	Project ADAM working staff	54
F-3	Educational profile, Project ADAM staff	56
G-1	Agricultural sector models for the Philippines: formulation and data	57
G-2	Philippine agricultural sector models: selection of variables from the computer runs and discussion of results	69

Appendix

H	A programming model for Philippine agriculture	97
I	Project ADAM: Institutional development plan . .	114
J	USAID/TAB Review of Project ADAM	123
K	Project ADAM published papers	127

TECHNICAL PROGRESS REPORT
(NSDB-DAFcon7202Ag)
February 1 - June 30, 1974

I. TITLE OF PROJECT

Agricultural Diversification and Markets in the Philippines (Project ADAM)

II. GENERAL OBJECTIVES

As re-defined during the workshop on the project held during its first year (December, 1972) in Davao City, the general objectives are:

A. To obtain an integrated picture of Philippine agriculture within which various policy goals can be formulated and analyzed.

B. To analyze the various constraints limiting farm income, employment and productivity in the country.

C. To develop the economic data and analysis needed to identify realistic agricultural production and market opportunities at the farm, regional, national and international levels in order to: increase and stabilize farm incomes; increase their contribution to national growth; increase employment; and increase foreign exchange earnings.

D. To develop in the Philippines, with the combined efforts of the Department of Agriculture and Natural Resources, the University of the Philippines, and the U.S. Department of Agriculture, the mechanisms for the continuous analysis

and re-evaluation of these opportunities and alternatives as production and market conditions change.

III. BRIEF HISTORY

The idea for Project ADAM first came up early in 1971 at a regional meeting on agricultural diversification and trade, at which Dr. Lawrence Witt (then with the Technical Assistance Bureau of USAID/Washington, D.C.) and Dr. Leonardo A. Paulino (Director of the Bureau of Agricultural Economics), agreed to explore the possibility of undertaking jointly a major research project on agricultural diversification and markets. The initial intention was to infuse such a project with an international scope/coverage, with bases of study set in Thailand, Central America, and the Philippines.

The Philippine project, approved for assistance by the National Science Development Board (NSDB), was initiated in February 1972 as a cooperative venture of the Department of Agriculture and Natural Resources' Bureau of Agricultural Economics (BAEcon), the University of the Philippines at Los Baños (U.P.L.B.), and the Economic Research Service of the U.S. Department of Agriculture (ERS-USDA). On the U.S. side, assistance was provided through the U.S. Agency for International Development (USAID/Manila).

The Memorandum of Agreement as signed by Chairman Florencio A. Medina, representing the NSDB, and Secretary Arturo R. Tanco, Jr. for the Department of Agriculture and Natural Resources, first assigned to Project ADAM the title NSDB Project No. 2.260; a change in this title was, however, instituted at the close of the 2nd project-year (now NSDB-RMEcon7202Ag) based on the new NSDB coding system.

The four work phases of Project ADAM was originally programmed for a period of three years. Phases I and II were to have been completed during the first year, but the unexpected voluminous amount of literature on agricultural research encountered by the project staff extended the period allotment for Phase I from three months to almost six months, thereby also delaying Phase II. The second project-year had been intended for Phase III alone, but due to the delays in the earlier phases and some difficulties encountered in the activities of Phase III itself, another year for this work phase was granted to allow the completion of the planned analytical activities. Phase IV remains for completion during the terminal (fourth) year.

IV. FUNDING

Four agencies contribute to the budget of Project ADAM, but the major portion of the operational expenses for the

project is borne by the NSDB. For the project's third year, NSDB has approved a total funding assistance of P330,000, out of which P76,000 constitutes the project's second-year savings, and the balance composes the grants-in-aid from the agency (Appendix C-7).

The other three cooperating agencies -- DANR, USAID, and UPLB - contribute some amount in the form of supplies, materials and some consultancy and commodity funds. With the inability of USAID to provide directly funds for local consultantships, the Office of the Secretary (DANR) assumed the responsibility of funding local consultancy requirements. Commodity assistance of USAID/Manila (earmarked for the first and second project years) includes three motor vehicles which were received by the project in June 1974, after a long delay; a number of these items still have to arrive.

V. PERSONNEL

The Project ADAM staff is divided into two operational groups, one based at the Bureau of Agricultural Economics in Quezon City and the other, in U.P. at Los Baños. At the Bureau's Central Office, about 75 percent of the project personnel are stationed under the supervision of the Project Leader. The rest or 25 percent, are stationed at the Department of Agricultural Economics in Los Baños under a Co-Project Leader.

At the close of the second-year activities, Project ADAM had a total of 4 Senior Research Associates, 13 Senior Researchers, 15 Research Assistants and 6 Science Aides. Emergency personnel numbered 12 for the entire project-year. Towards the end of the period under report, the staff numbered 48, both for Los Baños and Quezon City. Personnel contributions from the cooperating agencies consisted of a project director, a project leader, two co-project leaders, three assistant project leaders, and four research associates. Two other regular BAECon personnel -- a Senior Statistician and an Economic Researcher, both of them initially with the ADAM staff, remained on detail with the project during the period, as with the Resident Economist from the Economic Research Service (USDA). The project also retained its four consultants, three from the Philippines and one from the U.S. side.

VI. ANALYTICAL APPROACH

The objective of obtaining an integrated picture of Philippine agriculture within which realistic production and market opportunities can be identified in most appropriately analyzed in a programming framework. This framework permits the choice of alternative activities which optimize a given objective even with limited resources. The use of a non-linear objective function that considers individual product demands provides

stability. By first specifying values of instrumental variables that constitute a particular policy, various policy options can then be analyzed to determine their effects on income, employment, and foreign exchange earnings. This approach has been deemed suitable for application under conditions of present research capability and data availability in the Philippines.

Regression and other statistical techniques are most appropriate for analyzing farm survey data in order to determine the progress in HYV adoption and the response to the use of modern inputs. This enables comparisons with experimental results and other farm-level studies.

The demand and price model provides a basis for estimating the effects of changes in agricultural production on price relationships in the economy. A silumtaneous-equations model has been estimated by 3-stage least squares regression in order to handle the simultaneity problem. This program, which was developed by an ADIP consultant based at USAID/Saigon, is now available for use in updating and improving the model.

The programming model requires detailed information on individual product demand and supply of inputs, and this necessitated additional analysis. The methodology for the demand analysis is based on consumer demand theory and uses regression analysis of cross-section and time-series data.

MICROFILMED FROM BEST
AVAILABLE COPY

VII. ACTIVITIES AND ACCOMPLISHMENTS

Activities

A. Agricultural Planning Model

Project ADAM expects to complete a prototype of the integrated agricultural planning model for the Philippines soon. The full programming model is planned for completion by 1977 (Appendix H). It is expected that the values of production coefficients and demand elasticities can be available for integration into the model by August; then existing data to allow optimization of resource use, product mixes, etc. through 1980 will be plugged-in during the period. The coding and computerization of data will be done through October; debugging should be completed by November 30; and the first trial runs for the base period will be undertaken by the end of the project-year in January, 1975. The expected results for the model are based on the assumptions of availability of data in regard to irrigation and other inputs, agricultural investments, and allowing for one rate of technological change. The expected output in March 1975 on the resource use pattern for 1980 is based on normalized assumptions, that is, using data that is most consistent, with the 1970-1972 as a base period. By April 1975, or during the fourth year of Project ADAM, analyses

MICROFILMED FROM BEST
AVAILABLE COPY

of computer results shall have been completed and the preparation of the final report on the project started.

The project staff is still weighing the question of whether to include land reform into the model at this time, or later when information on such other variables as labor, migration, unemployment, weather conditions, and the full set of policy instruments shall have been compiled.

B. Evaluation of Project ADAM

The project was evaluated twice during the period under report by the Technical Assistance Bureau (TAB) of the U.S. Agency for International Development: (1) an internal review held on February 6, 1974 at Washington, D.C.; and (2) an in-country review on June 3-5, 1974 in Manila. A two-man team from USAID/TAB composed of Dr. Leland B. Fletcher, Chief of TAB's Agricultural Economics and Sector Planning Division, and Donald Anderson, of the same Division, was in Manila to evaluate the methodological or analytical approaches of the agricultural sector programming model developed by the ADAM staff.

As a result of the February review mentioned earlier, the USAID/TAB suggested a project-site evaluation of the analytical approach with regard to the construction of a framework for policy-level decisions and its relevance to

the project objectives. Discussions on the programming model and other sub-research areas used as bases for the micro-level analysis applied in the model were made during the in-country review. At the final session, the review team as well as the project management met with the Secretary of Agriculture for "wrap-up" purposes, which included a statement of the policy issues that were to be considered in the final agricultural sector planning model. A point taken up at the review was the urgent need to strengthen the Bureau's analytical capacity to enable it to maintain the model on a continuing basis after Project ADAM shall have been terminated.

The summary of the review and other relevant papers pertaining thereto are shown in Appendices I and J.

Accomplishments

A. Development of a Programming Model

At the head of the list of Project ADAM's accomplishments would be the production model discussed earlier. The methodology for this has been studied by the Project Consultants, Dr. Amando Dalisay and Dr. Jose Encarnacion, who have given valuable comments on and recommendations for revisions of the structure of the model and in the computational procedure. Such revisions have already been made.

Production and marketing alternatives for 13 crops and 4 livestock products included in the model are being examined. These involve seven regions where the land types are more or less suitable for these agricultural commodities. The crop years from 1970 to 1972 are being used as a base, and projections to 1980 are being made under alternative demand-supply conditions with varying constraints. Domestic demand functions are included for various products, with allowances for exports and imports. Optimal patterns of resource use will then be calculated for both the base period and 1980 under different assumptions.

The analytical framework has been developed and the model, at this point in time, is about 50 percent complete. The work phase on major resources constraint, by region, is also nearly complete, and input coefficients have been developed for rice for almost all regions; work on input coefficients has just been started for other major crops. Also about halfway to completion is the demand-analysis activity to be incorporated into the programming model.

B. Micro-Level Studies

Several micro-level studies being conducted under the Project ADAM research activities are contributing some inputs towards the programming model.

1. Optimum farm size - This study was originally an NRCP-assisted project on the size of farm that can be operated using family labor at different levels of technology, and which has been integrated into Project AD.II's research framework. The analysis for the lowland irrigated rice farm has been completed and a preliminary report published. Currently underway is the analysis for upland farm conditions.
2. An intensive analysis on fertilizer supply and demand results has been completed. This made use of an econometric model of fertilizer demand and supply response that will help to forecast future demand for fertilizer and the response of rice, corn, and sugarcane to fertilizer. Additionally, the study also developed linear programming models of representative farm situations to look at optimal fertilizer uses at different levels of technology.
3. A rice marketing study of the Bicol Region initiated during the second year by a Project AD.II participant from the East-West Center is now in its analytical phase. This study is being related to the Bicol River Basin Development Program.

C. Evaluation of Potential Demand

The preliminary draft for a 10-equation econometric model fitted by 3-stage least squares, using data from 1955/56 through 1968/69, has been completed; this model will be utilized for short-term forecasting and in connection with the programming model.

An analysis of the demand for agricultural products has been initiated as a joint effort with the USAID-assisted Bicol River Basin project and UPLB. This involves the estimation of demand functions using consumption survey data to develop income and price elasticities for most products included in the programming model.

D. UPLB-Project ADAM Activities

At the Los Baños base of the project, the following activities are nearing completion:

1. The supply-response activity involves an estimation of historical supply response functions for major crops, using a distributed lag model. The analysis is underway and should be completed by the end of July 1974.
2. Analysis of farm wages by crop, by operation, and by region.
3. Commodity balance sheets for major agricultural crops.

4. Analysis of price margins; seasonal price variations at wholesale and retail levels.

5. Production/area/yields tabulation for various agricultural crops, for which projections may be made.

E. Land Capability Study

The land classification study is proceeding satisfactorily with the strengthening of the ADMI research staff; personnel problems, along with the data needs on crop yields and the agricultural labor force, had previously contributed to some lag in the work schedule.

F. Project ADMI Published Research Output

1. During the first and second years, the project published three working papers and several other preliminary papers/reports. These included the nine-volume annotated bibliography as Working Paper No. 1; the review of literature as Working Paper No. 2; and the study on fertilizer-yield response using the DAS 1969/70 and 1970/71 data, as Working Paper No. 3. The preliminary report on the optimum economic family-size farms for land reform areas, originally an NRCP-funded study which has been integrated into the Project's "umbrella" of researches, was also published.

The above publications would constitute a series of studies under the general framework of Project ADAM; in a way, these have contributed to the capacity for economic analysis in the Philippines.

2. At the beginning of the third year, the preparation of working papers went on at a faster pace: Working Paper No. 4, The Fertilizer Supply Situation and Marketing System in the Philippines, 1954-1972 came out in April and the report on the agricultural machinery industry in the Philippines is being revised for possible publication during the third project-year.

3. Work on the series on regional agricultural patterns has been going on for several months now. Except for revisions on the statistical tables, Working Paper No. 6, which deals on the patterns for the following regions is about ready for publication: Central Luzon (Part I); Southern Tagalog (Part II); Bicol Region (Part III); and Northern Mindanao (Part IV). The second drafts for the following regions are undergoing editing for later publication: Central Visayas; Cagayan Valley; Ilocos Region; and Western Visayas. The manuscripts on 3 other regions (Southern Mindanao; Western Mindanao; and Eastern Visayas) are still in their first drafts.

4. An updated report on the fertilizer-yield response put out originally as Working Paper No. 3 has been prepared by Drs. Atkinson and Kunkel and will be released as the revised edition of the said working paper. The preliminary reports on the Philippine Agricultural Sector Models (Appendix G) prepared by the Project Consultant, Richard J. Foote, as well as those by the Los Baños group, will also be published as Project ADAM working papers during the third year.

A complete listing of works published under Project ADAM is shown in Appendix K.

G. Research Linkages

A planned-out objective at the beginning of the project had been the desire to establish linkages with research institutions and with other less developed countries (LDC's) which have a common interest in agricultural diversification. Insofar as its resources have allowed, the project has gone into sufficient direct linkages with a few academic and research institutions, which are committed to the advancement of agricultural research, as follows:

1. The University of the Philippines at Los Baños, where part of the project personnel is based.

2. The International Rice Research Institute - the project staff has corresponded and consulted frequently with IRRI staff on items of common research interests. Dr. Robert Herdt, Associate Economist of IRRI, was a participant at the USAID/TAB review of ADM.

3. The U.P. School of Economics, through the participation of Dr. Jose E. Encarnacion as Project Consultant.

4. The Food Institute of the East-West Center (University of Hawaii), which has sent a Ph.D. Candidate, Ismael P. Getubig, Jr., to Project ADM for his dissertation work. His adviser, Dr. William Staub, has been to the Philippines twice for consultation in regard to the development and progress of Mr. Getubig's research work.

5. The University of Tennessee, which also sent a Ph.D. student, Leonardo Gonzales, to the Project last year to survey possible dissertation areas. Mr. Gonzales is expected back about July 1974 for empirical research for his Ph.D. degree, on a project study in the Northern Luzon Region. Dr. Luther Keller, his adviser, will possibly be on consultation with the project management sometime this year.

6. The National Research Council of the Philippines (NRCP), through the participation of Dr. Amando H. Dalisay, (Executive Secretary) as Project Consultant.

No linkages have been initiated with other LDC's although the project staff hopes to participate in a regional seminar on agricultural diversification, where an interchange of ideas on varied project on the above areas may be possible.

VIII. PROBLEMS AND POSSIBLE SOLUTIONS

A. Staff Turnover

The problem of staff turnover had not posed serious implications for the project staff during its first year, since Phases I and 2 involved accumulation of research data and the subsequent delineation of research areas for the project. Phase 3, set originally for the second year, was a transition to the analytical phase, however, and demanded in addition to high-quality staff, a continuity of such staff members in order to at least ensure the smooth flow of the project activities. While the successful completion of the sub-areas of research was not contingent upon the continued services of the original research workers, staff turnover during the second year, and especially in the beginning of the third year, did upset the timetable and delayed some phases of Project ADAM activities.

On the senior-level staff, the project suffered, firstly, with the detail of Dr. Ernesto Abarientos to the National Food and Agriculture Council (NFAC) and of Dr. Aida Librero to the Philippine Council for Agricultural Research (PCAR); and, secondly, with the departure od Dr. Ramon Nasol, Co-Project leader of the Los Baños-based ADAM group, for an ADB assignment at Bangladesh. A Senior Research Associate remained on study leave. At about this time, too, the research force was further depleted with the transfer of six senior researchers to other offices; these were highly-trained and competent individuals who, while not serious losses to Project ADAM, could have helped immensely towards a sustained rapid pace of the various work areas within the project. At this time replacements have been found for them; although qualified however, the new employees have to be oriented to the work, thus setting back project activities by some time.

The void in the staff at Los Baños was most acutely felt at the beginning of the third project-year and the entire work group had to be transferred to Quezon City. The situation was eased later with the appointment of Dr. Narciso Deomampo as replacement for Dr. Abarientos and the return of Quintin Balagot from a study leave. In

the meantime, Dr. Librero succeeded Dr. Nasol as Co-Project Leader. With these developments, the Los Baños group was, therefore, re-assigned to the University of the Philippines at Los Baños in April 1974.

The project management also faces the prospect of some changes. The Project Director has been appointed SEARCA Visiting Professor at UPLB, and although he will remain connected with Project DAM, his absence from the central core of the project activities will require certain adjustments in the management of the project.

A corollary problem is the rather low salary scales of the project staff. The first technical progress report submitted in June 1972 had pointed out the need to provide incentives to the project staff through salary increases in order to minimize turnovers. The continuous departures through the second year to this date show the immediate need, therefore, to grant a general salary increase commensurate at least to the emergency allowances given to all other government employees. The project management has proposed such a general salary increase for the project staff, but approval by NSDB of the re-structured line-item budget which incorporates these salary increases has somehow been delayed. It is therefore recommended that the NSDB immediately approve the proposed change.

B. Budget

Another serious constraint confronted by the project has been the rather delayed releases of its budget. For the project's third-year operations the NEDB approved a funding assistance of ₱330,000 (including the accumulated second-year savings of about ₱76,000); the allotment for the first two quarters was released only on May 22, 1974, almost 4 months since the start of the third-year activities. The lack for funds for such items as survey operations, supplies and computerization was, therefore, an additional limitation to the project's activities.

The project staff also expects a shortage of supplies during the rest of this third project-year. The increased costs of supplies and other materials will greatly lessen the purchasing power of the supplies allotment, and with the documentation phase in full progress, certain difficulties in the printing of research output are anticipated.

The project, because of its volume of activities, has to supplement its regular force with emergency personnel and it would be difficult to reduce the present personnel size without having some of the activities curtailed or affected. The problem of insufficient funds for wages arose as early as May when the allocation for wages ran

MICROFILMED FROM BEST AVAILABLE COPY

short. Rather than suffer the consequences of personnel lay-offs, the project had to draw upon the limited budget of the Research Division of the Bureau to be able to pay the wages of the Emergency Science Aides for the month of June.

C. Computerization

Computerization and processing of data remained as major constraints. With the increasing tempo of activities of the different units of the Bureau of Agricultural Economics, and of Project ADM in particular, the data processing section cannot adequately cope with the jobs assigned to it. The project has divided its computerization work among the IBM at Makati; the U.P. Computer Center in Diliman; and the Bureau of Lands at the DANR, in addition to the data processing being done at the BAEcon, but this is still insufficient in relation to the magnitude of computerization work involved. However, with available funds for this purpose, an easing of the situation is expected with the operation of the newly-acquired IBM 370 of the Department.

D. Middle-Level Personnel Constraint

The lack of applicants for the Senior Research Associate positions has, to a certain extent, also impeded

MICROFILMED FROM BEST AVAILABLE COPY

the progress of Project ADM activities. During the second year the project had operated with only two or three Senior Research Associates, but only one of them was on a full-time basis through the project-year.

For this third year, the situation has partly been alleviated with the return of Messrs. Quintin Balagot and Moises Sardido. With Messrs. Balagot and Sardido supplementing in directing the different research areas within the project, work has noticeably accelerated within the last 30 days, such that work in the regionalization of the Philippines into seven major regions may be completed sooner than had been expected. With the expected return of Leonardo Gonzales from his graduate work at Knoxville, Tennessee, the work can be speeded up even more. (At about that time, however, Mr. Getubig is slated to return to the East-West Center to complete his doctoral work on agricultural economics.)

E. Data Gaps

Existing data gaps and certain inconsistencies in some data collected have hindered the development of a compact agricultural policy model. In addition, were the project to secure supplementary funds from other agencies,

as was done for the rice marketing study by Mr. Cotubig who has been granted some funds for his Bicol field research by the East-West Center, the project management would be faced with the problem of time involved in conducting additional surveys as may be required.

A major constraint in relation to these data gaps has been the delay in the release of the 1970 Census of Agriculture, on which the Project had depended for certain specific information; the coefficients needed to establish productivity levels would have easily been obtained from the 1970 Census results. The prototype model for agricultural planning analysis is nearly complete and is expected to be workable by November 1974. Should the Census results be ready by then, less problems in deriving the coefficients will be encountered and the project can develop a good predictive LP model.

IX. CONCLUSION

The project has until January 1, 1975 to complete its Phase III activities. Phase IV remains for completion after the third year. It is envisioned that the LP model can be made operational by the end of February 1975 and the revised draft of the project report submitted around July 1, 1975; however, the Project timetable is admittedly tight and leaves

little time for computer re-runs and reviews of work areas. And, considering the magnitude of the work that needs to be done before January 31, 1975, Phase IV may not enjoy the initial financial resources offered by "savings" like previous work phases did.

A portion of the one-year period allotted to Phase IV will probably be utilized for the expansion of the national agricultural policy analysis, to include more individual crops as well as livestock, so that the results, e.g., the approximation of the expected patterns of agricultural output and resource use by 1980, would be more realistic.

From the GOP side, the LP model would no doubt be highly useful. If opportunities will permit, studies on agricultural diversification and trade can be extended on a regional cooperation basis over Asia with Project ADAL's work as a starting point. But one major constraint is the lack of training of the project's workforce. To ease this constraint a bit, staff members were sent to local seminars and to other high-level technical staff meetings; but these are, of course, inadequate. The project management feels that if the training of the staff on computer analysis, on simulation techniques, on operations research, and on econometrics had been undertaken in the first and second years of the project, the con-

tinuity of Project MDMI's activities would have been assured by now. The possibility of graduate training for some personnel is also being explored in order to make MDMI ready to take over when the model has been rendered operational for application to the Philippines and other LDC's.

###

A P P E N D I C E S

APPENDIX A

PROPOSAL FOR FINANCIAL ASSISTANCE

PART I. PROPOSAL SUMMARY

1. PROJECT TITLE: Agricultural Diversification and Markets in the Philippines

2. PROJECT PROPONENT: Bureau of Agricultural Economics, DANR, Casman Bldg., Quezon City

3. COOPERATING AGENCIES: The Bureau of Agricultural Economics, DANR (BAEcon), the College of Agriculture, University of the Philippines (UPCA), and the Economic Research Service (ERS), of the United States Department of Agriculture (USDA)

4. PROJECT COSTS: TOTAL (FIRST YEAR) ₱576,600

a.	NSDB financing requested	₱265,300
b.	BAEcon's counterpart	39,000
c.	UPCA's "	36,000
d.	USDA-AID's "	236,300

5. SUMMARY: (Phase I, II, III, and IV)

The research project is designed to combine the research efforts of the BAEcon, UPCA, and ERS-USDA, starting September, 1971. Planned activities have been divided into four (4) major phases over a project period of 36 months. (Note that the financing requested at this time is for the first months). The tentative timetable of the different phases of the research is given in Part III-9 of this proposal.

Phase I. (3 months). Intensive study and evaluation of existing data, analysis and program. Starting date: September 1, 1971.

Phase II. (9 months) Evaluation of initial studies, establishing special research projects and preliminary macro-analysis.

Phase III. (12 months) Completion of regional micro-economic and industry studies, consolidation of the separate studies that have been undertaken into a preliminary draft of the final macro-economic analysis and initiation of analysis of trade prospect.

Phase IV. (12 months) Preparation of the intermediate reports and the final report for circulation and review, revision and publication of project report.

PART II. TECHNICAL DESCRIPTIONS

6. OBJECTIVES AND SIGNIFICANCE OF THE PROJECT:

a. To develop the economic data analysis needed to identify realistic agricultural production and market opportunities and alternatives at the farm, regional, national and international levels; and

b. To develop in the Philippines, through the combined efforts of the Department of Agriculture and Natural Resources, the University of the Philippines and the U.S. Department of Agriculture, the mechanisms for continuous analysis and reevaluation of these opportunities and alternatives as production and market condition change.

The research project is designed to combine the research efforts of the Bureau of Agricultural Economics of the Department of Agriculture and Natural Resources (BAEcon, DANR), the College of Agriculture of the University of the Philippines (UPCA) and the Economic Research Service of the United States Department of Agriculture (ERS, USDA) to achieve the foregoing objectives.

<u>Specific objectives, Phase I and II</u>

a. To gather, organize and evaluate existing research information that is related to current policy decisions on agricultural production and marketing.

b. To describe the data being generated or are being generated by these studies, and to evaluate their relevance as tools for identifying alternative production possibilities at the farm level, with emphasis on cost and returns analysis; and to determine the most critical additional surveys needed to answer current and future questions in this area.

c. To locate experience and experiments on agricultural diversification and to identify the agro-technical and market conditions in which they are operating or are planned to operate.

d. To identify and specify regions which appear to possess generally homogenous characteristics, suggesting the need for, or probability of, specialization along certain crop or livestock lines, or special regional market conditions.

e. To identify supply response studies, determine their strengths and weaknesses as sources for analyzing the diversification possibilities of the country, and to determining the gaps in data or analysis so that needed research in this area can be identified.

f. To conduct special industry studies, extensions or additions to past studies to facilitate the analysis of specific industry development, with major attention given the livestock industry.

g. To consolidate demand and market studies and to determine their current utility in providing data and/or analysis of demand prospects, on a commodity or regional market basis; and to identify the existing gaps in needed data and analysis for which additional research would be required.

h. To evaluate the initial studies, establish special research projects and preliminary macro-analysis. The materials generated in the sub-projects in Phase I will be combined with other current materials, including the revised 4-year plan for agriculture, to develop preliminary answer to current policy problems involved in the existing agricultural diversification effort in the Philippines.

The sub-projects generated by the specific need to conduct various studies will also serve the following purposes:

a. Serve as the basis for a preliminary appraisal of the production and market possibilities available for Philippine agriculture.

b. Provide BAEcon, UPCA and ERS, as well as others with a uniform body of knowledge of the existing data and analysis on these critical areas relevant to the further study of agricultural diversification in the Philippines.

c. Provide the BEcon, UPCA and ERS Research Program Committee with a sound foundation for determining the priority needs for additional research and/or data collection to commence with the successing phase of the research program.

7. PRESENT STATUS OF THE PROPOSED PROJECT: The ERS-USDA sent to the Philippines the chief of their Economic Development Branch, in the person of Dr. L. Jay Atkinson, in late June of this year, to work with BAEcon and UPCA officials, and the AID in drafting the original proposal (attached). Dr. Atkinson worked closely with the Director of BAEcon and UPCA representatives for about four weeks to draw up the overall project proposal as well as the various sub-projects.

This research project is the first of its kind in developing countries. The Philippines is the first such country in the world where a project of this dimension will be jointly undertaken by a group of research institution , viz., the BAEcon, UPCA, and USDA-AID.

Phase I of the project would include the amassing of scientific literature on diversification, market, and agricultural trade in general, both on a domestic and international levels, so that at this point in time, no bibliography on this area of research can be included in this proposal.

8. METHODOLOGY: A number of analytic approaches will be studied and the most revelant utilized. In supply response studies and demand relationships studies, econometric methods will be employed(multiple regression analysis, multiple correlation analysis, F-tests or t-tests of significance, etc.). In profitability studies, the use of benefit-cost ratios may be sufficient as criterion of profitability in the adoption of new techniques of production. On a micro scale, simulations model may be proposed to introduce systematic variations in underlying conditions to determine likely outcomes and laternative live policy options.

For analysis of production responses, historical analysis may suffice. It may be necessary to use either or both time series analysis and production functions analysis.

Activity analysis will involve looking into resource requirements and the calculation, by some optimizing procedure of the best combinations of production activities. The less complicated techniques would probably be the most practical, such as partial budgeting and linear programming. The methods of analysis to be actually employed will, of course, depend on the data and the situations to be analyzed.

PART III. PLAN OF WORK

9. SCHEDULE OF ACTIVITIES: It should be pointed out again that the funding requested at this time is only for Phases I and II.

See Appendices A and B, attached

10. FINANCIAL PLAN:

SUMMARY OF FINANCIAL PLAN

See Appendices C, D, E, F_1, F_2, and F_3, attached

11. PERSONNEL REQUIREMENTS: Information on personnel requirements are found in Appendix D, attached.

Phases I and II

No.	Position/Title	Durations (Man-months)	Salary/month
1	Assistant Director	6	₱1,140.76
1	Sr. Economist	12	546.00
1	Professor	3	1,210.00
1	Asst. Professor	6	620.00
1	Asst. Professor	3	636.66
1	Instructor	6	520.00
	Total- - - -	36	

The curriculum vitae of the above-listed individuals will follow.

PART IV. ADDITIONAL INFORMATION

12. REFERENCES: Dr. Pedro Sandoval, Professor. College of Agriculture, University of the Philippines, Los Baños
Dr. Jose M. Lawas, Director, Office of National Planning, National Economic Council, Office of the President
Dr. L. Jay Atkinson, chief, Economic Development Branch, Economic Research Service, United States Department of Agriculture, Washington, D.C.

13. RELATED ACTIVITIES OF PROPONENT: As assistant director for the Agricultural Economic Research Branch of the Bureau of Agricultural Economics, the principal investigator is involved in researches conducted by the bureau on:

a. Markets and market conditions such as costs of marketing of various agricultural commodities and livestock; the impact of market news on farm decision-making; market analysis of prices of crop and livestock.

b. Optimum size and optimum combination of enterprises on farm in land reform areas. The data collected are now being processed for computer analysis.

c. The economics of fertilizer application in rice production. Computation and an analysis being undertaken.

d. Farm accounting for farm management studies. The survey phase is completed. Analysis will be started on September 1, 1971.

e. Farm indebtedness as affecting farmers' decision-making productivity and progressiveness. To be started soon.

f. Patterns of crop shifting in different geographical areas and under different economic conditions.

g. Cost of farm operations in different regions of the country. Completed June 30, 1971. The analysis is in progress.

h. The Laurel-Langley Agreement and Trade Implications for the Philippines. University of Wisconsin Term Paper, 1969.

PART V. ACCEPTANCE OF CONDITIONS

I hereby agree to accept and abide by all terms and conditions which the National Science Development Board may stipulate in respect to the grant of assistance to our project proposal and which shall be embodied in contract and/or Memorandum of Agreement to be executed by me/or our institution and the NSDB.

(SGD) JESUS C. ALIX
Name and Signature
of Principal Investigator

PROJECT TRANSMITTAL APPROVED:

(SGD.) LEONARDO A. PAULINO
Director
Bureau of Agricultural Economics

DO NOT FILL BELOW

RECEIVED BY THE NSDB: BY _____ DATE _____

A true copy:
6-20-74
enp

APPENDIX B

MEMORANDUM OF AGREEMENT
NSDB PROJECT NO. 2.260

"AGRICULTURAL DIVERSIFICATION AND MARKET IN THE PHILIPPINES"

KNOW ALL MEN BY THESE PRESENTS:

This Agreement entered into and executed this 11th day of February 1972 at Bicutan, Taguig, Rizal, Philippines by and between:

THE NATIONAL SCIENCE DEVELOPMENT BOARD, hereinafter called the NSDB, created pursuant to Republic Act No. 2067, as amended, with principal office at Bicutan Taguig, Rizal, represented in this Agreement by its Chairman, Gen. Florencio A. Medina,

and

THE DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES (through the BUREAU OF AGRICULTURAL ECONOMICS), hereinafter called the PROPONENT, with principal Office at Diliman, Quezon City, represented in this Agreement by the Department Secretary, Mr. Arturo R. Tanco.

W I T N E S S E T H

WHEREAS, the NSDB passed Resolution NSDB 304 R. 8 dated January 18, 1972 approving the Project Proposal of the PROPONENT entitled: "Agricultural Diversification and Markets in the Philippines"

WHEREAS, the PROPONENT is prepared and has the capability to undertake the Project aforesaid;

WHEREAS, both parties are concerned and interested in the fruitful utilization of their respective investments in research resources and ultimately the success of the Project;

NOW, THEREFORE, in consideration of the above premises and their mutual covenants hereinafter contained, the parties have agreed as follows:

1. Project Title: The Project, more particularly described in the Project Proposal made an integral part hereof as Annex "A" shall be known as NSDB PROJECT No. 2.260 "Agricultural Diversification and Markets in the Philippines"

2. Objectives of the Project: The Project shall have the following general objectives:

a) to develop the economic data and analysis needed to identify realistic agricultural production and market opportunities and alternatives at the farm, regional and international levels; and

b) to develop in the Philippines a mechanism for continuous analysis and re-evaluation of these opportunities and alternatives as production and market condition change

3. Operation of the Project: The project shall be carried out and managed by the PROPONENT through a Project Director in the person of Dr. Leonardo A. Paulino, Director, Bureau of Agricultural Economics in accordance with the Procedure/Methodology and Plan of Work outlined in Annex "A". The Project Director shall be principally responsible for the diligent conduct of project operations.

4. Financial Assistance: The Project shall be funded and supported from the financial assistance granted by the NSDB in the amount of ONE HUNDRED NINETY-SIX THOUSAND (196,000.00) PESOS to be spent exclusively for the purposes specified in the Project Line-Item Budget dated January 5, 1972 made an integral part hereof as Annex "B", provided, that the proponent agency and the cooperating agencies defray their counterpart funds as reflected in Annex "B"

The financial grant from the NSDB, which shall be chargeable against and lump-sum appropriation for general grants-in-aid for FY 1972 and shall be released quarterly subject to the proper bonding of the Project Director, accounting and auditing rules and regulations, other pertinent policies laid down by the NSDB and the submission of the following:

(a) Quarterly reports of expenditures duly verified by Proponent's Auditor.

(b) Progress reports on the activities of the Project

Unless authorized by the Chairman of the NSDB by Special Order, no portion of the project funds, NSDB assistance or counterpart contributions shall be used to pay honorarium or other additional compensation to any official or employee of the NSDB, its agencies, or other government offices.

Payment to the Project Director of any honorarium or other additonal compensation that may be authorized under this Agreement corresponding to the final quarter of the Project shall be released by the NSDB only upon submission of the terminal reports required of the PROPONENT in paragraph 7(b) hereof.

5. Project Personnel: Additional personnel, when authorized and necessary to provide the personal services in the Project, shall be engaged by the Project Director on contract basis consistent with the provisions of this Agreement and NSDB Policy Instructions No. 5.6, made an integral part hereof as

MICROFILMED FROM BEST AVAILABLE COPY

Annex "C", provided that the Project Director shall submit to the NSDB a copy of each their contracts together with job descriptions and qualification guides for specific positions.

6. Ownership of Properties: All supplies, materials and other properties purchased out of any funds granted by the NSDB for the Project shall exclusively belong to the NSDB. They shall be inventoried and a copy of such inventory furnished the NSDB within thirty (30) days from date of purchase. Each item of non-expendable property shall be marked as such.

7. Obligations of PROPONENTS: In addition to obligation under Annex "C", the PROPONENT, through the Project Director, shall:

a) Keep a logbook recording completely the daily activity, operation and progress of the Project which shall be open for inspection by representatives of the NSDB.

b) Submit to the NSDB within sixty (60) days from the completion of the Project a detailed written account of the whole undertaking in thirty (30) copies, which shall indicate, among other things, the technical information gathered and the problems encountered in the Project and a financial report of all disbursements made of the funds herein granted, duly verified by the Proponent's Auditor.

c) Submit periodically reports on the state of usability of apparatus, equipment and other facilities forming part of the NSDB assistance to the Project.

d) Return to the NSDB the unexpended balance of the grant.

e) Remit to the NSDB whatever income may be derived from the Project.

8. Rights to Projects Results: The results of the Project and publication rights thereon shall be governed by pertinent provision embodied in every approved publication, news release or report in Annex "C", on or related to the project, the PROPONENT shall acknowledge the support of the BOARD and submit or release each item under the following style of heading:

NSDB - Assisted Project No._____
(Project Title)
"Title of Report or Publication"

9. Guiding Principles: In addition to the foregoing, the NSDB and the PROPONENT shall observe and comply with the following principles:

a) No official or employee of the Project shall be permitted to accept any fellowship, scholarship of training grant or shall be

shall be allpwed to leave station for abroad without prior approval of NSDB.

b) The activities and operations of the Project shall be subject to inspection by representatives of the NSDB.

c) It is understood that the services of the officials and employees of the Project shall be discountinued upon termination of the Project.

d) Personnel of the Project shall be entitled to fifteen (15) days sick leave and fifteen (15) days vacation leave which shall be non-cumulative.

e) The NSDB is in no way under obligation to grant pension or gratuity to Project employees retiring or laid off after the work.

10. Period of the Project: The Project shall be initially undertaken for a period of one (1) year beginning February 1, 1972. Any extension shall be at the discreation of the NSDB upon proper evaluation and recommendation. The NSDB reserves the right to discountinue the Project or the financial assistance there to at anytime for violation of any of the provision of this Agreement or upon determining that the results obtained or expectable do not justify further activity, provided that the PROPONENT shall only be obliged to account for the balance of the grant unexpended as of the date of receipt of a written notification of such discontinuance from the NSDB.

IN WITNESS WHEREOF, the parties have hereunto set their hands on the date and at the place first above-written.

NATIONAL SCIENCE DEVELOPMENT BOARD

By: (SGD.) FLORENCIO A. MEDINA
Chairman

DEPARTMENT OF AGRICULTURE
AND NATURAL RESOURCES

By: (SGD.) ARTURO R. TANCO, J
Secretary

CONFORME: (SGD.) LEONARDO A. PAULINO
Project Director

A true copy:
6-20-74
mbp

PROPOSED FUNDING PROGRAM
FIRST YEAR
(in pesos)

I T E M	BAECON	UPCA	NSDB	USDA-AID	TOTAL
1. Salaries and wages a/	10,000	-	159,000	-	169,000
a. Project researchers	-	-	74,250	-	74,250
b. Research aides	-	-	34,650	-	34,650
c. Casual clerks	-	-	31,500	-	31,500
d. Emergency interviewers	10,000	-	9,600	-	19,600
e. Honoraria	-	-	9,000	-	9,000
2. Travel expenses	15,000	-	10,000	-	25,000
a. Project staff	-	-	10,000	-	10,000
b. Field supervisors	15,000	-	-	-	15,000
3. Supplies and materials	4,000	1,000	5,000	-	10,000
4. Contractual services	10,000	10,000	15,000	40,000	75,000
a. Local consultant	-	-	-	40,000	40,000
b. Data processing	-	10,000	-	-	10,000
c. Other services	10,000	-	15,000	-	25,000
5. Equipment outlay	-	25,000	18,600	196,300	239,900
a. Local procurement	-	25,000	18,600	-	43,600
b. Foreign assistance	-	-	-	196,300	196,300
6. Contingencies (10% of total)	-	-	57,700	-	57,700
T O T A L	39,000	36,000	265,300	236,300	576,600

a/ Excluding those of technical personnel from BAEcon and UPCA, and from ERS on USAID assignment.

APPENDIX C-2

PROPOSED FUNDING PROGRAM
SECOND YEAR
(in pesos)

I T E M	BAECON	UPCA	NSDB	USDA-AID	TOTAL
1. Salaries and wages a/	12,000	-	243,000	-	255,000
a. Project researchers	-	-	108,000	-	108,000
b. Research aides	-	-	50,400	-	50,400
c. Casual clerks	-	-	45,000	-	45,000
d. Emergency interviewers	12,000	-	27,600	-	39,600
e. Honoraria	-	-	12,000	-	12,000
2. Travel expenses	15,000	-	35,000	-	50,000
a. Project staff	-	-	20,000	-	20,000
b. Field supervisors	15,000	-	15,000	-	30,000
3. Supplies and materials	5,000	2,000	18,000	-	25,000
4. Contractual services	10,000	30,000	30,000	80,000	150,000
a. Local consultant	-	-	-	80,000	80,000
b. Data processing	-	30,000	-	-	30,000
c. Other services	10,000	-	30,000	-	40,000
5. Equipment outlay	-	-	8,000	87,500	95,500
a. Local procurement	-	-	8,000	-	8,000
b. Foreign assistance	-	-	-	87,500	87,500
6. Contingencies (10% of total)	-	-	63,900	-	63,900
T O T A L	42,000	32,000	397,900	167,500	639,400

a/ Excluding those of technical personnel from BAEcon and UPCA, and from ERS on USAID assignment.

APPENDIX C-3

PROPOSED FUNDING PROGRAM
THIRD YEAR
(in pesos)

ITEM	BAEcon	UPCA	NSDB	USDA-AID	TOTAL
1. Salaries and Wages[a]	14,800	-	115,200	-	130,000
a. Project researchers	-	-	54,000	-	54,000
b. Research aides	-	-	25,200	-	25,200
c. Casual clerks	-	-	27,000	-	27,000
d. Emergency interviewers	14,800	-	-	-	14,800
e. Honoraria	-	-	9,000	-	9,000
2. Travel expenses	5,000	-	5,000	-	10,000
a. Project staff	-	-	5,000	-	5,000
b. Field supervisor	5,000	-	-	-	5,000
3. Supplies & Materials	5,000	2,000	8,000	-	15,000
4. Contractual services	10,000	20,000	30,000	15,000	75,000
a. Local consultant	-	-	-	15,000	15,000
b. Data processing	-	20,000	-	-	20,000
c. Sundries	10,000	-	30,000	-	40,000
5. Equipment outlay	-	-	-	-	-
a. Local procurement	-	-	-	-	-
b. Foreign assistance	-	-	-	-	-
Contingencies (10% of total)	-	-	25,600	-	25,600
TOTAL	34,800	22,000	183,800	15,000	255,600

a/Excluding those of technical personnel from BAEcon and UPCA, and from ERS on USAID assignment.

BUDGETARY REQUIREMENTS, BY YEAR
(in pesos)

I T E M	1st Year Phase 1 & 2	2nd Year Phase 3	3rd Year Phase 4	TOTAL
1. Salaries and wages a/	169,000	255,000	130,000	554,000
2. Travel expenses	25,000	50,000	10,000	85,000
3. Supplies and Materials	10,000	25,000	15,000	50,000
4. Contractual services	75,000	150,000	75,000	300,000
5. Equipment outlay	239,900	95,500	-	335,400
6. Contingencies (10% of total	57,700	63,900	25,600	147,200
TOTAL	576,600	639,400	255,600	1,471,600

a/ Excluding salaries of technical personnel from respective cooperating agencies.

APPENDIX C-5

PROJECT LINE-ITEM BUDGET
Fiscal Year 1972

PROJECT NO. NEW

Original X
DATE: January 5, 1972

PROJECT TITLE: AGRICULTURAL DIVERSIFICATION AND MARKETS IN THE PHILIPPINES

PROPONENT : Bureau of Agricultural Economics (BAEcon)
New Project : (1st year of 3 years) Area: AGRICULTURE

Item No.	Details	TOTAL	NSDB	Counterpart BAEcon	Counterpart UPCA	Counterpart USDA-A
	I. PERSONAL SERVICES					
1	One supervising scientist (project leader) at ₱13,689 (50%)	₱ 6,844	-	₱ 6,844	-	-
2	One supervising scientist (co-project leader) at ₱14,856 (25%)	3,714	-	-	₱ 3,714	-
3	One senior scientist (assistant project leader) (full time)	6,552	-	6,552	-	-
4	One senior scientist at ₱8,767 (25%)	2,191	-	-	2,191	-
5	One senior scientist at ₱8,167 (50%)	4,088	-	-	4,088	-
6	Six scientists IV (senior researchers) at ₱7,800	46,800	₱ 46,800	-	-	-
7	Three scientist IV (senior researchers) at ₱7,800 (9 months)	17,550	17,550	-	-	-
8	Six scientists II (researchers) at ₱5,400	32,400	32,400	-	-	-
9	Three scientists II (researcher) at ₱5,400 (9 months)	12,150	12,150	-	-	-
10	Eight science aide III (research assistants) at ₱3,600 (9 months)	21,600	21,600	-	-	-
11	Six science aide II (research assistants) at ₱3,000	18,000	18,000	-	-	-
12	Six science aide II (research assistants) at ₱3,000 (9 months)	13,500	13,500	-	-	-
	Total for Personal Services	₱185,389	₱162,000	₱13,396	₱ 9,993	-
	II. MAINTENANCE AND OTHER OPERATING EXPENSES					
1	Traveling expenses	₱ 25,000	₱ 10,000	₱15,000	-	-
2	Supplies and materials	9,100	4,100	4,000	₱ 1,000	-
3	Sundry expenses	73,391	13,391	10,000	10,000	₱ 40,0
	Total for Maintenance and Other Operating Expenses	₱107,491	₱ 27,491	₱29,000	₱11,000	₱ 40,0
	III. FURNITURE AND EQUIPMENT					
1	Equipment Outlay	-	-	1/ (₱10,000)	1/ (₱25,000)	(₱209,9
	Total for furniture and equipment	-	-	(₱10,000)	(₱25,000)	(₱209,9

E-ITEM BUDGET (cont'd)

m:	Details	TOTAL	NSDB	Counterpart		
				BAEcon	UPCA	USDA-A
	IV. SPECIAL PURPOSES					
1	Honoraria:					
	a) One supervising scientist (project leader) at P13,689 (13%)	P 1,780	P 1,780	-	-	-
	b) One supervising scientist (Co-project leader) at P14,856 (12%)	1,780	1,780	-	-	-
	c) One senior scientists (assistant project leader) at P6,552 (15%)	983	983	-	-	-
	d) One senior scientist at P8,767 (11.2%)	983	983	-	-	-
	e) One senior scientist at P8,176 (12%)	983	983	-	-	-
	Total for special purposes	P 6,509	P 6,500	-	-	-
	SUMMARY					
1.	Total for personal services	P185,389	P162 000	P13,396	P 9,993	-
2.	Total for maintenance and other operating expenses	107,491	27,491	29,000	11,000	P40,000
3.	Total for furniture and equipment	-	-	-	-	-
4.	Total for special purposes	6,509	6,509	-	-	-
	TOTAL	P299,389	P196,000	P42,396	P20,993	P40,000
		VVVVVVV	VVVVVVV	VVVVVV	VVVVVV	VVVVVV

*Chargeable against the lump-sum appropriation for general grants-in-aid for fiscal year 1972 and to be released quarterly subject to the submission of quarterly report of expenditures.

1/ BAEcon, UPCA and USDA-AID will provide for the use of the project their furniture and equipment valued at P10,000, P25,000 and P209,000, respectively.

(SGD.) JUAN P. SINDAYEN
Officer-in-Charge, B F D

true copy:
s 6/27/74

APPENDIX C-6

PROJECT LINE-ITEM BUDGET
Fiscal Year 1973

PROJECT NO. 2.260

Original ... [x]
Amended ....
Date: 23 March 1973

PROJECT TITLE: AGRICULTURAL DIVERSIFICATION AND MARKETS IN THE PHILIPPINES

PROPONENT: Bureau of Agricultural Economics AREA: Agriculture

PERIOD COVERED: February 1, 1973 - January 31, 1974 (2nd Year of 3 Years

Item No.	Details	TOTAL	NSDB	BAECON	UPCA	USAID
	I. PERSONAL SERVICES					
1	One project director at ₱17,532 (20%)	₱ 3,506	-	₱ 3,506	-	-
2	One project leader at ₱14,289 (50%)	7,145	-	7,145	-	-
3	One assistant project leader at ₱10,260 (50%)	5,130	-	5,130	-	-
4	Two research associates at ₱6,888	13,776	-	13,776	-	-
5	One co-project leader at ₱9,780 (25%)	2,445	-	-	₱ 2,445	-
6	One assistant project leader at ₱10,440 (25%)	2,610	-	-	2,610	-
7	One assistant project leader at ₱9,300 (50%)	4,650	-	-	4,650	-
8	Six senior research associates ₱9,600	57,600	₱ 57,600	-	-	-
9	Seventeen senior researchers at ₱6,000	102,000	102,000	-	-	-
10	Fifteen research assistants at ₱4,200	63,000	63,000	-	-	-
11	Six science aide III at ₱3,600	21,600	21,600	-	-	-
12	Wages for emergency laborers	20,000	20,000	-	-	-
	Total for personal services	₱303,462	₱264,200	₱29,557	₱ 9,705	-
	II. MAINTENANCE & OTHER OPERATING EXPENSES					
1	Traveling expenses	₱ 35,000	₱ 20,000	₱15,000	-	-
2	Supplies and materials	25,798	18,798	5,000	₱ 2,000	-
3	Sundry expenses	175,000	15,000	10,000	30,000	₱120,000
		₱235,798	₱ 53,798	₱30,000	₱32,000	₱120,000
	III. FURNITURE & EQUIPMENT					
1	Equipment Outlay	-	-	-	-	(₱ 87,500)
	Total for furniture & equipment	-	-	-	-	(₱ 87,500)

PROJECT LINE-ITEM BUDGET
Fiscal Year 1973

PROJECT NO. 2.260

Original ... ☐
Amended .... ☐
Date: 23 March 1973

PROJECT TITLE: AGRICULTURAL DIVERSIFICATION AND MARKETS IN THE PHILIPPINES

PROPONENT: Bureau of Agricultural Economics AREA: Agriculture

PERIOD COVERED: February 1, 1973 - January 31, 1974 (2nd Year of 3 Years)

Item No.	Details	TOTAL	NSDB	BAECON	UPCA	USAID
	IV. SPECIAL PURPOSES					
1	Honoraria for:					
	a) One project director at ₱17,532 (15%)	₱ 2,630	₱ 2,630	-	-	-
	b) One project leader at ₱14,289 (15%)	2,143	2,143	-	-	-
	c) One co-project leader at ₱9,780 (10%)	978	978	-	-	-
	d) One assistant project leader at ₱10,440 (13.4%)	1,395	1,395	-	-	-
	e) One assistant project leader at ₱10,260 (13.5%)	1,395	1,395	-	-	-
	f) One assistant project leader at ₱9,300 (15%)	1,395	1,395	-	-	-
	g) Two research associates at ₱6,888 (15%)	2,066	2,066	-	-	-
		₱ 12,002	₱ 12,002	-	-	-
	S U M M A R Y					
	1. Total for personal services	₱303,462	₱264,200	₱29,557	₱ 9,705	-
	2. Total for maintenance and other operating expenses	235,798	53,798	30,000	32,000	₱120,000
	3. Total for furniture and equipment	-	-	-	-	-
	4. Total for special purposes	12,002	12,002	-	-	-
	T O T A L	₱551,262	₱330,000	₱59,557	₱41,705	₱120,000

*Chargeable against the following:
₱ 46,343 - Savings last fiscal year
283,657 - Grants-in-aid for FY 1973
₱330,000 - To be released quarterly subject to the submission of quarterly report of expenditures.

1/USAID will provide furniture & equipment for the use of the project valued at ₱87,500.

APPROVED:

(SGD.) FLORENCIO A. MEDINA
Chairman

(SGD.) ROMULO M. ADEVA
Department Budget Officer

A true copy: ogo 6/26/74

PROJECT LINE-ITEM BUDGET
Fiscal Year 1974

PROJECT NO. NSDB-BAEcon 7202Ag

Original ... x
Amended ....
Date: 14 March 1974

PROJECT TITLE: AGRICULTURAL DIVERSIFICATION AND MARKETS IN THE PHILIPPINES

PROPONENT: Bureau of Agricultural Economics

Old/New Project (3rd year of 3 years) AREA: Agriculture and Natural Resources

PERIOD COVERED: February 1, 1974 to January 31, 1975

Item No.	Details	TOTAL	NSDB	BAECON Counterpart	UPLB Counterpart	USAID Counterpart
	I. PERSONAL SERVICES					
1	One Project Director at ₱17,532 (20%)	₱ 3,506	-	₱ 3,506	-	-
2	One Project Leader at ₱14,289 (50%)	7,145	-	7,145	-	-
3	One Assistant Project Leader at ₱11,904 (50%)	5,888	-	5,888	-	-
4	Three Research Associates at ₱8,400 ea.	25,200	-	25,200	-	-
5	One Research Associate	6,888	-	6,800	-	-
6	One Research Assistant	5,376	-	5,376	-	-
7	One Co-Project Leader @₱9,780 (25%)	2,445	-	-	₱ 2,445	-
8	One Assistant Project Leader @₱10,440 (25%)	2,610	-	-	2,610	-
9	One Assistant Project Leader @₱9,300 (50%)	4,550	-	-	4,550	-
10	Six Senior Research Associate @₱9,600	57,600	₱ 57,600	-	-	-
11	Seventeen Senior Researchers @₱6,000	102,000	102,000	-	-	-
12	Fifteen Research Assistants @₱4,200	63,000	63,000	-	-	-
13	Six Science Aide III @₱3,600	21,600	21,600	-	-	-
14	Wages for Emergency Laborers	25,000	25,000	-	-	-
	Total for Personal Services	₱332,808	₱269,200	₱54,003	₱ 9,605	-
	II. MAINTENANCE AND OTHER OPERATING EXPENSES					
1	Traveling Expenses	₱ 31,863	₱ 16,863	₱15,000	-	-
2	Supplies and Materials	25,798	18,798	5,000	₱ 2,000	-
3	Sundry Expenses	65,000	10,000	10,000	30,000	₱ 15,000
	Total for Maintenance and Other Operating Expenses	₱122,661	₱ 45,661	₱30,000	₱32,000	₱ 15,000
	III. FURNITURE AND EQUIPMENT					
	IV. SPECIAL PURPOSES					
	Honoraria for-					
	a) One Project Director @₱17,532 (15%)	₱ 2,630	₱ 2,630	-	-	-

PROJECT LINE-ITEM BUDGET
Fiscal Year 1974

PROJECT NO. NSDB-BAEcon 7202Ag

Original ... X
Amended ....
Date: 14 March 1974

PROJECT TITLE: AGRICULTURAL DIVERSIFICATION AND MARKETS IN THE PHILIPPINES

PROPONENT: Bureau of Agricultural Economics

Old/New Project (3rd year of 3 years) AREA: Agriculture and Natural Resources

PERIOD COVERED: February 1, 1974 to January 31, 1975

Item No.	Details	TOTAL	NSDB	BAECON Counterpart	UPLB Counterpart	USAID Counterpart
	b) One Project Leader @₱14,289 (15%)	₱ 2,143	₱ 2,143	-	-	-
	c) One Co-Project Leader @₱9,780 (10%)	978	978	-	-	-
	d) One Assistant Project Leader @₱11,904 (15%)	1,785	1,785	-	-	-
	e) One Assistant Project Leader @₱10,440 (13.4%)	1,395	1,395	-	-	-
	f) One Assistant Project Leader @₱9,300 (15%)	1,395	1,395	-	-	-
	g) Three Research Associates ₱8,400 (15%)	3,780	3,780	-	-	-
	h) One Research Associate @₱6,999 (15%)	1,033	1,033	-	-	-
	Total for Special Purposes	₱ 15,139	₱ 15,139	-	-	-
	S U M M A R Y					
	I. Total for Personal Services	₱332,808	₱269,200	₱54,003	₱ 9,605	-
	II. Total for Maintenance and Other Operating Expenses	122,661	45,661	30,000	32,000	₱ 15,000
	III. Total for Furniture and Equipment	-	-	-	-	-
	IV. Total for Special Purposes	15,139	15,139	-	-	-
	TOTAL FOR THE PROJECT	₱470,608	₱330,000	₱84,003	₱41,605	₱ 15,000

*Chargeable against the following:
₱ 65,782.35 - Savings last Fiscal Year
264,217.65 - Grants-in-aid for FY 1974
₱330,000.00 - To be released quarterly subject to the submission of quarterly report of expenditures.

RECOMMENDING APPROVAL:

(SGD.) JOSE O. JAUG
Senior Scientist for Agriculture
DANRR

(SGD.) AGAPITO M. PEREZ
Officer-in-Charge, BFD

APPROVED:

(SGD.) FLORENCIO A. MEDINA
Chairman

A true copy: ogs 6/26/73

APPENDIX D-1

REPUBLIKA NG PILIPINAS
Kagawaran ng Pagsasaka at Likas na Kayamanan
KAWANIHAN NG EKONOMIYA SA PAGSASAKA
(Bureau of Agricultural Economics)
Casman Bldg., Quezon Boulevard Ext.
Lungsod ng Quezon

January 12, 1974

The Chairman
National Science Development Board
Bicutan, Taguig, Rizal

S i r :

This is to respectfully invite attention to the termination, by January 31, 1974, of the second year of NSDB-B/Econ 7202Ag project, "Agricultural Diversification and Markets (AD/M) in the Philippines," which had been originally scheduled for a three-year period covering four phases.

In this connection, may we request the following, in order to ensure continuity of the project's activities and thus enable it to meet its objectives so important to the country's development planning programs:

1. That Project AD/M be granted a year's extension for the completion of Phase III involving computerization and analysis.

2. That the balance of ₱28,008 from the project's second-year allotment of ₱330,000 be immediately released.

3. That Project AD/M be allowed to utilize its estimated second-year savings of about ₱76,000 to initially fund its third-year operations while NSDB evaluates the project's second-year accomplishments; the savings to be specifically used for payment of salaries and wages of the project personnel.

It will be noted from the progress report submitted to NSDB that Project ADAM requires twelve more months in order to complete the analyses vital to the building of the integrated agricultural production model; and, as indicated in the line-item budget (proposed for the third year), attached, no increase of the funding level is requested. Phase IV is for implementation during the terminal year of the project.

The amount of ₱28,008 requested for immediate release is intended for the third-quarter FY 1974 operations of the project, while permission to utilize the savings for the initial third-year operations will lead to a smooth transition period from the second to the third year.

Approval of these requests will afford the project the opportunity to remove the feeling of uncertainty among its participants, and thus enable it to finish the work needed for the successful completion of Phase III, which remains at its most critical stage.

Thank you very much, and please allow us to thank you for NSDB's sustained support of Project ADAM.

Very truly yours,

(SGD.) LEONARDO A. PAULINO
Director

a true copy:
6-26-74/csa

MICROFILMED FROM BEST
AVAILABLE COPY

APPENDIX D-2

Republika ng Pilipinas
PAMBANSANG LUPON SA PAGPAPAUNLAD NG AGHAM
(National Science Development Board)
Gen. Santos Ave., Bicutan, Taguig, Riz. 1

Telepono Blg. 842-2040-44
Kahong Koreo Blg. 3596 — Maynila

Sa Sagot
Sinupan Blg.__

26 March 1974

Hon. Arturo R. Tanco, Jr.
Secretary of Agriculture and
Natural Resources
Diliman, Quezon City

Through the Project Director
NSDB Project No. NSDB-B/Econ 7202Ag
Bureau of Agricultural Economics,
Quezon City

S i r :

This has reference to Project No. NSDB-B/Econ 7202Ag (2.260) entitled, "Agricultural Diversification and Markets (ADAM) in the Philippines" for which you are requesting the Board's financial assistance for the third year of operation covering the period 1 February 1974 to 31 January 1975.

In this connection, and considering the importance of the project to the agricultural and economic development of the country, and the favorable recommendations of the Chairman of NSDB Planning and Programming Committee and our technical staff, your request is hereby approved. Attached herewith for your guidance and information is the approved line-item budget for the third-year extension of the project. The amount of ₱330,000.00 granted to the project is subject to the following conditions:

1. That the sum of ₱330,000.00 shall be released to the project on a quarterly basis subject to the submission of quarterly reports of expenditures;

2. That all pertinent provisions of the Memorandum of Agreement entered into and executed on February 11, 1972 by and between the National Science Development Board and the Department of Agriculture and Natural Resources shall continue to be in full force and effect unless otherwise provided therein;

3. That proper acknowledgement of the financial and other assistance rendered by the NSDB shall be given due credit in all reports, articles, and news release;

MICROFILMED FROM BEST
AVAILABLE COPY

4. That all income derived from the project if any, shall be remitted to the Board;

5. That the project shall be guided by NSDB Policy Instructions No. 5.6 concerning discoveries and inventions in NSDB research projects; and

6. That a subsequent request for extension for another year shall be approved by the NSDB upon proper evaluation and recommendation.

Please confirm acceptance of the conditions set forth in this grant for the third-year operation by returning the duplicate copy of this letter along with your concurrence.

We hope that the approval of this request will lead to the continued smooth operation of the project as well as the attainment of its objectives.

Very truly yours,

(SGD.) FLORENCIO A. MEDINA
Chairman

CONFORME:

(SGD.) ARTURO R. TANCO, JR.
Secretary of Agriculture and
Natural Resources

(SGD.) LEONARDO A. PAULINO
Project Director

a true copy:
6-26-74/csa

April 4, 1974

The Chairman
National Science Development Board
Bicutan, Taguig, Rizal

Attention: Dr. Jose T. Jaug, Chief, NSDB-DANRR

S i r:

Thank you for the early approval of our request for the extension of the NSDB-BAEcon7202Ag project on Agricultural Diversification and Markets in the Philippines (Project ADAM) for another year, or from February 1, 1974 to January 31, 1975. We look forward to a third year of our Project's smooth and viable operations.

In this connection, we wish to inform you of the resignation of Dr. Ramon L. Nasol as Co-Project Leader effective February 14, 1974. Dr. Nasol has been authorized to accept a year-long assignment at the Asian Development Bank in Bangladesh as per attached copy of a letter of the Executive Secretary, Malacanang.

Dr. Aida R. Librero, Assistant Project Leader, is thus taking on the co-project leadership on the Los Baños side, effective on the date of Dr. Nasol's resignation. Meanwhile, Dr. Narciso M. Deomampo has been recommended as Assistant Project Leader effective February 1, 1974, vice Dr. Ernesto Abarientos who had resigned earlier. One vacancy in the Project ADAM leadership thus exists, i.e., Dr. Librero's earlier position as Assistant Project Leader.

We are also pleased to submit herewith the project's proposed quarterly plan for the period February 1, 1974 to January 31, 1975, as well as the restructured line-item budget for the same period. The financial plan, may we point out, provides for a general salary increase of ₱50.00 for all project personnel.

Lastly, please allow us to express our appreciation for the sustained support extended by NSDB to the Bureau of Agricultural Economics for Project ADAM.

Very truly yours,

For and in the absence of the Director:

(SGD.) JESUS C. ALIX
Assistant Director

A true copy
6/26/74 - iba

PROJECT LINE-ITEM BUDGET
FISCAL YEAR 1974

PROJECT NO. NSDB-BAEcon 7202Ag

Original
Amended X
Date: April 1, 1974

PROJECT TITLE: AGRICULTURAL DIVERSIFICATION AND MARKETS IN THE PHILIPPINES

PROPONENT: Bureau of Agricultural Economics Area: Agriculture

PERIOD COVERED: February 1, 1974 - January 31, 1975 (3rd Year of 3 Years)

Item No.	DETAILS	TOTAL	NSDB	BAECON	UPCA	USAID
	I. PERSONAL SERVICES					
1	One project director at ₱17,532(20%)	₱ 3,506	₱ -	₱ 3,506	₱ -	₱ -
2	One project leader at ₱14,289 (50%)	7,145	-	7,145	-	-
3	One Assistant project leader at ₱11,904 (50%)	5,952	-	5,952	-	-
4	Three research associates at ₱8,400	25,200	-	25,200	-	-
5	One research associate at ₱6,888	6,888	-	6,888	-	-
6	One research assistant at ₱5,376	5,376	-	5,376	-	-
7	One co-project leader at ₱12,540(25%)	3,135	-	-	3,135	-
8	One assistant project leader at ₱13,320 (25%)	3,330	-	-	3,330	-
9	One assistant project leader at ₱9,300 (50%)	4,650	-	-	4,650	-
10	Six senior research associates at ₱10,200	61,200	61,200	-	-	-
11	Seventeen senior researchers at ₱6,600	112,200	112,200	-	-	-
12	Fifteen research assistants at ₱4,800	72,000	72,000	-	-	-
13	Six science aide III at ₱4,200	25,200	25,200	-	-	-
14	Wages for emergency laborers	25,000	25,000	-	-	-
	Total for Personal Services	₱360,782	₱295,600	₱54,067	₱ 11,115	₱ -
	II. MAINTENANCE AND OTHER OPERATING EXPENSES					
1	Travelling expenses	₱ 20,863	₱ 5,863	₱15,000	₱ -	₱ -
2	Supplies and materials	15,426	8,426	5,000	2,000	-
3	Sundry expenses	59,000	4,000	10,000	20,000	15,000
	Total for Maintenance and Other Operating Expenses	₱ 95,289	₱ 18,289	₱30,000	₱ 32,000	₱15,000

DETAILS	TOTAL	NSDB	BAECON	UPCA	USAID
III. EQUIPMENT OUTLAY					
Equipment outlay	-	-	-	-	-
Total for furniture & equipment	-	-	-	-	-
IV. SPECIAL PURPOSES					
Honoraria for -					
a) One project director at ₱17,532 (15%)	₱ 2,630	₱ 2,630	₱ -	₱ -	₱ -
b) One project leader at ₱14,289 (15%)	2,143	2,143	-	-	-
c) One co-project leader at ₱12,540 (15%)	1,881	1,881	-	-	-
d) One assistant project leader at ₱11,904 (15%)	1,785	1,785	-	-	-
e) One assistant project leader at ₱13,320 (14.1%)	1,881	1,881	-	-	-
f) One assistant project leader at ₱9,300 (10.52%)	978	978	-	-	-
g) Three research associates at ₱8,400 (15%)	3,780	3,780	-	-	-
h) One research associate at ₱6,888 (15%)	1,033	1,033	-	-	-
Total for Special Purposes	₱ 16,111	₱ 16,111	₱ -	₱ -	₱ -
SUMMARY					
1. Total for personal services	₱360,782	₱295,600	₱54,067	₱11,115	₱ -
2. Total for maintenance and other operating expenses	95,289	18,289	30,000	32,000	₱15,000
3. Total for furniture and equipment	-	-	-	-	-
4. Total for special purposes	16,111	16,111	-	-	-
T O T A L	₱472,182	₱330,000	₱84,067	₱43,115	₱15,000

FORM A

QUARTERLY FINANCIAL PLAN

For the Period February 1, 1974 to January 31, 1975

April 4, 1974

The Chairman

National Science Development Board

Bicutan, Taguig, Rizal

Project No. NSDB-BAEcon7202Ag Title: Agricultural Diversification and Markets in the Philippines

The following is requested quarterly financial plan for this project. The start of this project is on February 1, 1974 (3rd project-year).

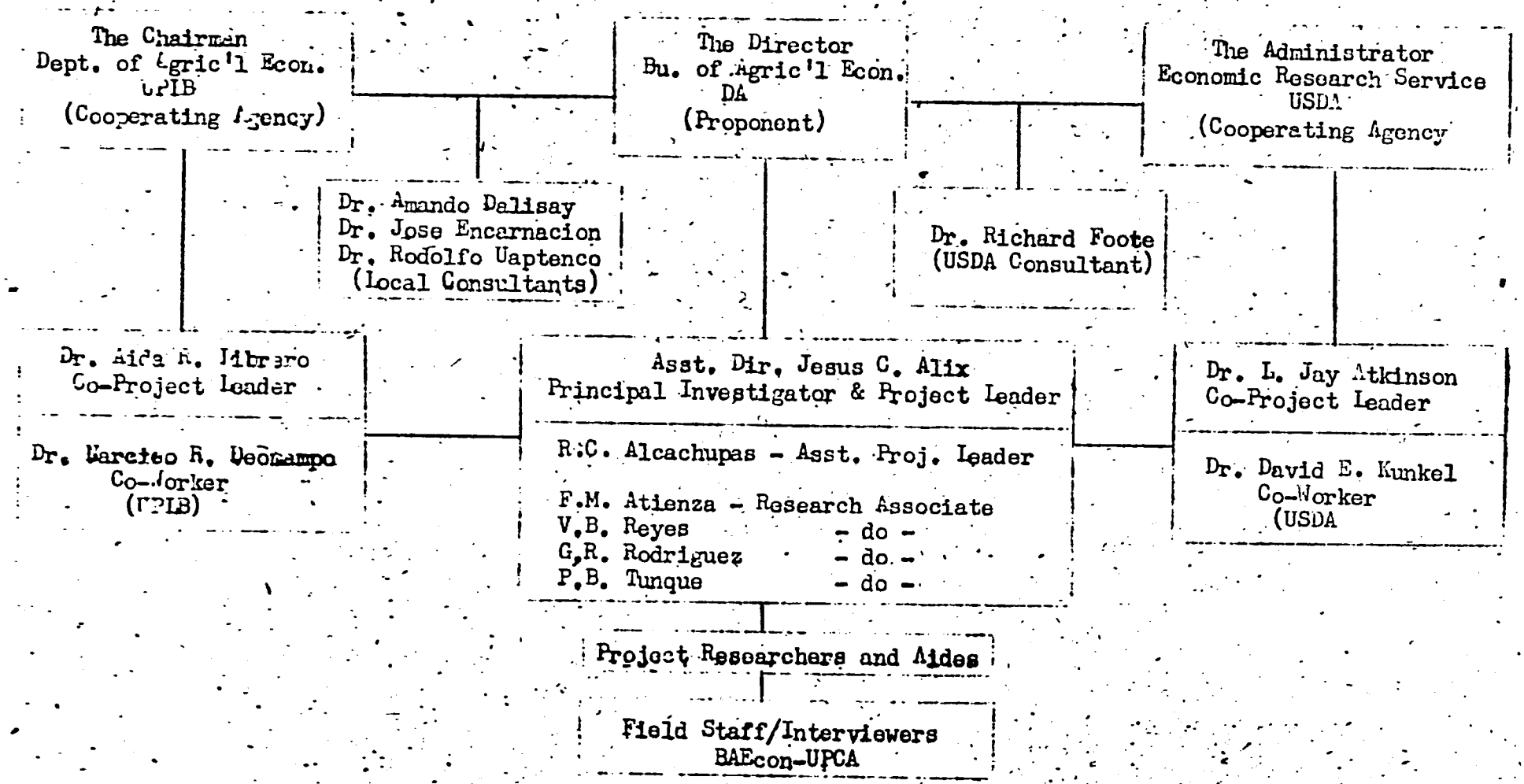
EXPENSE CLASS	AUTHORIZED APPROPRIATION	3rd QTR. FY 1974	4th QTR. FY 1974	1st QTR. FY 1975	2nd QTR. FY 1975	3rd QTR. FY 1975
Salaries	270,600.00	45,100.00	67,650.00	67,650.00	67,650.00	22,550.00
Wages	25,000.00	10,000.00	10,000.00	5,000.00	-	-
Traveling Expenses	5,863.00	2,686.00	1,500.00	1,000.00	677.00	-
Supplies and Materials	8,426.00	4,000.00	2,000.00	1,000.00	1,000.00	426.00
Special Purposes	16,111.00	2,685.17	4,027.75	4,027.75	-	-
Equipment Outlay	-	-	-	-	-	-
T O T A L	330,000.00	66,471.17	86,677.75	79,354.75	73,354.75	24,318.58

For and in the absence of the Director:

(SGD.) JESUS C. ALIX
Assistant Director and Project Leader

APPENDIX E

RESEARCH PROJECT ON
AGRICULTURAL DIVERSIFICATION AND MARKETS
IN THE PHILIPPINES



APPENDIX F-1

PROJECT ADAM ADMINISTRATIVE STAFF

Project Director

Leonardo A. Paulino, Ph.D., Michigan State University, 1966

Project Leader

Jesus C. Alix, M.S., University of Wisconsin, 1960

Co-Project Leaders

L. Jay Atkinson, Ph.D., Iowa State University, 1946
Aida R. Idtorro, Ph.D., University of Minnesota, 1970

Assistant Project Leaders

Narciso R. Deomampo, Ph.D., University of the Philippines, 1973
David E. Kunkel, Ph.D., University of Wisconsin, 1972
Ramon C. Alcachupas, B.S. Agriculture, University of the Philippines, 1954

Project Consultants

Amando M. Dalisay, Ph.D., Harvard University, 1946
Jose E. Encarnacion, Ph.D., Princeton University, 1960
Richard J. Foote, M.S., Iowa State University
Rodolfo T. Tapteneo, Ph.D., Michigan State University, 1967

Research Associates

Florentino M. Atienza, B.S. Agriculture, University of the Philippines, 1959
Victor B. Reyes, B.S. Agriculture, Aranete University, 1955
Gil R. Rodriguez, Jr., M.B.A., Ateneo University, 1974
Porfirio B. Tunque, B.S.A., University of the Philippines, 1972

PROJECT ADAM WORKING STAFF

Senior Research Associates

Quintin M. Balagot, M.S., University of the Philippines, 1974
Moises R. Cardido, M.S., University of the Philippines, 1974
Ismael P. Getubig, Jr., M.S., Virginia Polytechnic Institute, 1967
Ph.D. Cand., East-West Center University of Hawaii
Rebecca R. Jabutero, B.S.E., University of the Philippines, 1966

Senior Researchers

Aida C. Alcasid, B.S. Agriculture, University of the Philippines, 1971
Delia Priscilla G. Aquino, B.S. Agriculture, University of the Philippines, 1971
Erlinda M. Elison, B.S. Agriculture, University of the Philippines, 1971
Francisco P. Javillonar, AB Economics, University of the Philippines, 1967
BSC (Accounting), Assumption College, 1971 a/
Ester S. Laudo, B.S. Agriculture, University of the Philippines, 1972 b/
Cecilia M. de Leon, B.S. Agriculture, University of the Philippines, 1973
Juanita M. Receno, B.S. Agriculture, University of the Philippines, 1973
Belinda A. Oriosto, B.S. Agriculture, University of the Philippines, 1968 b/
Josefina B. Sison, B.S. Statistics, University of the Philippines, 1971 a/
Rebecca R. Coroza, B.S. Agriculture, University of the Philippines, 1972
Rodolfo M. Garcia, B.S.C. (Undergraduate), Philippine College of Commerce
Cielo-Gracia Tutaan, B.B.A., St. Louis University, 1972
Isabelita R. Bulacan, B.S.C. Marketing, Philippine College of Commerce, 1972
Elizabeth C. Bordin, B.B.A. Economics, University of the East, 1972
Angelina Mendoza, B.S. Agriculture, University of the Philippines, 1973
Venus P. Orogo, A.B. History, Ateneo de Naga, 1971
Aleli R. Funtanilla, B.S. Agriculture, University of the Philippines, 1972
Josefina Sidiangco, A.B. (Economics), University of the Philippines, 1974

Research Assistants

Carmelita S. Abad, B.S.C. (Economics), Philippine College of Commerce, 1972
Imelda B. Aguas, B.S. Biological Sciences, University of the East, 1970
Guillermo C. Bella, Voc. Training, Calamba Vocational School
Carolina E. Belen, B.S.C. (Accounting) Laguna College, 1967
Marina M. Velasco, B.S.C. (Accounting) Laguna College, 1971
Moises B. Malabanan, B.S.C. Student, Laguna Institute, 1970 to date
Filomena M. Almario, B.S.C. (Accounting) Far Eastern University, 1969
Erlinda S. Maulit, B.S.C. (Banking and Finance) Notre Dame University, 1970
Nerisa D. Mendoza, Secretarial Science, Tech. Institute of the Philippines, 1969
Emelina N. Presa, Secretarial Science, Arellano University, 1971
Emelina G. Solano, B.S.E.ED. Cand., University of the East
Santiago Flores, B.S.C. (undergraduate) National Teachers' College
Josefina Deoquino, B.A. (Marketing), University of the Philippines, 1970
Robert D. Gerochi, B.S.C. (Economics), Lyceum of the Philippines, 1972

---

a/ Detailed from BAEcon

b/ Resigned within the period under report

Science Aide III

Simplicia Panganiban, A.C.S., University of the East, 1970
Zenaida G. dela Cruz, B.S.E.ED., University of Santo Tomas, 1968
Josefa A. Duque, Associate in Arts, Philippine Dental College, 1953
Florita A. Tañido, B.S.E.ED., National Teachers' College, 1970
Myrna B. Pasagui, A.C.S., San Pablo Colleges, 1967

Emergency Science Aides

Corazon T. Camaya, B.S.E.ED., Baliwag Junior College, 1967
Rosa Maria Estrellado. B.S. Medical Technology, Far Eastern University, 1972
Marta M. Moyano, A.C.S. Araullo Vocational School, 1971
Maura P. Maloma, B.S.E.ED., National Teachers' College, 1970
Julita Cabatbat, B.S.C. (Accounting) Luzon Colleges, 1971
Fatima V. Moneda, B.S.B.A. (Accounting), Ateneo de Naga, 1972
Virginia F. Matel, B.S.E.ED., South Eastern College, 1968
Eater Casan, A.C.S., Philippine College of Commerce, 1971
Amelia Villaluna, B.S.C. (Banking and Finance) Arellano University, 1965
Fe Valdez, A.B. Economics, Lyceum of the Philippines, 1971
Jose R. Fabros, Mechanical Engineering, Mapua Institute of Technology, 2nd year
Teresita L. Agbay, B.S.B.A. (Economics), University of the East, 1973
Perfecto del Rosario, High School Graduate

Educational Profile, Project ADAM Staff

Degree/Preparation 1/	Project Consultants and Management	BAECON Staff on Detail	Regular ADAM Staff	Emergency ADAM Staff	TOTAL
I. Doctoral Level					
Ph.D. in Agricultural Economics/Economics	7	-	-	-	7
Ph.D. in Fields other than Ag. Economics/ Economics	1	-	-	-	1
II. Master's Level					
M.S./M.A. in Agricultural Economics/Economics	1	-	3	-	4
M.S./M.A. in Fields other than Ag. Economics/Economics	1	1	-	-	2
III. Bachelor's Level					
B.S. Agriculture, major in Agricultural Economics	1	-	7	-	8
B.S. Agriculture, major other than Ag. Economics	-	2	1	-	3
A.B./B.S. major in Economics or Statistics	-	3	6	2	11
A.B./B.S. major other than Economics/Statistics	-	-	11	7	18
Undergraduate (A.B./B.S.)	-	-	11	3	14
TOTALS	11	6	39	12	68

1/ Highest degrees only

AGRICULTURAL SECTOR MODELS FOR THE PHILIPPINES: FORMULATION AND DATA

by R. J. Foote

Introduction

Two models were run, one covering rice, corn, root crops, wheat flour and flour equivalent of wheat, fish, pork, beef, poultry meat, and eggs, and a second limited to the five most important items, namely, rice, corn, fish, pork, and poultry meat. Each is designed to complement the previously completed macro model for the Philippines. Endogenous variables relating directly to agriculture total 16 for the full model and 11 for the smaller model. In each case, two identities are involved, leaving 14 and 9 equations, respectively, that were fitted by 3-stage least squares. A first-round equation for disposable income was included in each model, based on an index of production for all items in the model plus the three predetermined variables from the macro model, but this variable for analytical purposes will be estimated from the macro model.

All quantitative data are on a per capita basis, and all price and value data are in real terms. Macro variables are in 1955 prices. Price data were deflated by use of the Consumer Price Index for Manila on a 1965 base. For the production indexes, 1964-65 = 100. Rice data are for an October-September year, and all other annual data relate to a July-June year. In a number of cases, calendar year data were averaged to obtain an estimate for the latter. Livestock inventories are for the March 1 or January 1 prior to the start of the crop year. All data were compiled and checked by Project ADAM personnel, and a write-up giving sources and procedures is available from them.

The models were fitted based on data for the 14 years, 1955-56 through 1968-69. Crop production data beginning in 1969-70 were based on a changed sampling procedure and do not appear completely consistent with the series for prior years. Certain other apparent discontinuities in data series are discussed later.

Export crops were omitted because demand for them chiefly is determined in world markets or in the countries to which they are shipped. Separate analyses for the major ones will be made later. These may be mainly of a descriptive nature.

For these models, all production data are considered as predetermined. For forecasting, two approaches will be tested: (1) Use of production equations developed at Los Baños based on a Nerlove approach, and (2) Enterprises that would maximize total farm income based on an IP model. In either case an iterative approach likely will be involved to equate predicted prices from the agricultural sector model with those in the production functions.

Variables

Variables for the full model are listed below, first described in words and then in symbols and numbers as used for the computer run. Symbolic names are limited by the computer program to six characters. The first one or two characters relate to the nature of the data as follows: Q is production, C is consumption or disappearance as derived from the identities in the model, IM is net imports, S is slaughter, and P is price. Remaining characters in the symbol show part or all of the commodity name. For variables to be estimated from first-round equations, an F is the first character. Macro variables have the same symbols as in the macro model. Q /II and Q SUB relate, respectively, to production indexes on a per capita basis, and ANUNIT is a grain-consuming animal units series on a per capita basis developed for the study. The F-notation is that used in the format and data cards.

The variables Q PORK, Q BEEF, and Q POULT were obtained in an unusual way. Ratios were computed between slaughter and inventories for the respective items for each year. These were plotted on graphs, and free-hand trends or discontinuous averages were drawn. The variables equal inventories for each year times the "trend ratio" for that year placed on a per capita basis. Had smooth upward trends been obtained, these would have represented improvements in technology. No trend was found for beef. Pork was flat through 1963-64 and then shifted rapidly to a 38 percent higher level beginning in 1965-66. Poultry was flat through 1958-59, then dropped by 13 percent to another flat level through 1965- then increased to an 82 percent higher level from 1967-68 forward. Project ID/M personnel plan further study of the livestock and poultry series relating to inventories and slaughter as time permits.

Endogenous Variables

Y_1 - Derived disappearance of rice (kgl)

Y_2 - Net imports of rice (kg.)

Y_3 - Wholesale price of palay in Manila, weighted average of Wag-Wag, Elon-Elon, and Macon (per 56 kg. sack)

Y_4 - Derived disappearance of corn (kg.)

Y_5 - Net imports of corn (kg.)

Y_6 - Wholesale price of white whole-grain corn in Manila (per 56 kg. sack)

Y_7 - Imports of wheat and wheat flour on a flour-equivalent basis (kg.)

Y_8 - Wholesale price of fresh Bangus fish in Manila (per kg.)

Y_9 - Wholesale price of pork in Manila (per kg.)

Y_{10} - Wholesale price of beef in Manila (")

Y_{11} - Wholesale price of live chickens in Manila (per kg.).

Y_{12} - Wholesale price of Leghorn chicken eggs in Manila (per 100 eggs)

Y_{13} - Farm value of root crops (per ton)

Y_{14} - Slaughter of chickens and ducks, dressed-weight (kg.)

Y_{15} - Slaughter of hogs, dressed-weight (kg.)

Y_{16} - Slaughter of cattle and carabao, dressed-weight (kg.)

Y_{17} - Disposable income in 1955 prices (Pesos)

MICROFILMED FROM BEST
AVAILABLE COPY

Predetermined Variables

X_1 - Production of palay (rice equivalent) (kg.)

X_2 - Production of shelled corn (kg.)

X_3 - Value of imports of wheat flour (per kg.)

X_4 - Production of fish (kg.)

X_5 - Inventory of pigs adjusted for changes in technology (kg.)

X_6 - Inventory of cattle and carabao adjusted for changes in technology (kg.)

X_7 - Inventory of chickens and ducks adjusted for changes in technology (kg.)

X_8 - Production of eggs (kg.)

X_9 - Production of root crops (kg.)

X_{10} - A price-weighted index of production of all commodities included in the full model (Index + population in millions)

X_{11} - X_5, X_7, and X_8 combined based on relative consumption of grain (kg.)

X_{12} - A price-weighted index of production for rice, corn, pigs, fish, and poultry (Index + population in millions)

X_{13} - Lagged consumer expenditures for all items in the National Accounts (Pesos)

X_{14} - Exports of all goods and services (Pesos)

X_{15} - Government expenditures for consumption (Pesos)

MICROFILMED FROM BEST
AVAILABLE COPY

Variables in Symbolic Terms

No.	Variable	Symbol	F-notation
1	X_1	Q RICE	4.2
2	X_2	Q CORN	4.2
3	X_3	P FLOUR	4.4
4	X_4	Q FISH	4.2
5	X_5	Q PORK	4.2
6	X_6	Q BEEF	4.3
7	X_7	Q POULT	4.3
8	X_8	Q EGGS	4.3
9	X_9	Q ROOTS	4.2
10	X_{10}	Q ALL	4.3
11	X_{11}	ANUNIT	4.2
12	X_{12}	Q SUB	4.3
13	X_{13}	C-1	4.1
14	X_{14}	X	4.2
15	X_{15}	G	4.2
16	Y_{17}	YD	4.1
17	Y_1	C RICE	4.2
18	Y_2	IMRICE	4.2
19	Y_3	PRICE	4.2
	End 1st Data Card		
20	Y_4	C CORN	4.2
21	Y_5	IMCORN	5.3
22	Y_6	P CORN	4.2
23	Y_7	IM WHFL	4.2
24	Y_8	P FISH	4.3
25	Y_9	P PORK	4.3
26	Y_{10}	P BEEF	4.3
27	Y_{11}	P CHICK	4.3
28	Y_{12}	P EGGS	4.2
29	Y_{13}	P ROOTS	4.2
30	Y_{14}	S POULT	4.3
31	Y_{15}	S PORK	4.2
32	Y_{16}	S BEEF	4.3
33	$\hat{Y}_3$	F P RICE	
34	$\hat{Y}_6$	F P CORN	
35	$\hat{Y}_7$	F IM WFL	
36	$\hat{Y}_8$	F P FISH	
37	$\hat{Y}_9$	F P PORK	
38	$\hat{Y}_{10}$	F P BEEF	
39	$\hat{Y}_{11}$	F P CHIC	
40	$\hat{Y}_{12}$	F P EGGS	
41	$\hat{Y}_{14}$	F S POUL	
42	$\hat{Y}_{15}$	F S PORK	
43	$\hat{Y}_{16}$	F S BEEF	
44	$\hat{Y}_{17}$	F YD	

Equations In The Full Model

These are shown first in symbolic terms, and then in (a) letters and (b) numbers. Variables with a hat are from first-round equations. Demand and price equations include those substitute or complementary products that were believed to be most important. Program limitations prevent inclusion of all items in all equations. Even with the formulation shown, the last four equations had to be omitted at first. As variables were dropped due to wrong signs, omitted equations were added.

Fish was assumed to be complementary with rice and corn because of its importance in diets of those with very low incomes. ANUNIT was included in the equations for rice, corn and root crops because of their possible use as livestock feed and was required to enter with a positive sign. Beef was considered to have little competition from other foods, and eggs also were treated in this way. Allowance was made for pork, poultry, and fish to be competitive with each other. Income was permitted to enter with either a positive or negative sign in the equations for rice, corn, fish, and root crops. In all other equations, a positive sign was required. In the slaughter equations, a coefficient close to unity was expected on production. No sign was specified on the price of the item except that the sign for eggs was required to be negative (high egg prices tend to reduce slaughter from a given inventory of chickens). Research in Vietnam showed that favorable hog/rice price ratios tended to reduce slaughter due to a holding back of animals for breeding. On the other hand, high meat prices might encourage current slaughter. Feed prices were required to have a sign opposite to that for the price of meat. (Ratios would have been preferred, but lack of experience with the Gauss-Seidel routine in Vietnam made it desirable to use linear equations which could be solved by algebra if necessary.) Rice (palay) may be used as feed for both hogs and poultry, but likely is not used for beef. In fact, any grain for beef may be negligible in terms of totals for the country. Imports of both rice and corn were considered to equal the difference between calculated consumption and predetermined production but, of course, are endogenous to the entire system. Prices for flour (chiefly from U.S. wheat) were considered to be determined in world export markets.

Variables that entered with wrong signs and that were not considered as essential were dropped one at a time for each 3-SIS equation, taking out that variable which was believed to be least important of those left or that had the smallest t-ratio. If major variables (own-price or supply) entered with a wrong sign in the 3-SIS equation but had a correct sign in the 2-SIS equation, the 2-SIS equation was used. Other modifications will be discussed in another memo where results are shown.

Stochastic Equations to Be Fitted by 3-SIS

(1) C RICE = f(P RICE, P CORN, P FISH, ANUNIT, YD)
(2) P RICE = f(Q RICE, Q CORN, Q FISH, IMWHFL, ANUNIT, YD)
(3) C CORN = f(P RICE, P CORN, P FISH, ANUNIT, YD)
(4) P CORN = f(Q RICE, Q CORN, Q FISH, IMWHFL, ANUNIT, YD)
(5) IMWHFL = f(P FLOUR, P RICE, P CORN, YD)
(6) P FISH = f(P RICE, P CORN, Q FISH, S POUIT, S PORK, YD)
(7) P PORK = f(S PORK, S POUIT, Q FISH, YD)
(8) P CHICK = f(S POUIT, S PORK, Q FISH, YD)
(9) S POUIT = f(Q POUIT, P CHICK, P EGGS, P RICE, P CORN)
(10) S PORK = f(Q PORK, P PORK, P RICE, P CORN)
(11) P BEEF = f(S BEEF, S PORK, YD)
(12) S BEEF = f(Q BEEF, P BEEF, P CORN)
(13) P EGGS = f(Q EGGS, YD)
(14) P ROOTS = f(Q ROOTS, Q RICE, Q CORN, ANUNIT, YD)

Identities

(15) IMRICE = C RICE - Q RICE
(16) IMCORN = C CORN - Q CORN

(Note: YD to be estimated from macro model)

Stochastic Equations Repeated As Numbered Variables

(1) $Y_1 = f(\hat{Y}_3, \hat{Y}_6, \hat{Y}_8, X_{11}, \hat{Y}_{17})$

(2) $Y_3 = f(X_1, X_2, X_4, \hat{Y}_7, X_{11}, \hat{Y}_{17})$

(3) $Y_4 = f(\hat{Y}_3, \hat{Y}_6, \hat{Y}_8, X_{11}, \hat{Y}_{17})$

(4) $Y_6 = f(X_1, X_2, X_4, \hat{Y}_7, X_{11}, \hat{Y}_{17})$

(5) $Y_7 = f(X_3, \hat{Y}_3, \hat{Y}_6, \hat{Y}_{17})$

(6) $Y_8 = f(\hat{Y}_3, \hat{Y}_6, X_4, \hat{Y}_{14}, \hat{Y}_{15}, \hat{Y}_{17})$

(7) $Y_9 = f(\hat{Y}_{15}, \hat{Y}_{14}, X_4, \hat{Y}_{17})$

(8) $Y_{11} = f(\hat{Y}_{14}, \hat{Y}_{15}, X_4, \hat{Y}_{17})$

(9) $Y_{14} = f(X_7, \hat{Y}_3, \hat{Y}_6, \hat{Y}_{11}, \hat{Y}_{12})$

(10) $Y_{15} = f(X_5, \hat{Y}_3, \hat{Y}_6, \hat{Y}_9)$

(11) $Y_{10} = f(\hat{Y}_{15}, \hat{Y}_{16}, \hat{Y}_{17})$

(12) $Y_{16} = f(X_6, \hat{Y}_6, \hat{Y}_{10})$

(13) $Y_{12} = f(X_8, \hat{Y}_{17})$

(14) $Y_{13} = f(X_9, X_1, X_2, X_{11}, \hat{Y}_{17})$

---

(1) 17 = f (11, 33, 34, 36, 44)

(2) 19 = f (1, 2, 4, 11, 35, 44)

(3) 20 = f (11, 33, 34, 36, 44)

(4) 22 = f (1, 2, 4, 11, 35, 44)

(5) 23 = f (3, 33, 34, 44)

(6) 24 = f (4, 33, 34, 41, 42, 44)

(7) 25 = f (4, 41, 42, 44)

(8) 27 = f (4, 41, 42, 44)

(9) 30 = f (7, 33, 34, 39, 40)

(10) 31 = f (5, 33, 34, 37)

(11) 26 = f (42, 43, 44)

(12) 32 = f (6, 34, 38)

(13) 28 = f (8, 44)

(14) 29 = f (1, 2, 9, 11, 44)

First-Round Equations (12 in all)

19, 22, 23, 24, 25, 26, 27, 28, 30, 31, 32 = f (1 through 9)

16 = f (10, 13, 14, 15)

(Variables 10, 11, and 12 are combinations of those included in the regular first-round equations and hence should not be included when these are in.)

Sub-Model

This takes into account only the five most important commodities, namely, rice, corn, fish, pork, and poultry meat.

Stochastic Equations

(1) $Y_1 = f(\hat{Y}_3, \hat{Y}_6, \hat{Y}_8, X_{11}, \hat{Y}_{17})$

(2) $Y_3 = f(X_1, X_2, X_4, X_{11}, \hat{Y}_{17})$

(3) $Y_4 = f(\hat{Y}_3, \hat{Y}_6, \hat{Y}_8, X_{11}, \hat{Y}_{17})$

(4) $Y_6 = f(X_1, X_2, X_4, X_{11}, X_{17})$

(5) $Y_8 = f(\hat{Y}_3, \hat{Y}_6, X_4, \hat{Y}_{14}, \hat{Y}_{15}, \hat{Y}_{17})$

(6) $Y_9 = f(\hat{Y}_{15}, \hat{Y}_{14}, X_4, \hat{Y}_{17})$

(7) $Y_{11} = f(\hat{Y}_{14}, \hat{Y}_{15}, X_4, \hat{Y}_{17})$

(8) $Y_{14} = f(X_7, \hat{Y}_3, \hat{Y}_6, \hat{Y}_{11})$

(9) $Y_{15} = f(X_5, \hat{Y}_3, \hat{Y}_6, \hat{Y}_9)$

---

(1) 17 = f (11, 33, 34, 36, 44)

(2) 19 = f (1, 2, 4, 11, 44)

(3) 20 = f (11, 33, 34, 36, 44)

(4) 22 = f (1, 2, 4, 11, 44)

(5) 24 = f (4, 33, 34, 41, 42, 44)

(Con't)

(6) 25 = f (4, 41, 42, 44)

(7) 27 = f (4, 41, 42, 44)

(8) 30 = f (7, 33, 34, 39)

(9) 31 = f (5, 33, 34, 37)

Identities (as before)

First-Round Equations (12 in all)

All must be run so that a common set of name cards can be used for both models.

19, 22, 23, 24, 25, 26, 27, 28, 30, 31, 32 = f (1, 2, 4, 5, 7)

16 = f (12, 13, 14, 15)

Data

Table 1 shows the data as used for the models, including the actual value of the ratios that were designed to measure technological changes in livestock production. Population and CPI also are given. It should be remembered that all price and value data are in real terms and that all initial quantitative variables were put in per capita terms. Initial data series (prior to conversion) are available from project ADAM personnel. If calendar year data as shown in the project ADAM tables were averaged to obtain fiscal year data, this is indicated by an asterisk. However, some project ADAM tables were obtained in this way. If their table is shown on a fiscal year basis, no asterisk is shown on table 1. Exports of rice and corn are available only for calendar years, but imports are by fiscal years. Exports were allocated to the corresponding fiscal year having smallest imports. Foreign trade was considered of negligible importance for all items in the model except rice, corn, and flour (including the flour equivalent of wheat), and no stock figures were used due to a lack of data for most items.

Table 1. Philippine Agricultural Sector Models: Data Used and Related Variables

Year	Population* Mil.	CPI, Manila 1965 = 1 July-Jun.	CPI, Manila 1965 = 1 Oct-Sept	Y_1 C RICE Kg.	Y_2 IMPRICE Kg.	Y_3 PRICE Per sack	Y_4 C CORN Kg.	Y_5 IMCORN Kg.	Y_6 P CORN Per sack	Y_7 IMWHFL Kg.	Y_8 P FISH Per Kg.	Y_9 P PORK Per Kg.	Y_{10} P BEEF Per Kg.
1955-56	23.9	.72	.72	89.3	2.8	27.9	38.0	0	11.2	9.7	1.90	1.81	3.88
56-57	24.7	.74	.74	85.4	.4	29.0	36.4	.20	15.0	10.1	1.88	1.75	3.78
57-58	25.4	.76	.77	88.5	8.1	32.5	34.4	.83	15.9	11.6	1.76	1.71	3.68
58-59	26.2	.76	.76	90.9	2.2	25.7	39.4	.61	11.9	9.5	1.59	1.72	3.68
59-60	27.0	.77	.78	87.5	.3	25.8	40.3	-2.85	11.9	7.7	1.70	1.69	3.64
60-61	27.8	.80	.81	88.3	3.9	30.6	43.0	-.50	17.2	8.1	1.75	1.62	3.50
61-62	28.6	.83	.84	88.7	2.4	28.3	42.7	-.21	13.7	8.5	1.57	2.39	3.37
62-63	29.5	.88	.88	88.8	4.3	29.6	43.2	0	15.6	8.4	1.73	2.48	3.26
63-64	30.4	.94	.96	91.3	11.4	33.6	42.5	0	16.3	10.6	1.54	2.63	3.18
64-65	31.3	1.00	1.00	97.3	16.7	32.1	41.9	0	16.8	10.6	1.41	2.45	3.00
65-66	32.3	1.02	1.04	83.6	3.9	34.2	42.9	0	20.7	11.1	1.59	2.64	2.94
66-67	33.3	1.08	1.10	87.9	9.2	36.7	46.5	1.51	16.8	10.8	1.67	2.65	2.78
67-68	34.3	1.14	1.14	82.5	-1.2	33.3	47.6	.15	15.5	13.0	1.53	2.79	3.07
68-69	35.1	1.15	1.16	78.7	-1.2	30.2	49.4	0	16.2	8.8	1.51	2.78	3.04
69-70	36.2	1.23	1.28	90.9	0	33.6	56.2	.69	14.2	9.8	1.40	2.72	2.85
70-71	37.3	1.43	1.48	92.9	3.3	34.5	54.4	.64	20.2	9.4	1.37	2.79	2.73
71-72	38.5	1.52	1.67	98.0		38.2	56.1	3.79	21.5	9.5	1.77	2.93	3.47
72-73	39.6												
73-74	40.8												
74-75													

Table 1. (Con't)

Year	X_7 Q POULT Kg.	X_8 Q EGGS* Kg.	X_9 Q ROOTS +	X_{10} Q ALL Kg.	X_{11} ANUNIT Kg.	X_{12} Q SUB +	X_{13} C-I* Pesos	X_{14} X* Pesos	X_{15} G* Pesos	Slaughter-Inventory Ratio Pork	Poultry (kg./Head)	Beef°
1955-56	1.94	3.91	52.8	3.22	26.2	3.13	314	48.1	29.7	48	1.04	17
56-57	2.10	3.99	52.3	3.26	28.1	3.15	320	46.2	30.4	47	1.00	17
57-58	2.16	4.01	52.4	3.15	29.2	3.04	323	42.5	31.1	45	.97	18
58-59	2.08	3.94	51.2	3.34	27.6	3.26	324	38.9	31.7	47	.98	20
59-60	1.91	3.93	52.3	3.34	29.4	3.26	330	40.0	33.0	47	.89	19
60-61	1.71	4.34	52.0	3.28	28.7	3.18	331	42.4	34.9	46	.88	17
61-62	1.58	4.05	47.0	3.22	25.3	3.15	336	41.6	37.4	51	.86	19
62-63	1.57	3.22	46.1	3.18	26.5	3.16	339	44.7	40.7	45	.84	19
63-64	1.44	2.97	51.1	3.08	23.5	3.06	342	50.0	42.4	47	.91	17
64-65	1.48	2.94	49.1	3.19	28.1	3.19	345	55.0	42.8	53	.89	17
65-66	1.58	3.19	45.7	3.39	36.9	3.39	348	64.9	44.1	65	.84	17
66-67	2.06	3.11	41.3	3.40	35.9	3.40	350	68.0	44.4	65	.97	17
67-68	3.19	3.06	38.3	3.44	26.6	3.44	358	58.9	46.3	65	1.51	16
68-69	3.19	3.64	33.1	3.59	30.0	3.58	373	53.0	50.7	69	1.61	18
69-70	2.83	3.59	36.4		28.9		390	53.3	50.0	61	1.56	15
70-71	2.50	3.59	32.7		25.6		394	56.6	48.0		1.65	
71-72	2.42		31.6				390	59.2	48.1			
72-73	2.10						394					
73-74												
74-75												

* Average of calendar year data as given on Project ADAM tables.
\+ Index number divided by population in million.
o Low ratio reflects use of most animals for draft power.

Table 1. (Con't)

Year	Y_{11} P CHICK Per Kg.	Y_{12} P EGGS Per 100	Y_{13} P ROOTS Per ton	Y_{14}* S POULT Kg.	Y_{15} S PORK Kg.	Y_{16} S BEEF Kg.	Y_{17} YD* Pesos	X_1 Q RICE Kg.	X_2 Q CORN Kg.	X_3 P FLOUR Per Kg.	X_4 Q FISH Kg.	X_5 Q PORK Kg.	X_6 Q BEEF Kg.
1955-56	3.25	15.1	8.6	2.00	10.7	2.96	343	86.4	37.9	0.338	15.2	10.4	3.03
56-57	3.16	14.7	8.4	2.11	10.9	3.13	356	85.0	36.2	.326	16.0	10.9	3.19
57-58	3.16	15.3	7.3	2.09	10.8	3.23	366	80.5	33.5	.309	15.2	11.1	3.11
58-59	3.01	15.3	6.8	2.05	11.0	3.48	370	88.7	38.8	.304	16.3	10.9	3.03
59-60	2.96	13.9	7.8	1.95	11.4	3.36	378	87.2	43.1	.301	16.1	11.4	3.09
60-61	2.88	14.0	9.8	1.73	10.9	2.97	385	84.4	43.5	.340	16.0	11.1	3.06
61-62	2.81	13.5	10.1	1.55	7.6	3.04	385	86.2	42.9	.423	15.9	10.2	2.79
62-63	2.65	12.3	10.1	1.51	6.8	2.95	380	84.5	43.2	.531	16.4	10.7	2.74
63-64	3.02	12.9	9.8	1.51	9.7	2.48	385	79.9	42.5	.393	18.0	9.6	2.63
64-65	3.09	13.6	9.7	1.51	11.2	2.43	399	80.5	41.9	.398	19.3	11.2	2.59
65-66	3.16	14.2	12.0	1.52	14.0	2.64	407	79.7	42.9	.465	20.7	14.0	2.70
66-67	2.59	13.2	13.1	2.06	13.5	2.75	417	78.7	45.0	.305	21.3	13.6	2.79
67-68	2.95	12.9	13.8	3.04	10.5	2.63	422	83.7	47.5	.318	21.9	10.5	2.86
68-69	2.62	12.3	18.1	3.26	11.9	2.91	430	79.9	49.4	.263	26.7	11.3	2.93
69-70	2.68	12.1	25.0	2.78	10.8	2.49	450	90.9	55.5	.359	26.0	11.4	2.93
70-71	2.76	14.8	24.4	2.62			456	89.7	53.8	.299	26.5	11.3	2.90
71-72	3.41	15.9					452	83.3	52.3	.488		11.9	2.91
72-73							462					12.7	2.97
73-74													
74-75													

(Con't)

PHILIPPINE AGRICULTURAL SECTOR MODELS SELECTION OF VARIABLES FROM THE COMPUTER RUNS AND DISCUSSION OF RESULTS

Richard J. Foote 1/

Introductory Comments

Fitting of these models, as I understand it, is designed for three purposes: (a) To generate a system of equations which can be used with other analyses and information as a guide for policy decisions relating to agriculture for both public officials and individual farmers. (b) To determine the extent to which presently available data and other information is satisfactory for this purpose and, by default, areas where new or revised data or other information is needed. (c) To assist Filipino and other research workers to increase their knowledge of relatively complex methods of econometric analysis, in this case, the development, use, and interpretation of systems of simultaneous equations. Because of this last-named purpose, this report discusses fully the thought processes involved in going from the model as initially formulated and described in a previous report to the final model that emerged from the many runs made through the computer.

Three aspects of the method of 3-stage least squares need to be understood: (a) The mathematics involved in calculating frequency distributions for coefficients that relate to systems of simultaneous equations is so complex that it has been impossible to obtain these for other than infinitely large samples. Hence it has been necessary to study these properties for small samples by use of Monte Carlo approaches. Results of the studies that have been made, while not conclusive, suggest strongly that methods such as 2-SLS and 3-SLS that take account of the simultaneity in the system give considerably better estimates of the coefficients even under many types of mis-specification than do methods such as ordinary least squares (OLS) that do not take account of this simultaneity. 3-SLS, which makes use of more information about the model than does 2-SLS, usually was slightly better than 2-SLS. An excellent computer program that gives 2-SLS and 3-SLS results for all or most stochastic equations in the system in a single pass is available. On the USAID/Saigon IBM 360/50, about

---

1/ Project ADAM consultant and Econometrician, ADFA/AES.

5-1/2 minutes of computer time was required to run simultaneously the first 10 equations of the full model and all equations for the sub-model as initially formulated. Two characteristics of equations within a system are related to simultaneity: (1) The presence of two or more endogenous variables within an equation and (2) an assumption that the error terms for one equation are not independent of those in other equations in the system. 3-SLS takes account of each of these aspects. (b) 2-SLS corrects, in a sense, for the presence of more than one endogenous variable in a given equation by replacing all but one by a calculated value obtained by regressing each such endogenous variable on all or certain predetermined variables in the system. These are called first-round equations. Necessary equations are determined by examining a model as outlined on pages 7-8 of my hecto report dated January 7, 1974, with one equation for each endogenous variable that appears on the right of an equality sign. These equations are run automatically by the computer in the first round, and the necessary substitution of calculated values is made in the second and third rounds. A calculated value that depends only on predetermined variables becomes, in effect, a predetermined variable. Hence, second-round equations can be and are fitted by OLS. Theoretically, all independent predetermined variables in the system should be used in the first round. As a practical matter, the number used must be one or two less than the number of observations to allow some degrees of freedom for the first-round equations. I use no more than N-2. In this case, the model contained 14 observations and 9 independent predetermined variables, so no problem arose. If some variables must be omitted, a least correlated set (to maximize the information) should be used. Another problem arises as predetermined variables are dropped from the system. Some purists argue that these variables also should be dropped from the first-round equations. My view is that they may still belong in the system; the fact that they were dropped from a particular sample set may merely reflect peculiarities of that sample. Preferred procedures should be determined by Monte Carlo methods. To my knowledge, no studies in this area have been made. (c) 3-SLS takes the matrix of cross products of error terms from the 2-SLS equations, uses these as an estimate of the corresponding matrix for the population, and takes account of this in the third round. For this reason, equations that make up a simultaneous block should be fitted as a block. This concept was used in the Project ADAM decision to fit the macro model as a unit and to fit the agricultural sector

model as a separate unit. Disposable income (YD) for use in the agricultural sector model was replaced by calculated values from a first-round equation because its value likely depends in part on price and consumption variables in the agricultural sector model. However, the error terms for the 4 stochastic equations in the macro model were assumed to be essentially independent of the error terms for the 14 stochastic equations in the agricultural sector model.

As was discovered in fitting the full agricultural sector model, 3-SLS also requires that the number of stochastic equations to be fitted be less than the number of observations. This was observed in the fifth run which involved all 14 equations. Signs of coefficients in many equations which had been consistent with economic theory in the fourth run reversed. Also some standard errors of the regression coefficients were indicated to be 0.0. This run was used only to evaluate the merits of dropping certain variables based on the fourth run. For the sixth run, slaughter equations for poultry and beef were dropped from the model on the assumption that error terms from these might be least correllated with error terms for other equations retained in the model. Satisfactory fits for these had been obtained in prior runs, and these were used in obtaining reduced form equations for the final model. On the sixth run, previously satisfactory equations became satisfactory again.

Full Model

Modifications in the Successive Computer Runs

The 3-SLS program permits no more than 70 variables, including constants, in the third stage. This number represents the sum of the number of variables in each equation. If this number is exceeded, the program terminates after the second stage. As initially formulated, the first 10 equations in the full model contained 69 variables and constants. Equations in the model were ordered such that the first 10 related to items other than beef, eggs, and root crops. Interrelations among the items included were assumed to be high, whereas beef, eggs, and root crops were believed to be more nearly independent of each other and of the first set. The two equations for beef were added on the third run, and the remaining two equations were added on the fourth run. This was possible only by dropping the equation for S BEEF, for which all coefficients were satisfactory. As noted, all 14 equations were included on the fifth run, but those for S POULT and S BEEF were omitted on the sixth and subsequent runs.

Somewhat by oversight, the price of flour was omitted from equations (1) and (3) as initially formulated. All other variables, regardless of sign, were retained in these two equations for the second run and the price of flour (X_3) was added. For this run, one variable in each of the other equations had been dropped due to signs contrary to economic expectations. Thus there was no conflict with the 70-variable maximum.

Table 1 shows the variables added or dropped in each run, and any whole equations added or dropped. If variables were endogenous, calculated values from the first round were involved. To simplify the interpretation of table 1 and the discussions of individual equations, the symbol P RICE, for example, is used rather than the actual F PRICE. In writing revised control cards, one must remember that F PRICE is the variable involved.

A Modified Fit

In 6 of the 11 equations that included YD initially, this variable was dropped either because of a sign on its coefficient contrary to economic expectations or a sign on own price or supply that was in error. As this is a rather major variable, a decision was made to refit the model in the following way. The first run was made simultaneously with the seventh (and last) run for the initial fitting procedure.

(a) For those equations for which YD had been dropped, all other variables in the initial formulation [including P FLOUR in equations (1) and (3)] were retained initially and then dropped one at a time as required in a way comparable to that done previously.

(b) For equations that did not involve YD initially or for which YD was retained in the initial fit, the formulation used for the seventh (and last) run was used initially in the new fit. Variables then were dropped if required based on the same criterion as used previously.

(c) Equations for S POULT and S BEEF were omitted to provide necessary degrees of freedom for the 3-SLS fit.

Results for this set of runs are summarized in table 2, which is comparable to table 1 for the initial fit. Reduced form equations and calculated values for endogenous variables were obtained for both the initial and the modified fits.

MICROFILMED FROM BEST
AVAILABLE COPY

MICROFILMED FROM BEST AVAILABLE COPY

TABLE 1. FULL MODEL: VARIABLES AND EQUATIONS ADDED AND DROPPED IN SUCCESSIVE COMPUTER RUNS ***

Equation		Modifications In Specified Runs						
No.	Dependent variable	2nd	3rd	4th	5th++	6th	7th	Remaining variables with wrong signs
1	C RICE	Add P FLOUR	Drop P CORN	Drop ANUNIT	Drop YD	Drop P FLOUR	-	
2	P RICE	Drop IM WHFL	Drop Q FISH*	Drop IM WHFL	-	-	-	
3	C CORN	Add P FLOUR	-	Drop P RICE	-	-	-	
4	P CORN	Drop Q FISH	Drop ANUNIT	-	-	-	-	
5	IM WHFL	Drop YD	Drop P CORN°	Drop YD	-	-	-	
6	P FISH	Drop P CORN	Drop P RICE	Drop S POULT**	Drop P RICE	Drop YD	Drop S PORK	
7	P PORK	Drop Q FISH	-	-	-	-	-	
8	P CHICK	Drop Q FISH	Drop YD	Drop S PORK°	Drop YD	-	-	
9	S POULT	Drop P CORN	-	-oo	-	Drop eq.		
10	S PORK	Drop P CORN	Drop P RICE+	Drop P CORN	-	-	-	
11	P BEEF		Add eq.	Drop S PORK	Drop YD	-	-	S BEEF
12	S BEEF		Add eq.oo	Drop eq.	Add eq.	Drop eq.		
13	P EGGS			Add eq.	Drop YD	-	-	Q EGGS
14	P ROOTS			Add eq.	Drop Q CORN	Drop Q RICE	Drop ANUNIT	

*** A blank indicates that the equation was not in this nor the previous run. A dash indicates no change from the previous run.

* Add IM WHFL. ** Add P RICE ° Add YD

oo Equation for final model + Add P CORN

++ This run was suspect for 3-SLS due to same number of equations as observations.

TABLE 2. FULL MODEL, MODIFIED FIT: VARIABLES DROPPED IN SUCCESSIVE COMPUTER RUNS*

Equation No.	Dependent variable	Modifications in Specified Runs: 2nd run	3rd run	4th run	Remaining variables with wrong signs
		Equations for which all variables except YD were included initially			
1	C RICE	P CORN	ANUNIT	-o	P FISH but OK on 2-SLS
5	IM WHFL	P CORN	-	-	
6	P FISH	S PORK	P CORN	S POULT	P RICE but OK on 2-SLS
8	P CHICK	S PORK	-	-**	
11	P BEEF	S BEEF	-	-	
13	P EGGS	-+	-+	-+	Q EGGS
		Equations based on formulation at end of 7th (and last) run from initial fit			
2	P RICE	ANUNIT	-	-	
3	C CORN	-	-	-	
4	P CORN	-	-	-	
7	P PORK	-	-	-	
10	S PORK	-	-	-	
14	P ROOTS	-	-	-	

* Equations for S POULT and S BEEF were omitted. A dash indicates no change from the previous run.

\+ Sign on own supply was wrong, but nothing could be done to this equation.

** S POULT reversed to a wrong sign but was satisfactory on 2-SLS. Hence no change was made in this equation.

o P FISH retained a wrong sign but was satisfactory on 2-SLS. Hence no change was made in this equation.

Modifications in Specific Equations

In the following paragraphs, the rationale for changes for each of the equations following each run is discussed. If t-ratios are shown, they were small enough to have a bearing on the decision to drop a variable. If not shown in the text, they were 2.0 or larger. The initial fit is discussed first, and this is followed by comments relating to the modified fit.

(1) C RICE - On the first run, P RICE and P CORN entered with wrong signs. Since P FLOUR was to be added, these were retained. On the second run, the same two variables had wrong signs. Hence P CORN was dropped. Income carried a negative sign. On the third run, P RICE and ANUNIT had wrong signs. Hence ANUNIT (t-ratio = .30) was dropped. On the fourth run, P RICE still had a wrong sign, with other variables satisfactory. This was true also for 2-SLS. Hence, YD was dropped. On the fifth run, P FLOUR reversed to a wrong sign but P RICE, for the first time, had a correct sign. Hence P FLOUR (t-ratio = 1.08) was dropped. On the sixth run, signs on the two remaining causal variables, P RICE and P FISH, were satisfactory.

On the modified run, P RICE, P CORN, AND P FISH all had wrong signs on the first run. In order to attempt to reverse P RICE, it was desirable to drop a variable with a high rather than a low t-ratio. Hence, P CORN was dropped. This was successful in reversing the sign on P RICE. However, P FISH and ANUNIT had wrong signs, and ANUNIT was dropped. P FISH retained a wrong sign on 3-SLS but was satisfactory on 2-SLS and hence was retained. The 2-SLS equation was used for the final model.

(2) P RICE - On the first run, Q CORN, Q FISH, and IMWHFL all entered with wrong signs, and all t-ratios exceeded 2. Flour imports were dropped as likely least important of these three. On the second run, Q FISH retained a wrong sign and was dropped. However, since P FLOUR entered with a correct sign in equation (1), IMWHFL was brought in for the third run. Income entered with a positive sign. On the third run, IMWHFL and ANUNIT both had wrong signs. Hence IMWHFL was dropped. On the fourth run, all signs were satisfactory. YD retained a positive sign.

Although YD was retained for the modified run, ANUNIT (t-ratio = 0.019) reversed to a wrong sign on the first run. Hence it was dropped. On the second and subsequent runs, signs on remaining variables were satisfactory. On the second run, YD reversed to a negative sign and this continued on subsequent runs.

(3) C CORN - P RICE and ANUNIT entered with wrong signs on the first run, but both were retained since P FLOUR was to be added. All signs were satisfactory on the second run. Income had a positive effect. On the third run, P RICE (t-ratio = 0.0005) entered with a wrong sign. Hence it was dropped. On the fourth run, all signs were satisfactory. Income retained a positive sign.

On the modified run, all coefficients remained satisfactory. Income retained a positive sign.

(4) P CORN - On the first run, Q FISH was the only variable with a wrong sign, so it was dropped. On the second run, YD had a positive sign. On the second run, ANUNIT had a wrong sign (t-ratio = 0.1). Hence it was dropped. On the third run, all signs were satisfactory. YD retained a positive sign.

On the modified run, all coefficients remained satisfactory. Income retained a positive sign.

(5) IM WHFL - On the first run, P CORN carried a wrong sign and YD was negative. While it seemed possible that income has little effect on flour consumption, flour was not considered to be an inferior good (in the economic sense). Hence YD was dropped for the second run. On this run, P CORN retained a wrong sign. Hence it was dropped and YD was brought back in. On the third run, YD remained negative. Hence it was dropped. On the fourth run, all signs were satisfactory.

As could have been expected from the initial run, P CORN entered with a wrong sign on the modified run. Hence it was dropped. On the second and subsequent runs, signs on remaining variables were satisfactory.

(6) P FISH - Q FISH, P CORN, and S POULT all had wrong signs on the first run. Corn had been included as a possible complementary item. This seemed somewhat tenuous; hence P CORN was dropped for the second run. On this run, Q FISH and S POULT retained wrong signs and P RICE became wrong. Income had a negative coefficient. For the third run, P RICE was dropped with an expectation that it would be brought back in if S POULT retained a wrong sign. This happened, so S POULT was dropped and P RICE was added for the fourth run. Q FISH retained a wrong sign. On the fourth run, both Q FISH and P RICE had wrong signs, so P RICE (t-ratio = 1.34) was dropped.

Q FISH retained a wrong sign on the fifth run, so YD (with a negative sign) was dropped. This caused the sign on Q FISH to reverse, but S PORK also reversed to a wrong sign. Hence S PORK was dropped. On the seventh run, Q FISH, the one remaining causal variable, retained the desired negative sign.

On the modified run, Q FISH and P RICE entered with correct signs on the first run. However, P CORN, S POULT, and S PORK all had wrong signs. S PORK (t-ratio = 1.12) was dropped based on this criterion. P CORN and S POULT retained wrong signs on the second run, and P CORN was dropped. S POULT retained a wrong sign on the third run and P RICE reversed to a wrong sign. S POULT was dropped in the hopes that P RICE (t-ratio = 0.68) might again reverse. This did not happen for 3-SLS but the sign on 2-SLS was satisfactory. The 2-SLS equation was used for the final model.

(7) P PORK - In the first run, Q FISH was the only variable with a wrong sign. Hence, it was dropped. From the second run forward, all variables retained correct signs.

All signs remained correct on the modified run.

(8) P CHICK - Q FISH and S PORK both had wrong signs on the first run. YD had a negative coefficient which would seem to be in error. Q FISH was dropped for the second run. S PORK and YD retained wrong signs. YD was dropped, with an expectation that it would be brought back if S PORK retained a wrong sign. This happened. Hence, for the fourth run, S PORK was dropped and YD was added. On the fourth run, YD retained a negative sign and this was true also for 2-SLS. Hence YD was dropped. This left S POULT as the only causal variable. It entered with the expected negative sign.

On the modified run, only S PORK entered with a wrong sign. Hence it was dropped. This left S POULT and Q FISH, for which signs continued correct on the second run. However, on the third run S POULT reversed to a wrong sign (t-ratio = 0.32), but the sign was satisfactory on 2-SLS although the t-ratio was almost zero. A decision was made not to change the equation on the 3rd run but to use 2-SLS if necessary for the final model. The sign reversed to the expected negative on the fourth and final run.

(9) S POULT - In the first run, the coefficient on Q POULT was 0.99. P CORN was the only variable with a wrong sign, so this was dropped. High chicken prices, low egg prices, and low

rice prices were indicated to be associated with a large slaughter. On the second run, all variables retained correct signs. The coefficient on Q POULT was 0.96. On the last few runs, two equations needed to be omitted to provide needed degrees of freedom for the 3-SLS fit. This and equation (12) were chosen to be dropped. The fit from the fourth run was used for the final model.

This equation also was omitted for the modified fit.

(10) S PORK - On the first run, the coefficient on Q PORK was 1.52, seemingly too large. P PORK had a negative sign, suggesting that favorable prices tend to cause breeding stock to be held back, thus reducing slaughter from a given inventory. Hence, feed prices were required to have a positive sign. P CORN had a wrong sign based on this reasoning and was dropped in the second run. In this run, P RICE entered with a wrong sign. Hence it was dropped and P CORN was brought back in. This resulted in a reversal of the sign for P PORK, thus making a negative sign for P CORN acceptable. however, the coefficient on Q PORK was 1.71, much too high. Hence P CORN was dropped on the fourth run. This reduced the coefficient on Q PORK to 1.26, which is acceptable, and reversed the sign on P PORK to negative which seems more reasonable. On the sixth run, the coefficient on Q PORK dropped further to 1.08, a fully acceptable level. However, on the seventh run, this increased to 1.16, but still satisfactory.

On the modified run, signs were satisfactory, but Q PORK had a coefficient of 1.50 on the first run. It seemed best to hope for a lower coefficient on later runs. This coefficient dropped to 1.21 on the second run and to 1.13 on the final run.

(11) P BEEF - On the first run with this equation, S PORK had a correct sign but both S BEEF and YD were wrong. Hence, S PORK was dropped. Wrong signs on both variables continued, however, and this was true also on 2-SLS. It seems possible that, although beef likely is consumed chiefly by the wealthier classes, their consumption may not be related to average incomes of all consumers. Hence YD was dropped. On the suspect fifth run, the remaining causal variable S BEEF reversed to the expected negative sign. On the sixth run, it reversed back to positive, and this was true also for 2-SLS. This was true again on the seventh run. Since beef is not an integral part of the model, plans were made to drop the two equations for beef.

On the modified run, S PORK entered with a correct sign and S BEEF with a wrong sign. It seems possible that pork supplies

do have more effect on beef prices than does the supply of beef. Hence S BEEF was dropped. The correct sign on S PORK was retained on subsequent runs. The equation from the final run was used also for the initial model.

(12) S BEEF - On the first run with this equation, P BEEF entered with a positive sign and P CORN with a negative sign. The coefficient on Q BEEF was 0.97. Hence all were satisfactory. This equation was dropped at this point to allow entry of those for P EGGS and P ROOTS. It was brought back for the fifth run, but was dropped again in subsequent runs to obtain needed degrees of freedom for the 3-SLS fit. The coefficients from the third run were used for the model.

This equation also was omitted from the modified run.

(13) P EGGS - On the first run, both variables entered with wrong signs. YD may not be important, hence it was dropped. This resulted in the expected negative sign on the single remaining causal variable Q EGGS in the suspect fifth run. However, on the sixth run, the coefficient again became positive, and this was true also on the seventh run for both 2-SLS and 3-SLS.

On the modified run, Q EGGS retained a wrong sign. This equation was left intact with the unlikely hope of a later reversal which never took place.

Given these results, a scatter diagram between P EGGS and Q EGGS was made. No relation existed for the years 1955-56 through 1961-62, but the collective group relative to later years would have forced an overall positive relation. A downward sloping line was indicated for subsequent years, with sizable deviations for some. A freehand regression was drawn based essentially on data for 1962-63 through 1969-70. This equation was used for both models. However, to avoid distortions from this source, actual egg prices were used in connection with equation (9) for years prior to 1962-63.

(14) P ROOTS - On the first run for this equation, Q CORN entered with a wrong sign and hence was dropped. Income had a positive effect. On the next run, Q RICE entered with a wrong sign. Hence it was dropped. On the third run for this equation, ANUNIT entered with a wrong sign. Hence it was dropped. On the last run, Q ROOTS continued with the expected negative sign, and income had an acceptable positive sign.

On the modified run, all signs remained satisfactory. Income retained a positive sign.

Final stochastic equations for the initial run and derivation of equations to obtain calculated values of the endogenous variables.

All stochastic equations are based on the 3-SLS fit for the seventh or final run unless otherwise indicated. Numbers in parentheses beneath the coefficients are the respective standard errors. Constant terms retain the same number of decimals as for the initial data.

(1) C RICE = 101.4 - .1388 P RICE - 5.703 P FISH
(9.1) (.2156) (3.988)

(2) P RICE = 104.2 - .9101 Q RICE - .05044 Q CORN
(13.9) (.1075) (.07434)

+ .05168 ANUNIT + .007458 YD
(.07757) (.022730)

(3) C CORN = -24.7 - .9490 P CORN - 2.219 P FISH
(5.6) (.1159) (1.007)

+ 14.86 P FLOUR + .1560 ANUNIT + .1940 YD
(2.69) (.0781) (.0134)

(4) P CORN = 61.8 - .4679 Q CORN - .6184 Q RICE
(19.5) (.1726) (.1543)

- .8470 IMWHFL + .08534 YD
(.2572) (.03810)

(5) IMWHFL = -.9 - 2.957 P FLOUR + .3860 P RICE
(1.7) (1.628) (.0509)

(6) P FISH = 2.08 - .02322 Q FISH
(.11) (.00588)

(7) P PORK = - 6.79 - .06661 S PORK - .4783 S POULT
(.80) (.02286) (.0910)

+ .02758 YD
(.00253)

(8) P CHICK = 3.26 - .1406 S POULT
(.07) (.0242)

(9) S POULT = .35 + .9622 Q POULT + .4737 P CHICK
(.18) (.0136) (.0615)

- .08291 P EGGS - .01771 P RICE
(.01219) (.00318)
(Equation from fourth run)

(10) S PORK = - .9 + 1.162 Q PORK - .5841 P PORK
(1.8) (.144) (.4171)

(11) P BEEF = 4.37 - .09536 S PORK
(.38) (.03455)

(Equation from final modified run)

(12) S BEEF = - .46 + .9715 Q BEEF + .3561 P BEEF
(.40) (.2187) (.1210)
- .04005 P CORN
(.00730)
(Equation from third run)

(13) P EGGS = 21.3 - 2.5 Q EGGS
(Free-hand regression based on data for 1962-63 through 1969-70. Actual egg prices were used for earlier years.)

(14) P ROOTS = -6.5 - .2354 Q ROOTS + .07267 YD
(6.2) (.0399) (.01181)

This model is easy to solve by ordinary algebra because many equations contain only predetermined variables. It should be remembered that calculated values of YD are obtained from the macro model and hence are taken as predetermined for this model so far as calculated values are concerned. Computational methods are similar to a recursive model, but the model was not fitted in this way. Full simultaneity was taken into account in the 3-SLS fit.

We first look for equations that contain only predetermined variables on the right of the equality sign. These are those for P RICE, P FISH, P EGGS, and P ROOTS.

We next look for equations that contain only predetermined variables or the above variables on the right of the equality sign. These are those for C RICE and INWHFL. Availability of these variables then permits solutions for P CORN and C CORN in that order.

S POULT can be solved by substituting the equation for P CHICK in the S POULT equation and making use of previously calculated values for other endogenous variables. The following is involved:

Rewrite equation (9) as
S POULT = .4737 P CHICK + A_9
where A_9 = .35 + .9622 Q POULT - .08291 P EGGS - .01771 P RICE

Then

$$S\ POULT = .4737\ (3.26 - .1406\ S\ POULT) + A_9$$
$$= 1.54 - .06660\ S\ POULT + A_9$$
$$1.0660\ S\ POULT = 1.54 + A_9$$
$$S\ POULT = 1.44 + .9381\ A_9$$

Given this value, P CHICK can be computed from equation (8).

S PORK is solved in a similar way by substituting the equation for P PORK in equation (10). First, rewrite equation (7) as

(7a) $P\ PORK = -.06661\ S\ PORK + A_7$
where $A_7 = -6.79 - .4783\ S\ POULT + .02758\ YD.$

Next rewrite equation (10) as

$$S\ PORK = -.5841\ P\ PORK + A_{10}$$
where $A_{10} = -.9 + 1.162\ Q\ PORK.$

Then

$$S\ PORK = -.5841\ (-.06661\ S\ PORK + A_7) + A_{10}$$
$$= .03891\ S\ PORK - .5841\ A_7 + A_{10}$$

$$.96109\ S\ PORK = -.5841\ A_7 + A_{10}$$
$$S\ PORK = -.6073\ A_7 + 1.0405\ A_{10}$$

Given this value, P PORK can be obtained from equation (7a).

Given these calculated values, P BEEF and S BEEF, in that order, can be obtained. IMRICE and IMCORN are obtained from the two identities in the model.

For those who are computer minded, equation systems normally are solved by the iterative Gauss-Seidel technique. For many models, however, particularly if they are completely linear, a direct algebraic solution can be obtained with little effort. This was true for this relatively large model. In such cases, a computer program for the direct solution could be written by anyone familiar with FORTRAN or a similar computer language with no more difficulty than writing the control cards for the Gauss-Seidel program, and the resultant program would be much more efficient than an iterative solution and likely would require less internal core. Since my knowledge of FORTRAN is scant and largely forgotten, calculations were made on a desk calculator.

Final stochastic equations for the modified run and derivation of equations to obtain calculated values of the endogenous variables

All stochastic equations are based on the 3-SLS fit for the fourth or final run unless otherwise indicated. Some equations are from the 2-SLS fit. Equations are shown in the same way as for the initial model.

(1) C RICE = 91.5 - .1830 P RICE - 2.621 P FISH + 17.24 P FLOUR
(23.0) (.3865) (9.230) (15.07)
(Equation from 2-SLS)

(2) P RICE = 113.5 - .9533 Q RICE - .03227 Q CORN - .005352 YD
(12.7) (.0998) (.07773) (.021890)

(3) C CORN = - 15.8 - .6431 P CORN - 3.368 P FISH
(6.6) (.0906) (.888)

+ 13.43 P FLOUR + .1240 ANUNIT + .1676 YD
(3.23) (.0547) (.0159)

(4) P CORN = 63.2 - .3629 Q CORN - .5943 Q RICE
(14.6) (.0902) (.1108)

- .5822 IM WHFL + .05844 YD,
(.1395) (.02392)

(5) IMWHFL = -.6 - 3.624 P FLOUR + .3828 P RICE
(1.8)(2.181) (.0506)

(6) P FISH = 2.15 - .02443 Q FISH - .001825 P RICE
(.30) (.01050) (.011410)
Equation from 2-SLS)

(7) P PORK = -5.79 - .03909 S PORK - .4290 S POULT + .02397 YD
(.91) (.01933) (.0700) (.00255)

(8) P CHICK = 3.50 - .01431 S POULT - .02723 Q FISH
(.12) (.04009) (.00857)

(9) S POULT = .35 + .9622 Q POULT + .4737 P CHICK,
(.18) (.0136) (.0615)

- .08291 P EGGS - .01771 P RICE
(.01219) (.00318)
(Equation from fourth run for initial fit)

(10) S PORK = - .8 + 1.132 Q PORK - .4940 P PORK
(2.0) (.143) (.4740)

(11) P BEEF = 4.37 - .09536 S PORK
(.38) (.03455)

(12) S BEEF = - .46 + .9715 Q BEEF + .3561 P BEEF - .04005 P CORN
(.40) (.2187) (.1210) (.00730)
(Equation from third run for initial fit)

(13) P EGGS = 21.3 - 2.5 Q EGGS
(Free-hand regression as for initial model)

(14) P ROOTS = - 15.4 - .1539 Q ROOTS + .08564 YD
(6.9) (.0384) (.01449)

Based on the same criteria as for the initial model, equations are solved in the following order: P RICE, P EGGS, P ROOTS, IMWHFL, P FISH, C RICE, P CORN, and C CORN. Remaining equations require algebraic substitutions as for the initial model. These are described in a condensed form below.

Rewrite equation (9) in the same way as for the initial model (since this is the same equation). Then

S POULT = .4737(3.50 - .01431 S POULT - .02723 Q FISH) + A_9

or

S POULT = 1.65 - .01281 Q FISH + .9933 A_9

Given this value, P CHICK can be computed from equation (8).

Rewrite equation (7) as

(7a) P PORK = -.03909 S PORK + A_7

where A_7 = -5.79 - .4290 S POULT + .02397 YD.

Rewrite equation (10) as

S PORK = -.4940 P PORK + A_{10}

where A_{10} = -.8 + 1.132 Q PORK.

Then

S PORK = -.4940(-.03909 S PORK + A_7) + A_{10}

or

S PORK = -.5037 A_7 + 1.0197 A_{10}

Given this value, P PORK can be obtained from equation (7a).

Remaining equations then are solved in the following order: P BEEF, S BEEF, IMRICE, and IMCORN.

Theil U-coefficients for the initial and modified fits over the period of fit

The models turned out better than I had expected over the period of fit given what appeared to be hard-to-explain sharp up or down movements in some quantitative series and almost flat data over several years for some livestock price series and for poultry slaughter per capita. Theil U-coefficients that were less than one were given for 13 of the 16 endogenous variables for the initial model and for 11 out of 15 variables for the modified model. (Egg prices were the same for both models and hence were counted only for the initial model.). A U-coefficient of zero indicates perfect forecasts; a coefficient of unity or larger indicates that estimates should be based on values for the previous year or some other simple approach rather than attempting to make estimates from the model. Coefficients that were greater than unity related to corn imports and to prices of livestock and poultry items.

On an overall basis, the modified model had a slight edge. Ignoring variables that could be estimated more accurately by not using the model (such as assuming that imports were zero or that prices would equal those in the preceding year), calculated values from the modified model over the period of fit were better for 6 items and worse for 5, but the ones that were worse were only slightly so whereas two of those that were better were quite a lot better. These two were imports and consumption of rice. A final decision will need to wait until results outside the period of fit can be computed.

For all of these calculations, YD was taken at its reported value. This was done because, at this stage, the agricultural sector model was being tested. Tests of the macro model have been completed. For calculations outside the period of fit, YD at times at least should be based on its calculated value form the macro model.

A few modifications were tested. If imports of corn are assumed to be zero, thus making consumption of corn equal to production of corn, estimates of both imports and consumption are improved over the calculated values from the model. If slaughter of poultry is assumed to equal production of poultry, improved estimates over those from the model are given. However, chicken prices can be estimated more accurately by making use of the "poor" slaughter estimates from the model than by assuming that slaughter and production are the same, although for the modified model they can be estimated more accurately still by assuming that they will

be unchanged from the preceding year. Beef slaughter can be estimated more accurately from equations in the models by assuming that beef prices are unchanged from a year earlier than by using calculated prices from the model. For both beef and pork prices, improved estimates are given by assuming no change from a year earlier in comparison to calculated values from the models.

Table 3 shows Theil U-coefficients from the various calculations. Table 4 shows calculated values from the modified model for those variables for which the model should be used or that are needed for other variables.

Table 3 - Theil U-coefficients over the period of fit for the initial and modified models*

Variable	Basic models		Modifications		
	Initial	Modified	Initial	Modified	Assumption
C RICE	.901	.838			
IMRICE	.734	.683			
P RICE	.465	.475			
C CORN	.623	.630	.443		) Imports = 0
IMCORN	1.242	1.264	.889		)
P CORN	.517	.507			
IM WHEA	.781	.788			
P FISH	.776	.775			
P PORK	1.180	1.116	1.0		) Price = t-1 value
P BEEF	2.399	2.314	1.0		)
P CHICK	.987	1.006	1.030	1.009	S POULT = Q POULT
P EGGS	.973	.973			
P ROOTS	.703	.724			
S POULT	.259	.291	(.255		P CHICK, P EGGS=t-1
			(.187		S POULT = Q POULT
S PORK	.696	.676	(.783		P PORK=P PORK - 1
			(.734		S PORK = Q PORK
S BEEF	.825	.807	(.696	.687	P BEEF = P BEEF - 1
			(.888		S BEEF = Q BEEF

* Based on 1956-57 through 1968-69, with YD at its reported level. Lowest value for each variable is underlined.

MICROFILMED FROM BEST AVAILABLE COPY

TABLE 4 - CALCULATED VALUES FROM THE MODIFIED MODEL OVER THE PERIOD OF FIT FOR VARIABLES THAT SHOULD BE ESTIMATED FROM THE MODEL OR THAT ARE NEEDED FOR OTHER VARIABLES

Year	C RICE Kg.	HRICE Kg.	P RICE Per sack	P CORN Per sack	INSHFL Kg.	P FISH Kg.	P EGGS Per 100°	P ROOTS Per ton	S POULT Kg.*	S PORK Kg.	S BEEF Kg.+
1955-56	87.7	1.3	28.1	12.9	9.0	1.73	-	5.9	1.85	10.4	3.36
56-57	87.2	2.2	29.4	14.9	9.5	1.71	-	7.1	2.08	10.8	3.42
57-58	86.1	5.6	33.7	18.1	11.2	1.72	-	7.8	2.02	10.9	3.17
58-59	87.5	-1.2	25.6	13.3	8.1	1.70	-	8.4	2.07	10.6	3.26
59-60	87.3	.1	27.0	12.9	8.6	1.71	-	9.0	2.00	11.1	3.33
60-61	87.5	3.1	29.5	14.2	9.5	1.71	-	9.6	1.77	10.7	3.24
61-62	89.2	3.0	27.8	14.0	8.5	1.71	-	10.4	1.71	9.5	2.94
62-63	90.8	6.3	29.5	14.4	8.8	1.70	13.2	10.0	1.69	10.2	2.82
63-64	87.8	7.9	33.8	16.5	10.9	1.65	13.9	9.7	1.41	8.9	2.60
64-65	88.1	7.6	33.3	17.3	10.7	1.62	13.9	11.2	1.43	10.5	2.50
65-66	89.2	9.5	33.9	17.8	10.7	1.58	13.3	12.5	1.55	13.6	2.52
66-67	88.3	7.6	34.8	17.7	11.6	1.57	13.5	13.8	1.97	13.2	2.59
67-68	87.4	3.7	29.9	15.4	9.6	1.56	13.6	14.8	3.12	9.8	2.69
68-69	86.1	6.2	33.4	16.4	11.2	1.44	12.2	15.5	3.12	10.6	2.82

° Equation cannot be used prior to 1962-63.

* Better to let S POULT equal Q POULT, but calculated value is needed for S PORK.

\+ Equation from the model when P BEEF is assumed to equal P BEEF-1.

MICROFILMED FROM BEST AVAILABLE COPY

Sub-Model

The decision to fit a model made up of only the five most important commodities reflected an experimental fact that small models at times give better results than large models. The computer program permits fitting a number of formulations, one after another, provided all are based on the same first-round equations. This is done by punching a 1 in column 26 of the second and following main problem cards. The cards that follow are control cards for each set of equations. This procedure was used in fitting the sub-model. However, for the first run, first-round cards as shown on page 10 of my Jan. 7, 1974, report were used. The program treated the first nine of these as stochastic equations, and reported a set of errors for the tenth card since it was attempting to interpret this as a third main problem card. Thus, this run was discarded for the sub-model.

Plans provided for rerunning the final sub-model with a correct set of first-round equations, to determine how much difference this made in the coefficients. However, after the third run for this model, a decision was made to drop the sub-model. This was based on three considerations: (1) The full model was rapidly becoming simpler due to the dropping of variables, (2) the slaughter equation for poultry appeared to need P EGGS as a variable, but eggs were omitted from the sub-model, (3) results for the sub-model were not sufficiently different from the full model to warrant further fits.

Table 5 shows procedures for the sub-model comparable to those in table for the full model. The same basic notation is involved.

Preliminary Calculated Values Outside the Period of Fit

Updated data to the extent available were received from project ADAM personnel. However, no indication was given as to how to link the old and new production series for rice and corn. Hence an initial decision was made to update only the modified model, handling this in two ways: Method I - Assume that the new and old series are comparable. Method II - Assume no change in production between 1968-69 and 1969-70 and then make a corresponding percentage adjustment in subsequent years. This resulted in multiplying rice production from 1969-70 forward by 0.8523 and corn production by 0.8630. Consumption was computed based on the revised production. (A partial justification for Method II was that production of root crops in 1969-70 was approximately 2 percent lower than in 1968-69, suggesting little change in crop production due to weather.) Comparison of result for Method I against those for Method II for rice prices for the three years 1969-70 through 1971-72 showed prices that were 8 to

MICROFILMED FROM BEST AVAILABLE COPY

Table 5 - Sub-model: Variables added or dropped in successive computer runs, and variables remaining at the end of the third run*

Equation No.	Dependent Variable	Modifications: 2nd run	Modifications: 3rd run	Variables remaining with: Acceptable signs	Variables remaining with: Incorrect signs
1	C RICE	Drop P CORN	Drop ANUNIT	P FISH, YD	P RICE
2	P RICE	Drop Q CORN	Drop Q FISH	Q RICE, YD	ANUNIT
3	C CORN	Drop P RICE	Drop ANUNIT	P CORN, P FISH, YD	
4	P CORN	Drop Q FISH	-	Q RICE, Q CORN ANUNIT, YD	
5	P FISH	Drop P CORN	Drop S POULT	YD	Q FISH, P RICE S PORK
6	P PORK	Drop Q FISH	-	SPORK, S POULT, YD	
7	P CHICK	Drop Q FISH	Drop S PORK	S POULT	YD
8	S POULT	Add P EGGS	+	+	+
9	S PORK	Drop P CORN	Drop P RICE	Q PORK, P PORK	

* A dash indicates no change from the previous run.

\+ S BEEF instead of P EGGS was added by error on the second run. This was supposed to be corrected on the third run, but P EGGS instead of P P EGGS was used. This resulted in wrong signs for both P EGGS and P CHICK.

11 pesos below actual prices for Method I and that were 2 to 4 pesos above actual prices for Method II. Results for corn prices were less uniform, but showed prices that were 3 to 8 pesos too low for Method I and were 0 to 5 pesos too high for Method II for the same years. Also calculated prices for root crops for Method I were 4 to 8 pesos too low, suggesting that a production adjustment was needed here also. Given these results, a decision was made to adjust production such as to force average calculated prices for the three years for each of the crops to equal average actual prices and to then use this adjustment factor for each year from 1969-70 forward.* Calculated values then were obtained both for the initial and the modified models. This may bias results somewhat in favor of the modified model. Adjustment factors for production computed in this way were as follows: Rice-0.8845, corn-0.9244. 1972-73 was not included in the average because the sharp drop in production for rice and corn should have resulted in a sharp increase in price; instead, deflated prices declined.

The animal units series was modified slightly by the revised production data for rice since availability of rice bran is deducted from feed requirements in estimating the animal units series.

Fish production data given us initially by Project ADAM personnel were for calendar years instead of the desired and so-labeled fiscal years. Both series chiefly follow an upward trend. Too much work would be involved to rerun the models on the computer at this stage. However, this data series error could explain at least in part the poor results obtained for the fish equations in the sense that most causal variables other than fish production were dropped due to signs contrary to economic expectations. The new "correct" series was used for the years outside the period of fit.

Calculated values and Theil U-coefficients

Table 6 shows calculated and actual values for the endogenous variables for each of the years beyond the period of fit, and table 7 shows U-coefficients that exclude 1972-73. Production of both rice

---

* This was rather tricky because of the nature of the equations. Rice production first was adjusted to balance rice prices. The new rice production then was used in the equation for P CORN, and necessary adjustments for corn production then were made. This took into account the fact that the new calculated price for rice affected imports of wheat flour, which in turn affected the price of corn. Final calculated values for rice and corn were within one tenth of a peso of the desired average. A similar approach could not be used for root crops. Even a zero production would have given calculated prices that on the average were too low.

TABLE 6 - CALCULATED AND ACTUAL VALUES FOR AVAILABLE DATA OUTSIDE THE PERIOD OF FIT

Variable	1969-70 Actual	1969-70 Calculated Initial	1969-70 Calculated Modified	1970-71 Actual	1970-71 Calculated Initial	1970-71 Calculated Modified	1971-72 Actual	1971-72 Calculated Initial	1971-72 Calculated Modified	1972-73 Actual	1972-73 Calculated Initial	1972-73 Calculated Modified
C RICE	80.4	88.5	97.9	82.6	88.3	86.8	88.4	87.7	89.0	69.5		
I RICE	0	5.1	7.5	3.3	9.0	7.5	14.7	14.0	15.3	7.4		
P RICE	33.6	33.4	32.9	34.5	34.3	33.9	38.2	39.7	39.2	33.1	50.7	50.4
C CORN	56.2	53.0	52.2	54.4	51.5	51.5	56.1	52.0	52.3	48.4		
I CORN	.69	-2.5	.9	.64	-2.5	1.8	3.79	- .3	4.0	2.17		
P CORN	14.2	17.3	16.5	20.2	18.7	18.1	21.5	21.2	21.0	19.6	28.1	27.
I [illegible]	9.9	10.9	10.7	9.4	11.4	11.3	9.5	13.0	12.6	11.3	17.3	17.0
P FISH	1.40	1.45	1.44	1.37	1.45	1.43	1.77	1.43	1.40	1.57		
P POMA	2.72	3.52	3.40	2.79	3.95	3.72	2.98			2.73		
P MILK	2.85	3.39	3.38	2.73	3.43	3.43	3.47			3.95		
P CHICK	2.62	2.86	2.73	2.76	2.91	2.73	3.41			3.58		
P EGGS	12.1	12.3	12.3	14.0	12.8	12.8	15.9			15.1		
P HOGS	25.0	17.[illegible]	17.5	24.4	18.9	18.7	22.6	18.9	18.4			
P POULT	2.76	2.61	2.77	2.62	2.47	2.39						
P COFA	11.5	10.3	10.4	9.5	9.9	9.9						
P [illegible]	2.[illegible]	2.[illegible]	2.90	2.72	2.83	2.85						
				Predetermined			Variables*					
S RICE	80.4			79.3			73.7			62.1+		
S CORN	51.3			49.7			48.3			42.8		
P FLOUR	.259			.299			.488			.459		
Q FISH	26.7			27.0			27.9					
ANNUITY°	30.3			26.7			(31.8)			(34.9)		

* That differ from those in table 1 of hecto report "Agricultural Sector Models for the Philippines: Formulation and Data", January 7, 1974.

\+ July-June rather than October-September as for prior years.

° Numbers in parentheses are partly estimated.

and corn were down sharply for this year, but actual prices were nearly unchanged. Since the Consumer Price Index rose, deflated prices declined, whereas the models predicted sharp increases in price. Thus, large errors were given for that year. This appears to be a "freak" year and likely should not be used in evaluating the models. U-coefficients for certain modifications also are given in table 7, and revised and updated predetermined variables that differ from those reported previously are shown in the lower section of table 6.

Table 7 - Theil U-coefficients outside the period of fit for the initial and modified models*

Variable	Basic models: Initial	Basic models: Modified	Modifications: Initial	Modifications: Modified	Assumption
C RICE	1.543	1.338	.608		Imports = 0
IMRICE	.832	.722			
P RICE	.299	.277			
C CORN	.436	.236			
IMCORN	1.049	.376	1.192		Imports = 0
P CORN	.535	.535			
IMWHFL	3.860	3.464	1.0		IMWHFL = IMWHFL-1
P FISH	.852	.906			
P PORK+	15.72	12.49	1.0		P PORK = P PORK-1
P BEEF+	3.932	3.908	1.0		P BEEF = P BEEF-1
P CHICK	2.343+	.503+	2.343	1.060	S POULT = Q POULT
P EGGS+	.742	.742			
P ROOTS	1.353	1.404	1.0		P ROOTS = P ROOTS-1
S POULT+	.302	.455	.419		P CHICK, P EGGS = t-1
			.309		S POULT = Q POULT
S PORK+	.620	.574	.667		P PORK = P PORK-1
			.084		S PORK = Q PORK
S BEEF+	1.072	1.082	.636	.573	P BEEF = P BEEF-1
			1.315		S BEEF = Q BEEF

* Based on 1969-70 through 1971-72 unless otherwise indicated. YD was at its reported level. Lowest value for each variable is underlined.

\+ Based on 1969-70 and 1970-71.

Based on table 7, the modified model again was best on the average. It gave results that were usable for all of the 16 variables (if S BEEF is based on P BEEF-1) and of these, 9 were the same or better than those for the initial model when the U-coefficient is used as a criterion.

Comments on individual variables for which U-coefficients were large

C RICE - Consumption was much below earlier years for the four years 1967-68 through 1970-71. These declines were not predicted by the models.

I.CORN - The initial model predicted small exports in each year, whereas small imports took place in each. These were predicted by the modified model.

IMWHFL - The models predicted imports that were moderately larger than those which took place. Since little year-to-year variation occurred, use of t-1 values would have been better than the calculated values from the models for these three years.

P FISH - Prices increased considerably in 1971-72 for no apparent reason. This increase was not predicted by the models.

P CHICK - Calculated prices for the initial model were too high in both 1969-70 and 1970-71. Poor results had been given by both models over the period of fit.

P ROOTS - Deflated prices were 31 percent higher in 1968-69 than in any previous year, and were 38 percent higher in 1969-70 than in 1968-69. Thereafter they remained higher than in any year prior to 1969-70. Calculated values were above actual prices for any year prior to 1968-69 but not as high as the actual prices for the years outside the period of fit.

P PORK and P BEEF _ Poor results were given by the models over the period of fit and also outside the period of fit.

Implied Elasticities

Linear demand and supply equations give a different elasticity for every point on the line. If elasticities are presented, most analysts show those that apply to averages over the period of fit. For a growing economy, these are of interest only in a historical sense. To me, it seems better to compute these for a recent more or less normal period. Elasticities given in this section were obtained in the following way: (1) Averages were obtained for such data as were available for the years 1969-70 through 1971-72. (2) Calculated values from the structural equations were obtained for each model based on these averages. (3) Each variable in the right of the equality sign was increased in turn by one percent, and the resulting percentage increase or decrease in the calculated value of the variable on the left of the equality sign is shown in table 8.

Table 8 - Implied elasticities for recent years based on structural equations from the models*

Dependent variable	Model	Variables on the right of the equality sign and percent change for a 1-percent change in each				
C RICE		P RICE	P FISH	P FLOUR		
	Initial	- .056	- .098			
	Modified	- .074	- .046	.075		
P RICE		Q RICE	Q CORN	ANUNIT	YD	
	Initial	-1.979	- .070	.042	.095	
	Modified	-2.102	- .045		-.068	
C CORN		P CORN	P FISH	P FLOUR	ANUNIT	YD
	Initial	- .337	- .065	.109	.088	1.676
	Modified	- .231	- .098	.098	.071	1.464
P CORN		Q CORN	Q RICE	INWHFL	YD	
	Initial	- .972	-2.097	- .213	1.614	
	Modified	- .916	-2.337	- .253	1.340	
INWHFL		P FLOUR	P RICE			
	Initial	- .095	1.176			
	Modified	- .121	1.171			
P FISH		Q FISH	P RICE			
	Initial	- .414				
	Modified	- .490	- .042			
P PORK		S PORK	S POULT	YD		
	Initial	- .130	- .350	3.369		
	Modified	- .114	- .343	3.114		
P CHICK		S POULT	Q FISH			
	Initial	- .139				
	Modified	- .015	- .272			
S POULT+		Q POULT	P CHICK	P EGGS	P RICE	
		1.037	.581	- .498	- .249	
S PORK		Q PORK	P PORK			
	Initial	1.238	- .148			
	Modified	1.200	- .129			
P BEEF+		S PORK				
		- .297				
S BEEF+		Q BEEF	P BEEF	P CORN		
		1.033	.406	- .258		

(Cont'd)

Table 8 - (Cont'd)

Dependent variable	Model	Variables on the right of the equality sign and percent change for 1-percent change in each			
P EGGS+		Q EGGS .692			
P ROOTS		Q ROOTS	YD		
	Initial	- .427	1.778		
	Modified	- .280	2.129		
YD+o		Q ALL	C-1	X	G
		- .0753	2.006	.0753	- .287

* See text for method of computation.
\+ Same equation for both models.
o Based on first-round equation shown below.
Q ALL was 3.77 for 1969-70 and 3.172 for 1970-71 based on the revised production data. The index numbers were 136.5 and 138.7, respectively.

$$YD - 354 - 9.825\ Q\ ALL + 2.522\ C\text{-}1 + .6599X - 2.903\ G$$
$$(174)(25.200) \qquad (.920) \qquad (.3332) \qquad (2.165$$

APPENDIX H

A PROGRAMMING MODEL FOR PLANNING IN AGRICULTURE

D.E. Kunkel

This statement describes the way we are undertaking an economic analysis of the central problems in agricultural development in the Philippines. Agriculture plays an important role in the economy by serving as a source of (a) basic food items; (b) industrial raw materials; (c) foreign exchange; and (d) income and employment for rural people. Because of the complexity of the agricultural sector, it is necessary to have an analytical framework which can take account of the interaction and competitive relationships that exist.

The efficient allocation of the economy's limited resources requires an analysis of the efficiency of the various programs in attaining the several policy goals and objectives. The existing programs and those planned are considered together as a particular policy mix to determine the most efficient use of the country's limited resources. The analysis is premised on the assumption that there exists a good potential for increasing agricultural production of most of the commodities that are presently produced and of others that may be developed.

A programming framework provides the best means for obtaining an integrated picture of Philippine agriculture within which real-

istic production and market opportunities are identified. This framework permits the specification of alternative activities which compete for the use of resources that are limited in supply. A set of activities are then chosen which are optimum for the objectives given. By first specifying values of instrumental variables (i.e. those things that can be changed by governmental action such as price supports, fertilizer subsidies) that constitute a particular policy, various policy options can be analyzed to determine their effect on income, employment and foreign exchange earnings.

OVERVIEW OF THE MODEL

The use of a programming model is based on the assumption that production and marketing processes can be aggregated into a relatively small number of activities. This type of study is best illustrated by Day, Singh and Mudah for the Punjab in India; Bolton for Vietnam (South); and Duloy and Norton for Mexico.[1/] For those

---

1/ These are best illustrated by the following studies: Richard H. Day and Indirjot Singh "A Micro Econometric study of Agricultural Development," Social Science Research Institute paper #7120, University of Wisconsin 1971; Mahinder S. Mudahar. Dynamic Models of Agricultural Development with Demand Linkages, Occassional Paper #59, Department of Agricultural Economics, Cornell University, 1973; William Bolton, "Application of an ERD production distribution model to the South Vietnam agriculture sector." 1971 (draft paper) and, John H. Duloy and Roger D. Norton, "CHAC: A Programming Model of Mexican Agriculture: ...S. Manne eds. Multi-level planning: Case studies in Mexico, (Amsterdam: North Holland; 1973).

unfamiliar with programming there are a number of texts that can be consulted.[2/]

With this type of analysis, it is possible to trace out the consequences of various policies at both the farm and intermediate levels of production, and handle the following characteristics of Philippine agriculture: (1) the interdependence of farm production decisions with consumption decisions; (2) the multi-product characteristics of agriculture; (3) technological change; (4) the learning and adoption of new products and production techniques; (5) linkage between farm production and agricultural related industries; (6) the relationship to foreign exchange requirements for imports and exports; and, (7) investment requirements.

The various goals for agriculture that have been stated are self-sufficiency in rice, corn, and feedgrains, maximizing the contribution to GNP, obtaining the maximum amount of foreign exchange, and a less unequal income distribution including land reform. These goals often are in conflict and thus need to be analyzed to determine the trade-offs among them.

2/ R.C. Agrawal and Earl O. Heady. Operations Research Methods for Agricultural Decisions, (Ames: Iowa State U. Press, 1973)
Robert Dorfman, P.A. Samuelson and R.M. Solow. Linear Programming and Economic Analysis (New York: McGraw Hill, 1958).

The potential production of all crops, livestock, and inland fisheries is related to both domestic and export markets and the optimum mix determined. The analysis takes the form of describing a recent period for which we have data, 1970-72 crop years. A projection of an equilibrium situation a few years hence will then be made with a consideration of the policies required to achieve the national goals. For practical purposes and for making the required projections of population, income and demand, 1980 has been adopted as the appropriate planning horizon.

Activities are provided for 12 of the principal crops now grown and 4 main livestock products. These are given in Table 1 as well as the policy objective for those crops and other crops. Various experimental field trials have also shown import substitution prospects for some crops not now produced which may be added to the analysis later.

Each region is represented by a set of production activities that are suited to it. These areas are linked together through marketing and processing activities on a regional or national basis. Specific demand constraints for a commodity or group of commodities are incorporated on the national level.

Because of economic and environmental requirements some crops can be grown more productively in some specific locations than in

others. Thus, to the extent possible homogenous agro-economic areas based on environmental and economic factors for each region have been specified. This allows us to identify areas within which only particular types of crops and other agricultural activities can take place. On a regional basis for the whole Philippines, the overall goal is the analysis of the majority of the agricultural sector in sufficient detail to obtain feasible adjustments in production patterns; resource requirements, marketing, and processing needs at the regional level.

Commodity	Included in the model	Policy Objectives
A. Production of Staple Foods		
1. Rice	X	- Self-sufficiency in order to conserve foreign exchange.
2. Corn	X	
3. Sorghum		
4. Meat		
a. Poultry	X	
b. Swine	X	
c. Beef and carabeef	X	- To increase farm income of small producers.
5. Fish	?	
6. Fruits and vegetables		
a. Tomatoes	X	
7. Other crops		
a. Camote	X	
b. Cassava	X	
c. Mongo	X	
d. Coffee	X	
B. Industrial Raw Materials		
1. Food grains		- To support the industrial needs of agricultural based industries (food mills, processors, manufacturers) for creating employment opportunities and at the same time conserve foreign exchange.
a. Corn	X	
b. Sorghum		
2. Cassava	X	
3. Other crops such		
a. Wheat		
b. etc.		
C. Production of Export Crop		
1. Traditional export crop		
a. Sugar	X	
b. Coconut	X	
c. Pineapple		
d. Banana	X	
e. Logs and lumber		- To earn foreign exchange needed for development.
f. Abaca	X	
g. Tobacco	X	
2. Potential export crop		
a. Papaya		
b. Mango	X	
c. Melon		
d. Castor oil		
e. Palm oil		
f. Rubber		
g. Garlic and other spice		
h. Sunflower		
3. Processed export		
a. Canned		
b. Dried		- To provide employment.
c. Dehydrated		
d. etc.		

MICROFILMED FROM BEST AVAILABLE COPY

Objective Functions

Philippine agriculture is best characterized as having a perfectly competitive structure where producers are price takers and equate marginal costs to product price. Assuming no external trade and zero cross price elasticities, the following set of domestic demand functions can be specified.[3/]

$$p = a + \hat{B}q$$

where:

commodity prices $= P = \begin{bmatrix} P_1 \\ \vdots \\ P_j \end{bmatrix}$ Quantity $= q = \begin{bmatrix} q_1 \\ \vdots \\ q_j \end{bmatrix}$

and Constants

$$\hat{B} = \begin{bmatrix} b_1 & & & & & \\ & \cdot & & & & \\ & & \cdot & & & \\ & & & \cdot & & \\ & & & & \cdot & \\ & & & & & b_j \end{bmatrix} \qquad a = \begin{bmatrix} a_1 \\ \vdots \\ a_j \end{bmatrix} \qquad 1 = \begin{bmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{bmatrix}$$

For simplicity, the supply function though much more complicated and based on the production activities in the model, can be characterized as a cost function for each commodity.

3/ The approach used here is patterned after Duloy and Norton, "CHAC a programming model of Mexican Agriculture" in I.M. Goroux and A.S. Manne eds., Multilevel planning: Case studies in Mexico (Amsterdam: North Holland, 1973).

MICROFILMED FROM BEST AVAILABLE COPY

$$c(q) = \begin{bmatrix} C_1(q_1) \\ \vdots \\ \vdots \\ \vdots \\ \vdots \\ C_j(q_j) \end{bmatrix}$$

The appropriate objective function for representing the competitive case is:[4/]

$$Z = q' [a + 0.5 Bq] - 1 [C'(q)] \quad [5/]$$

The objective function Z can be further broken down into consumer surplus (CS) and producer (PS).

In the single product case with linear supply and demand curves, the consumer surplus (CS) is the area ACP in figure 1, or $\frac{1}{2}$ the area ACEP

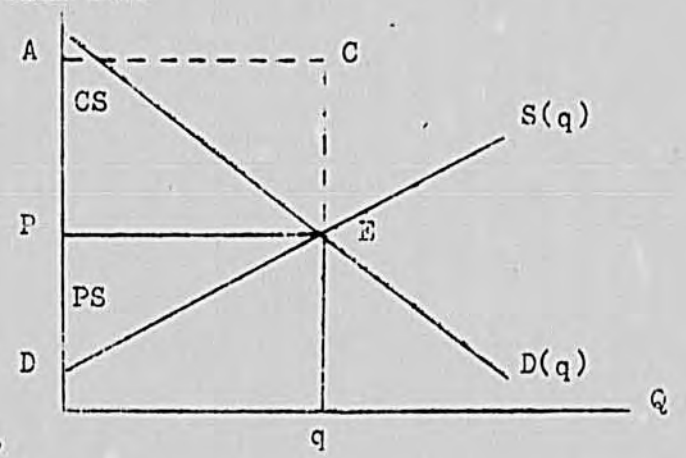


Figure 1.

4/ See Don Yaron and H.O. Heady, "Approximate and Exact Solution to non-Linear Programming Problems with Separable Objective Function." Journal of Farm Economics, Vol. ... No. ... (1962), pp. 57-70 and P.A. Samuelson, "Spatial Price Equilibrium and Linear Programming" American Economic Review, Vol. 42, No. 3 (June 1952), pp. 283-303.

5/ This is equivalent to the competitive equilibrium since, $dz/dq = a + Bq - C'(q) = 0$ $d[1(C'(q))]/dq = d[C(q)]/dq = C'(q)$ $p = C'(q)$ or price equals marginal cost. $C'(q)$ is a J x 1 vector of marginal costs.

Since cross elasticities are zero:

$$CS = \tfrac{1}{2}q' (a - P) = -0.5q' \widehat{B}q$$

The producer surplus is the area PED. Equivalently, it can be expressed as:

$$PS = q'P - \iota C(q)$$

Thus Z is the summation of the producer and consumer surplus.

$$\begin{aligned} Z &= PS + CS \\ &= -0.5q' \widehat{B}q + q'p - \iota C(q) \\ &= -0.5q' \widehat{B}q + q' (a + \widehat{B}q) - \iota C(q) \\ Z &= q' (a + 0.5 \widehat{B}q) - \iota C(q) \end{aligned}$$

In certain cases, the monopolistic case is more appropriate and it is useful to consider policies that maximize agricultural sector income. In this case, the demand curve becomes the marginal revenue curve. Thus the objective function becomes

$$Y = q' / a + \widehat{B}q / - \iota C'q) \text{ 6/}$$

This can either be used as the objective function of evaluation of policies, such as supply controls, on producer income or used as a constraint.

Though policies for increasing employment are most appropriately analyzed by using the above framework and analyzing the effect of different policies on both income and employment, it is also possible to maximize employment subject to some minimum income constraint.

. . . . . .

6/ $dy\ dq = a + 2\ \widehat{B}q - C'(q) = 0$ or Marginal Revenue Product = Marginal Cost
$= a + 2\ \widehat{B}q = C'(q)$

This objective function is stated,

$$N = q'L$$

where, L is a J x 1 vector of total labor requirements.

THE ACTIVITY SET

Activities in the programming model represent the range of choices at the farm, regional, and national level. Activities representing the farm level are developed for the various enterprises to be included in the model according to land capability class and availability of irrigation water. These are distinguised where relevant by type of technology and time period. These production activities transform the production inputs into either final output or intermediate outputs which are used in other activities.

Intermediate activities are used to transform output at the farm level into final form used for consumption. These are usually specified at the regional or national level for such activities as rice and corn milling, livestock production, cane milling, etc.

Input supply activities are provided for fertilizer, chemicals, and short-term capital. Labor supply activities represent on-farm and non-farm agricultural labor supply throughout the year, by region.

Sales and revenue activities are formulated to represent linear demand functions (see figure 2). The approach uses the grid methods to approximate the quadratic function q'Bq and 0.5 q'Bq specified earlier as part of the objective function. The demand tableau is illustrated for the demand function of a single commodity.

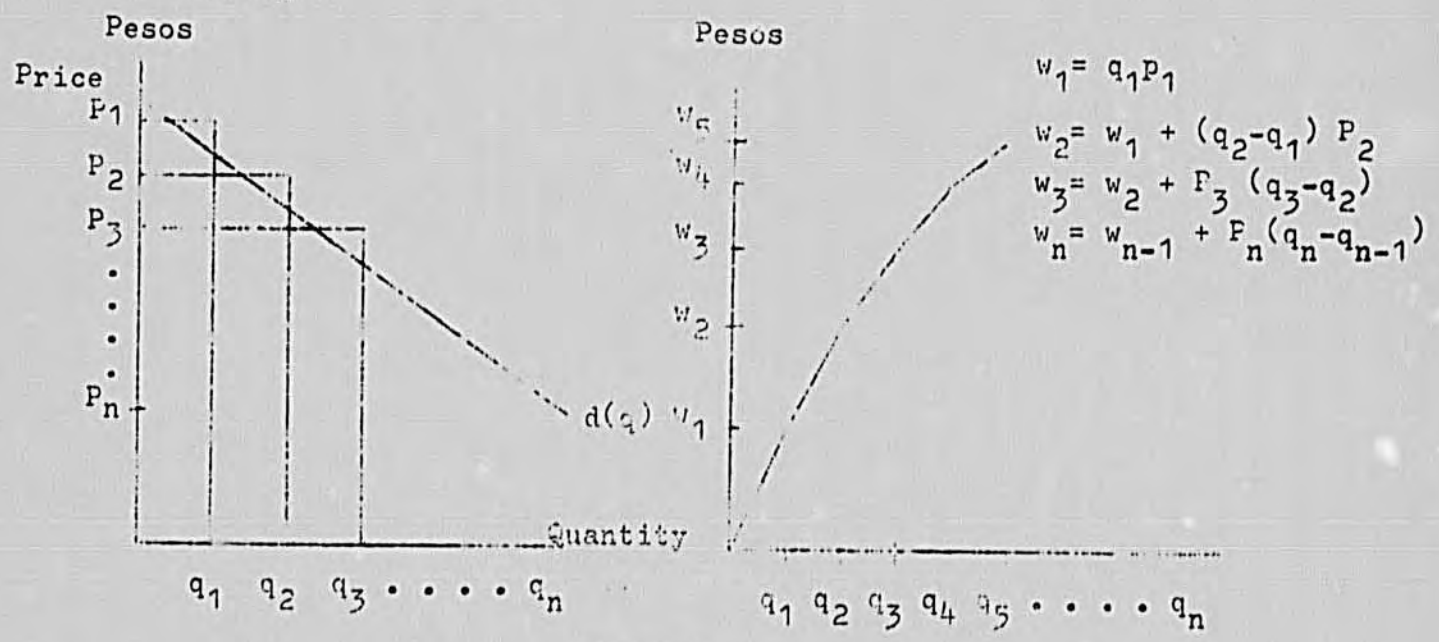


Figure 2

Single Commodity Demand Tableau

Rows/Activities	1	2	3 . . . 4		output
Objective function	w_1	w_2	$w_3 \cdot \cdot \cdot w_n$		≥ 0
Commodity balance	q_1	q_2	$q_3 \cdot \cdot \cdot q_n$	$-Q$	≤ 0
Convex combination	1	1	1 . . . 1		≤ 1

Because $q'\hat{B}q$ is a convex function, the solution will never use more than two of the activities in the demand set of a particular commodity and with the use of separable programming this can be limited to only one.

Since it is difficult to handle cross price elasticities without substantial nonlinearization, those commodities which are close substitutes, such as rice and corn, are grouped together. Substitution is followed within limits at fixed ratios maintaining the convexity of the objective function.

THE CONSTRAINT SET

The resources available limit what can be produced in the agricultural sector and can be broken down into land, labor, capital, and demand.

LAND -- Land is broken down when necessary by type of land and time of use (bi-monthly)

$$\sum_{j \in P} a_j^{r,c,t} X_j \leq L_j^{r,c,t} \qquad \begin{array}{l} r = 1, \ldots 6 \\ c = 1, \ldots 6 \\ t = 1, \ldots 6 \end{array}$$

The amount of land available in the rth region, c^{th} land class, and in time t is less than or equal to the amount used in all production activities.

LABOR -- the amount of labor available for use in crop production may be constraining during peak periods of use.

$$\sum_{j \in P} l_j^{r,t} X_j - l_r^{r,t} \leq 0 \qquad \begin{array}{l} r = 1, \ldots 6 \\ t = 1, \ldots 6 \end{array}$$

The amount of labor used in the rth region and the tth time period is less than or equal to amount supplied from family and hired resources.

CAPITAL INPUTS - this category covers such items needed in the production process as fertilizer, chemicals, and machinery service as well as other cash inputs.

$$\sum_{j \in p} c_j^{r,m,t} \; X_j - S^{r,m,t} \leq 0$$

The use of machinery service in the rth region is less than or equal to the supply.

$$\sum_{j \in p} c_j^{r,f} \; X_j - \sum_{j \in F} s_j^{r,f} \; X_j \leq 0 \qquad f = 1, \ldots 3$$

The use of fertilizer nutrients is less than or equal to the supply of fertilizer nutrients from all types of fertilizers in each region.

$$\sum_{j \in p} c_j^c \; X_j - S^c \leq 0$$

The quantity of chemicals used is less than or equal to their supply in monetary terms.

$$\sum_{j \in p} c_j^r \; X_j + \sum_{j \in p} s_j + \sum_{j \in H} H_j^r \leq C$$

The amount of operating capital needed by each production activity plus the amount used for cash inputs plus the amount paid to hired labor must be less than or equal to the amount of short-term capital available.

CAPACITY CONSTRAINT

These serve much the same function as the land constraints at the primary production level.

$$\sum_{j \in M} M_j^{rp} X_j \leq M^{-rp}$$

The amount of rice, corn, sugar cane, and coconuts milled is less than or equal to the amount of milling capacity in the region.

ANIMAL POWER

$$\sum_{j \in p} N_j^{rt} X_j \leq N^{-rt}$$

The amount of animal power used by the production activities is less than or equal to the supply.

COMMODITY BALANCE CONSTRAINTS

Palay - rough rice

$$\sum_{j \in p} q_j^{rp} X_j + \sum_{j \in M} M_j^{rp} X_j = 0$$

The amount produced in region r is equal to the amount milled rice.

Milled rice

$$\sum_{j \in M} q_j^{rm} X_j + q^{rps} = 0$$

The amount of milled rice produced is equal to the amount sold.

Regional rice balance

$$-\sum_{r=1}^{6} q_r^{PS} \; q_s^{-p} - q^{x} + q^{I} = 0$$

The amount produced equals the amount sold minus exports plus imports where q_s^* represents the separable demand function and requires an additional constraint.

Corn

$$-\sum_{j \in p} q_j^{rc} X_j + \sum_{j \in m} M_j^{rc} X_j + q^{rc} = 0$$

The amount of corn produced equals the amount milled sold plus the amount for other uses.

$$-\sum_{r=1}^{6} q_r^{cs} + q_s^{*c} = 0$$

The amount of milled corn produced equals the amount consumed where q_s^{*c} represents the separable demand function.

$$-\sum_{r=1}^{6} q_r^{c} + \sum_{j \in F} f_j^{c} X_j + q^{cx} - q^{cI} = 0$$

The amount of corn used for other purposes equals the amount fed to livestock plus the amount exported minus imports.

By products of rice, corn, sugar cane and coconuts

$$-\sum_{j \in B} m_j^{B} X_j + \sum_{j \in F} f_j^{B} X_j + f^{BI} - f^{BX} \leq 0 \qquad b = 1, \ldots 9$$

The amount of by-products used for feed or exported are less than or equal to the amount produced plus imports.

Sugar

$$- \sum_{j \in p} q_j^{rs} X_j + \sum_{j \in m} m_j^{rs} X_j = 0$$

The amount of sugarcane milled equals the amount produced.

$$- \sum q_r^{sg} + q^{*sg} + q^{*sgX} = 0$$

The amount of sugar produced is equal to the amount consumed plus exports where q^{*sg} is the separable demand function for sugar.

Livestock (Pork, beef, poultry, eggs)

$$- \sum_{j \in l} q_j^{l} X_j + q^{*l} - q^{ll} + q^{lx} = 0 \qquad l = 1, \ldots 4$$

The amount of livestock products produced is equal to consumption plus imports minus exports. q^{*l} represents the separable demand function for livestock.

Products Consumed Directly without Processing

$$\sum_{j \in p} q_j^{d} X_j + q^{*d} - q^{dI} + q^{dX} = 0 \qquad d = 1, \ldots 11$$

FARM INCOME

Using the matrix notation for demand that was developed earlier, farm income is given by

$$- q'p - \sum_{j \in p} c_j^{p} X_j^{p} - \sum_{j \in m} c_j^{m} X_j^{m} - \sum_{j \in l} c^{l} X_j - \sum_{j \in s} c^{s} X_j - \sum_{r=1}^{6} \Delta P_r Q_r \leq Y$$

$$\left[\text{Total Revenue}\right] - \left[\begin{matrix}\text{miscellaneous cash}\\ \text{production costs}\end{matrix}\right] - \left[\text{milling cost}\right]$$

$$- \left[\begin{matrix}\text{livestock pro-}\\ \text{duction costs}\end{matrix}\right] - \left[\begin{matrix}\text{Input cost in-}\\ \text{cluding labor}\end{matrix}\right] - \left[\begin{matrix}\text{Regional price}\\ \text{differentials}\end{matrix}\right]$$

$$\leq \left[\text{Farm Income}\right]$$

This equation may also be used as an objective function to maximize income to agriculture.

FARM PROFITS

Farm profits are obtained by adding back in the charge for family labor to farm income.

$$Y + \sum_{j \in Lf} C^{Lf} X_j \geq P$$

LABOR

$$\sum_{\substack{j \in P \\ j \in m}} l_j^T X_j \geq L$$

The total labor used by both primary production and intermediate production activities is greater than or equal to some specified level. This can also be used as an objective function subject to an income constraint.

OBJECTIVE FUNCTION

$$q'(a + .5\,\hat{B}q) - \sum_{j \in p} C_j^p X_j^p - \sum_{j \in m} C_j^m X_j - \sum_{j \in l} C_j^l X_j - \sum_{j \in s} C^s X_j - \sum_{r=1}^{6} \Delta P_r Q_r$$

This function represents the sum of consumer and producer surplus and is the same as the farm income function except for the demand term.

APPENDIX I

PROJECT ADAM: INSTITUTIONAL DEVELOPMENT PLAN[1]

A viable and cohesive institutional development plan for Project ADAM in the years to come and beyond its termination date as a special project must basically turn to the issue of building up its staff in order to ensure its capability to maintain the operations and continuity of its agricultural sector planning and programming model. By the very nature of its activities, which demand high-level expertise and technical capacity, Project ADAM already faces the problem of maintaining the few highly qualified personnel who have been attached with the said project since its early days, namely, Messrs. Gil R. Rodriguez, Jr., Porfirio B. Tunque, and possibly, Noises R. Sardido and Quintin Balagot.

Messrs. Rodriguez and Tunque, who have been closely working with Dr. David Kunkel, will most likely assume the Project's operational leadership when Dr. Kunkel completes his basic work at Project ADAM. Consequently, the Bureau recognizes the serious need to provide further intensive training for these two along the line of Dr. Kunkel's area of specialization, if the project operations are to be assured of continuity beyond the period of assistance by NSDB and USAID. Mr. Rodriguez has completed graduate work towards an M.B.A. at the Ateneo University, and work on his thesis on fertilizer which utilized an econometric model to forecast demand for two major crops of the country, was used as a micro data base for establishing a portion of the linear programming production-distirubtion model at Project ADAM. Mr. Tunque, on the other hand, has

---

1. Position Paper submitted by the Bureau of Agricultural Economics to the Technical Assistance Bureau, USAID.

an undergraduate degree in agriculture, with statistics as his major subject from the University of the Philippines at Los Baños.

The Bureau and the project leadership therefore feel that the graduate training of Project ADAM's technical personnel should start immediately, or not later than the fall term of school year 1974-1975. There are two major reasons for the immediacy of the proposed timetable above. First, the LP model has been established and, with the availability of Messrs. Leonardo Gonzales and Donato Antiporta, ADAM participants from the University of Tennessee and the University of Minnesota, Dr. Kunkel may have less urgent need for the assistance of the two ADAM candidates for graduate training. Second, the project staff envisions that Dr. Kunkel's major and basic work will reach completion by mid-1976, at which time it shall be mandatory for Mr. Tunque to have completed his training and return to the Philippines to do his part in the continuity of the project.

A three-year Ph.D. program in econometrics is proposed for Mr. Rodrigues, the first two years for coursework at a graduate school recognized in the area of computer programming and mathematical analysis, and the third year to be spent in residency with Project ADAM for his Ph.D. dissertation research. During this proposed third year in residency with ADAM, it is expected that the transition of the project's operational leadership from Dr. Kunkel to Mr. Rodrigues and Mr. Tunque shall be made, so that by the time the former's tour of duty shall end, Mr. Rodrigues will have in turn finished his advance graduate studies. Difficulties pertaining to admission to the appropriate graduate school

MICROFILMED FROM BEST
AVAILABLE COPY

are not anticipated, since Mr. Rodriguez has a satisfactory academic record at the undergraduate level and the impressive one at the graduate level.

For Mr. Munque, a master's program for one academic year (two terms or 9 months) in computer programming would be essential, plus a 3-month residency in an appropriate division of the USDA Economic Research Service, or Statistical Research Service, preferably after he shall have completed his M.S. work, to allow him to observe and work with some top-level USDA-ERS or SRS computer people, particularly on simulation and systems techniques and analysis and relate this training with the Philippine experience as it pertains to the drawing up of various models for the agricultural sector.

The project leadership feels that short-term non-degree training programs should also be provided ADAM on a continuing basis for a period of five years in order to fill in the needs of the computer programming staff not only of Project ADAM but also of the Bureau. Messrs. Sardido and Balagot may possibly be trained on operations research for a twelve-month period each. Other staff personnel may be selected for training on programming and other mathematical/statistical areas over a four-year period.

At the same time that the analytical capacity of Project ADAM is being developed, the five-year Ford Foundation-assisted staff development program of the Bureau shall, if approved, probably be underway. It is then expected that by Fiscal Year 1980, the Bureau of Agricultural Economics shall be staffed with a complement of highly

MICROFILMED FROM BEST
AVAILABLE COPY

Short-range timetable for building up BAFcon (and ADAM) capability

Proposed Program	Year 1 (1974-1975)	Year 2 (1975-1976)	Year 3 (1976-1977)	Year 4 (1977-1978)	Year 5 (1978-1979)
Ph. D. (Econometrics) Gil Rodriguez	Coursework	Coursework	Project ADAM Residency (Ph.D. dissertation, research)	Transfer of operation of leadership	Self-sustaining (with consultancy)
M.S. (Computer Programming) Porfirio Tunque	Coursework	ADAM application	ADAM application	Further training in new areas	ADAM application
Training A Moises Sardido Quintin Balagot		12-month training (operations research Jan.-Dec., 1975)	-do-	ADAM application	-do-
Training B		6 to 12-mo. training (computer programming July-Dec., 1975)	ADAM application	ADAM application	ADAM application
Training C			6-12 month training (simulation techniques)	-do-	-do-
Training D				6-12 month training (mathematical analysis)	-do-
Training E					6-12 month training (computer programming and systems analysis

trained and adequately skilled economists, marketing specialists, and statisticians, that will make the agency better able to meet challenges in economic research and statistical analysis.

By 1980, research is also anticipated to be more complex and leaning more and more towards complete computerization. Because of this, additional opportunities should be provided for training on computers, systems analysis, and new areas of analysis.

Along with this 5-year timetable for staff development is the issue of the quantity and quality of other staff members that will be needed by Project ADAM to keep it on a self-sustaining basis. The skills and expertise needed by ADAM are priced high on the "market." The Bureau sees the need to retain a crucial number of people in the project, but also recognizes the limitations imposed by government rules and regulations in regard to salary scales. At the final session of the USAID/TAB review of Project ADAM, the Secretary of Agriculture agreed to explore various ways and means by which to resolve the problem of unattractive salary scales, including the following: 1) obtaining consultancy positions for the top-level technical people of ADAM in order to augment their basic salaries; 2) a petition for the exemption of the Bureau from WAPCO coverage similar to what had been granted to NEDA and its affiliated agencies.

A third alternative that further calls for serious deliberation is the provision of further graduate training to qualified personnel. The Bureau normally has a contract calling for a two-year stint for every

year of training. While this would not be the sole reason for providing graduate-study opportunities, careful screening of candidates to include only those with the proper concern for the development of the Bureau and a certain desire for graduate work for its sake and for the possibilities of applying newly-acquired skills to the functional capability of the Bureau of Agricultural Economics, will hopefully surface the potential leaders for the agency in the years to come. This will also insure some staffing for Project ADAM.

It is felt that a minimum of 20 people are needed to develop the Bureau's research capability to keep Project ADAM activities on a continuing basis: five on a Ph.D. level; five on an M.S.-level; and ten junior-level staff. The anticipated Ph.D. graduates will be on a wide range of specialization (econometrics, computer programming and systems analysis, marketing, development economics and rural sociology) and will, therefore, be working not only on Project ADAM activities but also servicing other research undertakings that the Bureau will have. The planned M.S.-level output may be provided training slots for degree programs in the staff development program of the Bureau; for the ten junior-level staff, non-degree slots may be provided for by both USDA/TAB/AID and the Ford Foundation-assisted BAEcon staff upgrading scheme.

The above will be in line with the projected absorption of ADAM into the Bureau of Agricultural Economics, although the transition of ADAM from a project to a functional unit of the Bureau has been going

on for some time now. It will be noted that the project staff had been on a contractual basis at its inception in 1972. A number of staff members have been given appointments at the Bureau, among them Messrs. Rodriguez and Tunque. Messrs. Gardido and Balagot have been proposed for appointment while some junior-level staff with the appropriate civil service eligibilities have been integrated into the Bureau. It is planned to integrate into the regular Bureau staff as many more as are needed. NSDB support of the project will terminate in January, 1976, but further financial support is planned to be requested, possibly from PCAR, to allow the project to continue until about June, 1977. At about this time, TAB support in the form of full-time residency will have ceased. By the beginning of Fiscal Year 1976 then, it is envisioned that the project will have been fully absorbed by the Bureau of Agricultural Economics, in terms of staffing and funding

Infrastructural Relationships

Linkages with other institutions have been part of the general and over-all scheme for ADAM. While still limited at present, increased linkages are expected once the project's programming model has been developed, refined, and rendered operational. This work on the model will not be fully achieved until about 1976 or 1977 when the Bureau shall have the capability to run the model and/or develop other ones that would more specifically answer the needs of the times. The project is intended to be staffed with an econometrician, a computer

programmer/systems analyst; a marketing specialist; a development economist; and a rural sociologist, all of them on a Ph.D.-level. Together they should be able to put up relevant programs or projections more suitable to the various policy issues that will, admittedly, change over time. Thus, in order to make their work (on programs and projections) more viable, it will be necessary to establish linkages with academic institutions such as the University of the Philippines at Diliman and at Los Baños, and with research-monitoring bodies such as the Philippine Council for Agricultural Research (PCAR), and with a national planning and policy agency such as the National Economic and Development Authority (NEDA). Even at this stage, the Bureau is already in close linkage with the NEDA, the Bureau's Director being a member of the Statistical Advisory Board, and also chairman of the task force assigned to work on the improvement of rice and corn statistics in the country. The expertise that the ADAM trained staff have will, as a natural consequence, be subjected to pressures; the Bureau of Agricultural Economics expects, however, to be involved in a series of national and regional programs in which the participation of the ADAM staff will become a must, thereby not limiting the availability of these people to the Bureau alone but to national concerns, as well.

In the formulation and development of models, therefore, the Bureau shall be closely involved with academicians, practicioners, and other economists in addition to policy-making bodies. It is the intention of the Bureau to maintain and sustain the work of ADAM as a

regular activity, to service the national needs in relation to development planning for the agricultural sector (fishing and forestry included). The support of the NSDB, the USAID, and the USDA/TAB, especially in the area of building up the analytical capability, will make this highly possible.

###

USAID/TAB Review of Project ADAM
June 3-5, 1974

S U M M A R Y

The wrap-up session of the three-day ADAM review dwelt on five mutual areas of concern as follows:

1. An essential and immediate need is to build up the research and analytical capacity/capability of the Bureau in order to continue the work on the programming model after it (the model) shall have been rendered operational. The session participants agreed to look for training grants within the local USAID Mission's program and to provide the necessary training on the ERS-TAB side. Eventually, a complement of from three to five people was thought essential for model-programming purposes. Three ADAM people working closely with David Kunkel were mentioned for possible graduate training: Gil R. Rodriguez, Jr., Porfirio B. Tunque, and Moises B. Sardido.

2. The participants essentially agreed on the philosophy of the initiatory role of foreign assistance particularly in the case of Project ADAM. However, to keep project activities going smoothly and efficiently even after the proposed trainees shall have returned with sufficient knowledge on the operation of the models, TAB and the local USAID Mission expected to be still closely associated with the project, but in a less active way; ADAM could draw on the technical resources of TAB for consultancy.

3. It was felt that in order to make the agricultural planning model truly responsive and relevant to the needs of the country, the team has to have a firm research plan set according to the mutual needs and objectives of both BAECON and TAB.

   a. The review team gave assurance to the other participants that the timetable for termination of the project on the U.S. side would be flexible depending on when the analysis could be reasonably expected to be completed and sufficient institutional development of the Bureau has occurred in order to handle and continue to use the model.

   b. On the matter of (a), the Bureau felt that it needs time, first to complete the model and get it going; then to have personnel trained to handle the model. BAEcon hopes to continue the model and analysis after the foreign participants shall have completed their work. TAB, however, indicated further need for ADAM to have access to other consultants on a continuing, but not necessarily on full-time residency, basis.

4. It was agreed that the agricultural planning model has to address itself to key policy issues of the Government in order to assume a relevant role (in building the economy).

   a. The Secretary of Agriculture felt that the model appears satisfactory; that basically it has all the variables, but it faces certain problem areas and needs to include

other aspects in view of the changes in the economy due to the energy crisis, among other things, e.g., the emphasis and re-direction of the Government towards increased production of export crops and the emergence of interest in natural fibers may have to be taken into consideration.

b. TAB felt that it is not proper to call the ADAM model a predictive model but recognizes it as an optimizing model indicating what should be. To make it predictive would require that it be made recursive and demonstrate its ability to track back over time. However, given limited resources the approach taken in the project is to look at only two points in time. Once this analysis has been completed the model should be made recursive or combined with other types of simulation analysis.

5. The participants, agreeing on the crucial importance of attracting and keeping good and more people to the Bureau in view of the high level quality of staff needed to continue work on the model, deplored the low civil service pay scales of the technical staff of the Bureau. The Secretary of Agriculture viewed several avenues of increasing the remuneration of the technical staff at least to a level comparable with that of NEDA and its affiliated agencies and promised to explore possibilities to achieve this.

Place: Rajah Humabon Hall
Sulo Hotel, Quezon City

Time started: 1:30 p.m.

Time finished: 3:55 p.m.

Participants:

1. Arturo R. Tanco, Jr., Secretary of Agriculture
2. Leonardo A. Paulino, BAEcon
3. Jesus C. Alix, BAEcon
4. Frank B. Sheppard, USAID/Manila
5. William A. Faught, ERS/USDA
6. Leland Fletcher, TAB/USDA
7. Donald Anderson, TAB/USAID
8. L. J. Atkinson, ERS/USDA
9. David E. Kunkel, ERS/USDA

Observer:

1. Ramon C. Alcachupas, BAEcon

PROJECT ADAM PAPERS[1]

ALIX, J.C. 1973. A preliminary analysis of Philippine agriculture. Paper presented at the First National Congress on Agricultural Research of the Philippine Council for Agricultural Research, Los Baños, Laguna, Feb. 12, 1973. 68p.

The paper presents a descriptive analysis of how Philippine agriculture has grown over the years, and an overview (an evaluation) of the present state of agriculture in the country.

300

ATIENZA, F.M. and D.E. Kunkel. 1973. Determining the optimum economic family-size farms for land reform areas. Preliminary Report. Bureau of Agricultural Economics. 41p.

50

A preliminary report on NRCP project no. I - 4, now integrated into the ADAM research umbrella; the report contains an analysis of findings on the attempt to determine optimum economic family-size farms for land reform areas, discussing, first, assumptions used for the specified technology levels; the optimum combination of resources and cropping activities and the optimum solution for each level of farm technology; and comparisons of farm technologies and their component items.

ATKINSON, L.J. and D.E. Kunkel. 1973. Some exploratory notes on the nature of the green revolution in the Philippines. Working Paper No. 2, Bureau of Agricultural Economics, 25p.

100

An analysis of the 1970 farm survey data from the BAEcon's Integrated Agricultural Surveys, on the relationships between fertilizer and rice yields; the study used only a sub-sample of the survey data collected.

_____. 1974. HYV in the Philippines: Progress of the seed fertilizer-revolution. (Preliminary draft). Bureau of Agricultural Economics. Quezon City, 61p.

An extended revision of Working Paper No. 2 on the "Green Revolution" discussion; the paper discusses the 1972 BAEcon-IAS data. The analysis indicates significant deviations of rice yields from normality and indicate positive skewness.

1/ Figures on the right side indicate the total number of copies published.

FOOTE, R.J. 1974. Philippine agricultural sector models - selection of variables from the computer runs and discussion of results. Bureau of Agricultural Economics, Quezon City. 27p.

30

This report discusses the processes involved in initial formulations for the agricultural sector models developed. The models were designed for three purposes: to generate a system of equations which can be used with other analysis and information as a guide for policy decisions related to agriculture; to determine the extent to which available data is satisfactory - and areas where new data is needed; to as- Filipino technicians to increase their knowledge on economic analysis. The methods of 3-stage and 2-stage least squares regression analysis were used.

_____. 1974. Agricultural sector models for the Philippines; formulations and data. Bureau of Agricultural Economics, Quezon City. 14p.

30.

The report discusses the data used in, and the formulations of, two agricultural sector models for the Philippines; one model was run for a number of crops; and the second model limited to the 5 most important crops/products. Both models are designed to complement the previously completed macro-model for the Philippines.

_____. 1973. A macro-model for the Philippines for 1955-1969 in 1955 prices. Bureau of Agricultural Economics, Quezon City. 4p.

30

Discusses a macro-model (patterned after one developed for Taiwan) using two exogenous variables: exports, and government expenditures for consumption. Data from the Encarnacion econometric models are used, with some modifications.

_____. 1974. Macro-model for the Philippines in 1955 prices - results for 1970-72. Bureau of Agricultural Economics, Quezon City. 6p.

30

This report discusses ways on how to use the new data in the model, and presents results for the three available years outside of the period of fit. The general conclusion is that the model as originally formulated gives reasonably calculated values for GDP, YD and C for 1970-72.

KUNKEL, D.E. 1974. A programming model for Philippine agriculture. Bureau of Agricultural Economics, Quezon City.

50

The paper is a descriptive presentation of the programming model developed for Philippine agriculture, which (model) gives a set of activities for 7 regions delineated according to agro-climatic conditions. The model analyses the agricultural sector in sufficient detail so as to obtain feasible adjustments in production patterns, resource requirements, marketing and processing needs by region.

PAJE, M.P., D.E. Kunkel, and A.C. Alcasid. 1974. The fertilizer supply situation and marketing system in the Philippines. Working Paper No. 4. Bureau of Agricultural Economics, Quezon City. 115p.

100

The paper deals with two aspects of the fertilizer industry in the Philippines during the period 1954-1972: supply situation and marketing system. Importation and domestic production for the indicated years are included as with corresponding breakdown of fertilizers components imported into the country.

PAULINO, L.A. 1974. Narrative report on Project ADAM (NSDB-BAEcon 7202Ag). Bureau of Agricultural Economics, Quezon City. 46p.

50

A report on the activities and accomplishments of Project ADAM during its second project-year (Feb. 1, 1973 to January 31, 1974).

_____. 1973. Narrative report on Project ADAM (NSDB-assisted Project No. 2.260). Bureau of Agricultural Economics. Quezon City. 90p.

50

A report on the activities and accomplishments of Project ADAM during its first project-year (February 1, 1972 to January 31, 1973).

PAULINO, L.A. and J.C. Alix. 1973. Agricultural diversification and markets in the Philippines. Paper presented at the NSDB Evaluation Seminar on ADAM, June 16, 1973. 72p.

50

The paper presents the scope of the project, its rationale, analytical approach, policies, and accomplishments for the period February 1, 1972 to June, 1973.

MICROFILMED FROM BEST AVAILABLE COPY

PROJECT ADAM. 1973. Technical progress report. Bureau of Agricultural Economics, Quezon City. 98p.

50

A report on the technical progress of the project for the period February 1 to June 30, 1973.

_____. 1973. Planning for agricultural development: a review of literature. Working Paper No. 3. Bureau of Agricultural Economics. Quezon City. 189p.

200

A review of the selected studies deemed most helpful and relevant towards planning activities for agricultural development; the base for the review was a total of 1,000 studies "directly useful" to the project. The review is divided into ten sections: situation/policy; development/growth; crop management; livestock/poultry management; agricultural marketing; machinery and fertilizer products; agricultural credit; and international trade.

_____. 1973. Proceedings: NSDB evaluation seminar on agricultural diversification and markets in the Philippines. Bureau of Agricultural Economics, Quezon City. 72p.

50

A presentation of the reports, comments and discussions at the 2nd series on the evaluation seminar on Project ADAM held on June 17, 1973.

_____. 1972. An annotated bibliography of selected studies on agricultural diversification and markets in the Philippines. Working Paper No. 1A, (Parts I and II). Bureau of Agricultural Economics, Quezon City.

500

A seven-volume annotated bibliography of research studies relevant to agricultural diversification and markets in the Philippines, one seven classification as follows: agricultural economics and rural sociology; agronomy and horticulture; animal husbandry, forestry, fisheries and human nutritions; and fertilizers, entomology and plant pathology, agricultural botany, agricultural engineering and others; agronomy/horticulture; agricultural economics (marketing); and non-Philippine studies.

MICROFILMED FROM BEST AVAILABLE COPY.

PROJECT ADAM. 1972. Technical progress report, February 1 to June 30, 1972. Bureau of Agricultural Economics, Quezon City. 45p.

500

A report on the technical progress of the Project for the period February 1 to June 30, 1972.

RODRIGUEZ, G.R. 1974. Fertilizer demand in the Philippines, 1952-1980. Unpublished M.B.A. thesis, Ateneo University.

This uses an econometric approach to analyze demand for the supply response to fertilizer and forecasts future demand for fertilizers.