Agricultural Planning in Thailand

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AGRICULTURAL PLANNING IN THAILAND

FINAL REPORT

by

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FOREWORD

This Final Report summarizes activities and accomplishments of the Agricultural Planning Project (APP) in Thailand from June 1982 to October 1985. The APP was a cooperative technical assistance effort carried out by the Office of Agricultural Economics (OAE), Ministry of Agriculture and Cooperatives (MOAC), Royal Thai Government (RTG), in collaboration with the Center for Agricultural and Rural Development (CARD) at Iowa State University (ISU). The technical assistance program was funded by the United States Agency for International Development (USAID) and the RTG. This report describes technical assistance aspects of the APP which were provided through university contract. It does not cover other aspects of the large project which were not covered under the technical assistance contract, such as participant training, workshops and seminars, and equipment procurement. This project emphasized organizational and managerial structure to improve the quality of data collection, empirical analysis, and assessment of policy recommendations to enable MOAC to provide increased input into the national planning process, especially those phases relating to Thai agriculture. This project has built upon the research and analytical capability developed from 1973 through 1979 during the Agriculturel Sector Analysis Project (ASAP).

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GLOSSARY OF ACRONYMS

ADB	Asian Development Bank
APP	Agricultural Planning Bank
ASAP	Agricultural Sector Analysis Project
ASCS	American Soil Conservation Service
ASEAN	Association of Southeast Asian Nations
ASF	Area Sampling Frame
BOB	Bureau of the Budget
BPS	Baud per second
CARD	Center for Agricultural and Rural Development
CAS	Center for Agricultural Statistics
COPS	Crop Development Plan Section
CSC	Computer Services Center
DAER	Division of Agricultural Economics Research
DEPPE	Division of Economic Project and Program Evaluation
DOA	Department of Agriculture
DOAE	Department of AGricultural Extension
DPADP	Division of Policy and Agricultural Development Plan
DTEC	Department of Technical and Economic Cooperation
EEC	European Economic Community
FAF	Farmers Aid Fund
FYP-6	Sixth Five-year Plan
IRR	Internal Rate of Return
ISU	Iowa State University
LDD	Land Development Department
MOAC	Ministry of Agriculture and Cooperatives
MOF	Marketing Organizaton for Farmers
NCM	National Crop Model
NEA	National Energy Administration
NMG	National Modeling Group
OAE	Office of Agricultural Economics
PEMS	Project Evaluation Monitoring System
PID	Plan of Implementation Division
PPBS	Planning Program Budgeting System
PSU	Primary Sampling Units
RID	Royal Irrigation Department
RPG	Report Writing Generator
SAM	Social Accounting Matrices
S & O	Situation and Outlook
SOIS	Situation and Outlook Information System
SPSS	Scientific Package for Social Scientist
SPSS-X	Scientific Package for Social Scientist, Extended Version
SSU	Secondary Sampling Units
SU	Sampling Units
SUDS	Survey Data Processing System
RTG	Royal Thai Government
USAID	United States Agency for International Development

USAID/T	USAID, Bangkok, Thailand
USAID/W	USAID, Washington, D.C.
USDA	U.S. Department of Agriculture
USDA/SRS	USDA Statistical Reporting Service
USU	Utah State University
WIU	Western Illinois University

CHAPTER 1. PROJECT PURPOSE

The primary purpose of the Agricultural Planning Project (APP) was to strengthen the capabilities of Thailand's Office of Agricultural Economics (OAE) to carry out policy advisory, problem identification and analysis, planning, data management, and integrated project preparation functions. The assistance was designed to increase the OAE's capability to assist the Ministry of Agriculture and Cooperatives (MOAC) to more effectively plan and administer its resources to achieve specific policy objectives.

Under the Agricultural Economics Act of B.E. 2522 (1979), OAE was given substantially increased responsibility and authority for agricultural planning, policy analysis, budget analysis, and project preparation. The OAE which serves as the Secretariat to the Committee on Agricultural Policy and Plans chaired by the minister of agriculture, is expected to provide MOAC and Royal Thai Government (RTG) policymakers with estimates of the likely effects of alternative policies and programs on households of different income levels and in different regions. In addition, the OAE is responsible for providing support to MOAC on all aspects of decision making in such areas as policy, program design, project preparation and selection, annual budgets, and project decisions on five-year plan activities. Specifically, the OAE has the following responsibilities:

1. Policy formulation

2. Project identification, development, integration and evaluation

3. Data and information management, coordination, and computer retrieval

4. Budget analysis and coordination

5. Agricultural and rural development issues research on such topics as:

   a) Prices of agricultural inputs and products

   b) Production, consumption, price, income relationships

   c) Rural employment and seasonal labor supply and demand

   d) Socioeconomic factors related to income and its distribution

   e) Trade, marketable surplus, marketing margins

6. Agricultural survey design and data collection

7. Crop and livestock production and market forecasting

8. Statistical reporting for MOAC

The APP was designed to help the OAE strengthen its capabilities and improve performance by providing long-term technical assistants in its the major functional areas. Short-term consultants, participant training, and procurement of selected equipment were provided in addition to combined with the long-term technical assistance.

Specific objectives set forth for the project include:

1. To assist in developing a full range of managerial capabilities, with particular emphasis on coordinating and integrating the OAE's resources to serve its new and expanded functions;

2. To assist in conceptualizing, designing, and installing ministry wide systems and procedures for development planning, policy analysis, and plan implementation (budgeting);

3. To provide system management support and secondarily, specific policy advisory services;

4. To assist in developing institutional capability to manage data and information in such a way as to provide timely reporting and analysis of inputs for research, planning, and decision making;

5. To assist in developing of institutional capability to systematically identify, design, monitor, and evaluate agricultural projects that address the objectives of national plans and policies;

6. To assist in developing proper sampling techniques to be used in collecting data on the economic conditions of farmers;

7. To provide advice and assistance over the full range of statistical responsibilities being undertaken by the OAE; and

8. To assist in developing a full range of computer utilization and data processing, data analysis and storage, computer training, and data base systems for various agricultural subsections.

CHAPTER 2. PROJECT BACKGROUND AND OVERVIEW

The Thailand Agricultural Planning Project (APP) was a cooperative effort between Iowa State University (ISU)/ Western Illinois University (WIU)/Utah State University (USU), of the Ministry of Agriculture and Cooperatives (MOAC), the Office of Agricultural Economics (OAE), of the Royal Thai Government (RTG), and the United States Agency for International Development (USAID). The project, which was initiated in July 1982 and completed in October 1985, was developed in response to direct requests by MOAC for cooperative and collaborative effort to improve the organizational and administrative structure of the OAE in order to effectively and efficiently manage and improve the quality of data collection, empirical analysis, timely reporting of statistical information, and assessment of policy recommendations for agriculture.

Agricultural planning in Thailand has developed from a strong desire by MOAC and other (RTG) agencies to deal more effectively with basic production, income, and rural development problems facing the agricultural sector and the national economy. Agricultural production and rural development policy in Thailand is directly concerned with the 25.9 million people living in rural households (1980 census). These rural people constitute 57.8 percent of the nation's population. The average net farm income of these rural families was approximately $845 per household in 1983 (1983/84 Ag Statistics), or just over $150 per capita. Within these aggregate averages, significant variations exist among regions of the country, from a per capita average income of over $312 in the Central Plains to less than $85 in the Northeast. These wide variations among regions make allocation of scarce government resources even more critical as a means of alleviating substantial income disparity.

The RTG has attempted to develop policies and programs to increase employment opportunities and provide more equitable distribution of income in the rural sector, while providing the infrastructure needed to expand food production to meet projected domestic and export requirements. As in many nations, increasing pressures on scarce resources have forced decision makers to face complex problems of allocating scarce government resources among competing program alternatives that have widely variant impacts on the development of the Thai economy. Raising income levels of the less productive regions merits immediate attention, but extreme care must be exercised to identify and develop programs that are complementary, rather than competitive, with the long run growth of the agricultural sector and economy. Misallocation of scarce Thai resources could lower the total income level, as well as produce even wider variance in distribution.

The APP technical assistance contract was originally designed as a four year project to provide twelve person years of long-term technical assistance in the following five areas: (1) planning and policy systems management (four person person); (2) project development and design (three person years); (2) project development and design (three person (4) agricultural statistics (two person years); and (5) computer systems (one person year). Approximately twenty-seven months of additional short-term technical assistance were proposed to provide specialized support in specific areas such as statistical methods, survey procedures, computer systems analysis and design, computer system programming, economic and social research, area frame sampling, and project and institutional budgeting.

Based on contractor's experience with the previous Agricultural Sector Analysis Project (ASAP) in Thailand (1973-1979), the contract proposal included specific provisions for at least two regional seminars and one international seminar involving agricultural development activities in other regions of the world. Although extensive training was provided under the previous ASAP, the contract proposal recognized the need for additional specialized training both at advanced degree levels and in specialized short courses. Additional computer equipment and software requirements were anticipated to provide support for the expanded statistical data collection and processing activities, as well as the proposed reorganization of data processing and transfer. Administrative and office support staff fluent in Thai and English were identified in the project proposal as essential elements of support for the technical staff, with minimum requirements of an administrative assistant and a secretary/typist.

The original project grant agreement was signed by USAID and the RTG in December 1980, with a scheduled completion date of October 1985. Due to delays in issuing the RFTP and selecting a technical assistance contractor, a contract was not signed until June 1982. Several significant decisions were made during the contracting process. First, USAID chose to modify the original project proposal by shortening the project from four years to three years, primarily to conform to the completion date of the original project agreement. Second, USAID excluded the seminars, participant training, and equipment and software procurement from the technical assistance contract. Third, USAID required that the position of computer systems programmer be eliminated from the technical assistance contract. These and other contract modifications reduced the contract budget from $2.6 million to $2.0 million on the basis that the project had inadequate funding.

One other major change was made in the project before any activities were initiated. During contract negotiations in Washington, D.C., the chairman of the economics department at Utah State University (USU) indicated that the key personnel who had been identified in the project proposal could not be released from their department to serve on the initial project team. Thus, alternative staff had to be selected for the economic research position and the projects position. Since none of the long-term staff positions were rotated, the opportunity did not arise again for USU to supply long-term staff for the project. It should be noted, however, that Dr. Herb Fullerton, USU, provided major input into the development of the project and the identification of key resource personnel for the project. He also provided substantial assistance in assessing needs and project alternatives, even though he did not serve formally as a short-term consultant on the project and does not appear in the list of technical staff in Appendix I.

The APP was initiated in early July 1982 with the arrival of Dr. J. Edwin Faris as chief-of-party and planning and policy management specialist. Dr. Gary Vocke joined the team later in July as economic and data analysis specialist, and Mr. Winton Fuglie joined the team in August 1982 as project development and design specialist. Mr. Dan Tucker was selected as agricultural statistics specialist and joined the ISU team in May 1983. Dr. Faris was unable to extend his tour beyond the original two years, and his was the only position for which a replacement was nominated.

USAID, Bangkok, Thailand (USAID/T) scheduled a review of the project for late 1983, but was unable to field the review team until July 1984. Because USAID/T had some reservations about the progress and direction of the APP, it delayed all commitments on the project until it had the review report in hand. In July 1984, USAID/T rejected the candidate who had been nominated to replace Dr. Faris. This delay made it virtually impossible to select a new candidate and get the individual to Thailand by October, so that he or she would have at least one year of assignment in country (the minimum contract requirements for long-term benefits). One candidate was located who had previous experience in Thailand and the flexibility to relocate by the end of the year. USAID/T agreed to waive the one year requirement, but Wayne Ellingson eventually decided not to take the position. Mr. Tucker served as acting chief-of-party from July until the end of the year when it became apparent that the Policy position could not be filled and he served as Chief-of-Party for the duration of the project.

Overall, the work with the statistical center had the most consistent progress of the major areas of assistance. Progress, or lack of progress, in technical assistance work

is rarely a function of a single set of factors or events, but in some cases, key contributing factors can be identified. During the external project review and various internal review sessions, it was agreed that the work with the statistical center was the most clearly defined and job oriented. This is not to suggest, however, that the work plan was easy, as the summary in Chapter 6 verifies. The three other long-term technical assistance positions were associated with less specific job orientation and more institutional or structural change. Dan Tucker brought a high level of qualification and experience to the statistical center, but his outstanding ability to work with the staff must be noted as a significant success factor.

The project development and design specialist position was hampered, to some extent, by external factors. Between the time the APP was designed and actually implemented, by the RTG changed the role that the OAE was to play in the review, monitoring, and budgeting processes. Winton Fuglie was successful in working with the staff on several project evaluation and design activities during the early part of his assignment. During the last year of his assignment, the program and budgeting approach was more clearly defined, and rapid progress was made in designing and implementing the desired process.

The economic and data analysis position related to nearly all activities in the OAE, and this broad scope of potential activities made the position difficult to manage. Assistance was provided in a number of areas, but the focus of the last year and on reorienting the research activities from a functional basis to a commodity basis. Gary Vocke assisted the research staff in its efforts to develop teams of commodity specialists capable of responding to policy questions about all aspects of the production and marketing of a particular commodity. Several short-term consultants were utilized in this area to address specific topics.

The planning and policy management position had the broadest scope of work, and was the least job oriented. Ed Faris and the OAE staff did an extensive analysis of the current organization and objectives of the OAE, and they developed recommendations for organization, activities, staff, and facilities. These were initially presented in the form of a proposal to the World Bank for additional funding. Then, in a general move to facilitate debt servicing, the RTG severely restricted new borrowing, and the World Bank proposal did not reach the contract stage. Many of the changes that were proposed for OAE have been initiated through the current budget, special allocations, and other external funding.

Probably the most significant change in the organization and management of the OAE was the reallocation of resources to decentralize some of the OAE's activities to the regional offices. A second major change that should have a significant impact over time was the decision to implement a system of remote terminals and microcomputers for data processing. In an associated decision, the entire mainframe computing system is under review, with upgrading planned for the near future.

Operation of the computer center was determined to be a critical factor in the overall performance of the OAE, and because the original long-term computer systems programmer position was eliminated by USAID, support had to be supplied by short-term consultants. The recommendations by Art St. George seemed to address the needs and alternatives most clearly, and became the basis for several subsequent decisions concerning direction, staffing, and equipment in the center.

During the life of the APP, four individuals provided a total of 9.5 person years of long-term staff time. In addition, fifteen individuals provided 35 person months of short-term technical and administrative support to the APP in Thailand. Summaries of their activities are included in chapters 3 through 7, which deal individually with each functional area. The cooperating staff from the APP and the OAE are listed in the appendixes 1 and 20.

Throughout the term of the APP, Iowa State University and the APP team enjoyed excellent support from the OAE (the host agency), MOAC, and the RTG. In general, the APP also experienced good support from USAID. The APP team felt, however, and the external review verified, that the USAID/T project officer was inconsistent on some issues, and at times infringed upon the administrative responsibility of ISU and MOAC to carry out the contractual work plan. During the year following the external review, substantial improvement took place, and many decisions were reversed or finalized to facilitate earlier requests. In relative terms, the environment for productive work and the expectations for long run impact were excellent.

CHAPTER 3. PLANNING AND POLICY SYSTEMS MANAGEMENT

Thailand's Office of Agricultural Economics (OAE) was established by the Agricultural Economics Act of 8.E. 2522 (1979). This act promoted the Division of Agricultural Economics, which was under the jurisdiction of the Office of the Under Secretary for Agriculture, to its present status in the Ministry of Agriculture and Cooperatives (MOAC). The act also established the Committee on Agriculture and Cooperative Development Policy and Planning, and designated the Secretary General of the OAE as a member and secretary for this committee. The committee was given broad responsibilities and power in assisting orderly development in agriculture and agricultural policy. This chapter discussed those original responsibilities, then discusses the suggestions for reorganization made by Agricultural Planning Project (APP) consultants.

Organization and Functions of the OAE

The OAE was given a number of additional or expanded responsibilities, including agricultural policy analysis, development planning, research in production economics and marketing, market development, transportation, resource use, compilation of statistical information for the agricultural sector, evaluation of projects and program investments, analysis of international trade, registration of agricultural enterprises, and coordination of activities. The additional resources and responsibilities were assigned to the OAE so that it could provide better support for decision makers in MOAC and other agencies involved with the agricultural sector. Thus, the OAE was expected to provide functional support to MOAC decision makers, as well as to develop expertise in research, resource utilization, statistical data, and other areas.

As initially established, the OAE had six divisions: 1) the Office of the Secretary General; 2) the Division of Policy and Agricultural Development plan; 3) the Division of Economic Project and Program Evaluation (DEPPE); 4) the Plan Implementation Division (PID); 5) the Division of Agricultural Economics Research (DAER); and 6) the Center for Agricultural Statistics (CAS).

Most of the staff of the OAE is stationed in Bangkok or the Bangkok area. The Office of the Secretary General, the DPADP, the PID, part of the DAER, and a few of the staff members from the CAS are located in the MOAC building in Bangkok. This building is inadequate to house the staff and computer facilities. When data processing becomes more fully computerized the need for additional space will be even

greater. Most of the staff of the CAS and the DEPPE and part of the staff of the DAER is located on the outskirts of Bangkok at Bang Khen.

The DEPPE and the CAS have staff located in regional and zone offices outside of the Bangkok area. Because most of the professional expertise is located in Bangkok, however, even these divisions must send teams from Bangkok out to the field to collect data. Many of the problems, problem areas, and basic sources of information for agriculture are widely dispersed throughout Thailand, but this is not to deny that there are many needs for agricultural economists and agricultural statisticians in the Bangkok offices of the OAE. This is especially true for those involved in policy planning as well as for those in research, evaluation, and budgeting and monitoring of national and regional projects.

The size of OAE has remained almost constant for the past three years (1980-1982). The budget and employees of the OAE for that time period are presented in Table 3.1. Some increase was allocated for the 1983 fiscal year. The demands on the OAE in its support role to MOAC have, however, increased rather drastically every year. The number of crops included in the statistics reports, the responsibilities for evaluation, coordinating, and budgeting, and the need for forecasting or predicting may of the OAE. A number of support activities simply cannot be carried out at the needed level because of insufficient resources in the OAE.

The staff of the OAE includes some well-trained and effective agricultural economists who also have expertise in agricultural statistics. They are doing very well in meeting the demands placed upon them even though they are over committed in terms of assigned responsibilities.

The better trained and more productive staff in the OAE typically carry the heaviest workloads. Training and upgrading of some of the current staff is needed to enable them to be more productive and responsive to the needs of the OAE, MOAC, and the Committee on Agriculture and Cooperative Development Policy and Planning.

Staff within the OAE have developed models to estimate the effects of changes in yields, prices, resource availability, and other variables. These models have been constructed for examining the effects of the changes at the national, regional, and in some instances, local levels. Good information is required to obtain satisfactory results from analytical models. In a number of instances, large quantities of data are required to run the models. To

Table 3.1. The budget and employees of the OAE, 1980-1982

	1980					1981					1982				
	Budget	Civil Servant		Worker		Budget	Civil Servant		Worker		Budget	Civil Servant		Worker	
	baht	L 3-8	L 1-2	Perm.	Temp.	baht	L 3-8	L 1-2	Perm.	Temp.	baht	L 3-8	L 1-2	Perm.	Temp.
Office of the Secretary	3,915,100	32	23	22	25	4,570,900	32	24	22	25	4,865,500	32	26	24	17
Division of Policy & Agricultural Development Plan (DEPPE)	3,582,000	60	7	9	20	4,602,450	60	7	9	20	4,724,600	60	7	8	19
Divison of Economic Project and Program Evaluation (DEPPE)	7,007,600	110	40	31	52	9,306,600	110	41	31	16	10,538,100	113	38	29	18
Plan Implementation Division (PID)	2,573,400	50	11	10	44	3,305,050	50	11	10	14	3,542,600	51	10	10	14
Division of Agricultural Economic Research (DAER)	9,901,200	125	23	56	64	12,171,000	128	20	56	57	13,358,300	131	17	54	57
Center for Agricultural Statistics (CAS)	16,866,400	121	128	63	56	16,861,900	124	126	63	56	24,080,500	126	124	62	83
Total	43,925,700	498	232	191	261	50,817,900	504	229	191	188	61,109,600	513	222	187	208

obtain more data, and especially more precise data, additional inputs will be required at the zone, regional, and national levels. More resources will also be required to obtain additional information on institutional factors that influence outcomes. The latter are needed for building more realistic objective functions or goals into the models.

The statistical input is critical for many of the models. Efforts are currently underway to improve the statistical sample frame, and to see if remote sensing can be used to estimate cropland area. Obtaining additional objective yield samples is another need. The larger members of objective yield samples needed as a result of the rapid increase in the number of crops being estimated can create a considerable drain on available resources. Accurate estimates of the amount of land harvested and of yields are critical to the future credibility of the OAE. Most of the departments in MOAC make their own estimates of yields or of land or animals in productive use if the department has a special interest in a particular crop, livestock, or resource. This is a wasteful duplication of effort and the resources for making agricultural estimates need to be concentrated in the OAE rather than being spread over many departments. Perhaps the best way to reduce this duplication of effort is for the OAE to provide estimates so statistically reliable that other sources of information will prove to be considerably inferior.

In addition to better information on yield and quantities, more and better information is needed on prices paid and received, and on quantities of inputs used. Some of this can come from farm records kept by farm operators. Some can also come from the suppliers of inputs and from the product markets.

The different ministries in the government are responsible for using the resources available to them as effectively as possible. The OAE can and should provide leadership to MOAC for two management information systems: program budgeting and investment analysis. The Royal Thai Government (RTG) will be increasing its emphasis on program budgeting. There is, however, some uncertainty on how the changes will be implemented. It appears that in the near future, each ministry will be responsible for preparing and submitting its budget using the program budgeting format. The OAE has some expertise in this area, but needs to gain additional experience. One way to gain this experience would be to implement program budgeting for projects in the OAE. This would be helpful to both MOAC and the OAE by providing an actual "hands-on approach" to demonstrating how program budgeting works. This would provide needed expertise in MOAC when program budgeting is implemented on a ministry-wide basis.

Decisions continually need to be made about the feasibility of projects that are proposed for funding within MOAC. The various development projects need to be analyzed to determine whether their implementation would be a good investment of capital funds. Therefore, investment and economic analysis are critical in the decision making process. At present, the OAE is doing some of this work but resources are limited and potential projects are not evaluated as well as would be desirable.

The OAE staff is responsible for evaluating ongoing and completed projects within MOAC. Likewise, the OAE also monitors the financial inputs to certain projects. The evaluation and monitoring functions can be centered on the amount of inputs going into a project, on output forthcoming, or on both inputs and outputs. The emphasis in the past has been on inputs. With program budgeting and the need for better management control, the outputs will receive additional emphasis.

At present, the PID is responsible for monitoring and partially evaluating the financial inputs to determine if projects are "on schedule." The OEPPE currently evaluates a limited number of projects. The evaluation process is more comprehensive than evaluation processes in most other agencies, because it usually carries with it the responsibility of coordinating the implementation of the project being evaluated. Certain aspects of monitoring the project may also be included. Through these coordination activities, the OAE is filling a void for a number of projects that are joint projects between several departments in MOAC. This activity requires much staff time, and although the opportunities to evaluate numerous other projects exist, human and other resource limitations preclude accepting many of these assignments. The staff of the OEPPE also is responsible for weekly reporting of information concerning the crop situation and for working with the farm record program. Although this is a very important activity it is not a typical monitoring or evaluation activity.

A major responsibility of the OAE concerns economic analysis of current agricultural policy and program related areas. These analyses are used by the government to make decisions concerning the appropriate agricultural policies for Thailand to follow. A number of models have been constructed that can indicate the effect of different programs on Thailand's economy. These models are being improved over time. They do require large quantities of good data in order to give the types of information needed by decision makers. Of course, many analyses do not require sophisticated models, but they do require reliable data.

The OAE also is responsible for crop registration. In the past, this has not constituted a very large part of the OAE operation. If, however, it is decided that crop registration will be tied in with crop diversification and farmer education, this aspect of the OAE operation may expand considerably. One only has to look at the American Soil Conservation Service (ASCS) in the United States to see the type of resources that will be needed in this area if crop registration becomes more pervasive in Thailand's agriculture.

In addition to the responsibilities mentioned above, the OAE has primary responsibilities in the area of agricultural economics research. This includes the areas of marketing, production economics, and resource economics. The OAE is also responsible for the introduction of new industries into rural areas, for the harmonization of local plans with national plans, and for numerous other coordination and implementation functions.

The number of employees of the OAE for the years 1980, 1981, and 1982 was presented in Table 3.1. The size of the staff is not very large when compared to other departments in MOAC. The number of employees is, however, only one of the measures of an office. The quality of the staff is another, and perhaps more important, measure. Staff quality certainly gives a better indication of the capabilities and potential of the staff. It is difficult to measure or determine quality in a quantitative sense, However, the number of staff members with college degrees and advanced degrees can give an indication of the quality of the staff. The OAE has almost 300 staff members with university degrees. Of this number, more than 60 have completed requirements for the master's degree. In addition, a number of the staff members are currently on leave and working toward a master's degree. Upgrading of skills is encouraged within the OAE. More than a dozen staff members that have earned the Ph.D. degree. In addition, three students have entered Ph.D. programs in the United States through Agricultural Planning Project (APP) support. The Ph.D. degrees have been obtained primarily in the area of agricultural economics, although degrees in statistics have been encouraged in several instances. One student entered a Ph.D. program in public administration and agricultural economics.

The quality of the OAE staff is relatively high in terms of its educational level. This gives the staff the capability to use additional resources that might be allocated to its use effectively. The esprit de corps of the OAE is also high. The staff wants to develop the OAE into an even stronger arm of MOAC in terms of its capability to serve the needs of the government. The staff will work together to

attain this goal, and workers are anxious to obtain and utilize any resources allocated to the OAE, including technical assistance that increases the competence of the staff.

Suggestions for Reorganization

Reorganization has been a major topic of discussion since the Office was established in 1979. The pressure of additional work load and reassignment of staff has focused attention directly on the need for review and reallocation of resources to meet the new responsibilities assigned to OAE. Two APP consultants developed recommendations for reorganization of the OAE. First, Dr. J. Edwin Faris evaluated needs and resources and drafted a general plan for reorganization. Then, Dr. Fletcher Riggs, who served two short-term assignments developed more specific recommendations.

General Reorganization Plan

Early in his assignment, Dr. J. Edwin Faris, APP Planning and Policy Management specialist, conducted interviews with many OAE staff members to determine their function, resources, and needs in preparation for drafting a plan for reorganization that would enable OAE to meet its current and future needs.

A major concern in drafting the suggestions for reorganization was to develop adjustments in structure that would accommodate a greater emphasis on commodity analysis, upon increasing the field staff and its importance in the OAE. In looking at the functions and operations of the OAE and at changes possible over the next few years, Dr. Faris identified are three general types of activities: service, data collection, and data analysis. Service is basically an internal activity, but it includes certain activities for other departments in the MOAC. Data collection, the second major activity, is mainly from primary rather than secondary, sources. Obviously, the collection of field data falls into the data collection activities. The third major activity, data analysis, or perhaps simply analysis, is sometimes done for internal purposes, but much of it needs to be made available for decision makers or to further analysis.

Ideally, a deputy secretary-general would be assigned to each of the three activities mentioned above, although the OAE could continue to function adequately if only two deputy secretary-general positions could be justified by the civil service.

The three major activities and the subunits that should fall under the jurisdiction of each of the major activities

(and deputy secretary-general) are listed below:

Deputy secretary-general for Services

*Office of the Secretary
Computer Services Division
Publications and Communications
Training Programs

Deputy Secretary-General for Data Collection

*Center for Agricultural Statistics (CAS)
*Plan Implementation Division(PID)
Field Offices

Deputy Secretary-General for Data Analysis

*Division of Agricultural Economics Research (DAER)
*Division of Policy and Agricultural Development Plan (DPADP)
*Division of Economic Project and Program Evaluation (DEPPE)

The asterisks (*) denote currently existing divisions staffed by division directors. The other subunits would not all need a director, although the computer center should have a director and the field offices need one or more directors. (A compromise at present would be a director for field office staff.)

The need for director's positions in the computer center and field offices is justified by the fact that a large number of decisions are necessary concerning the operation (and expansion) of these two units. Unless a director or someone with a special interest and support in these areas is appointed, it does not appear that changes will be made as soon as they are needed.

It is important that these two divisions be built into stronger units as soon as possible. The computer is to provide a service to the other divisions. A strong, well-functioning computer center will be helpful to staff in other service areas who have responsibilities for collecting data, organizing it, and using it in economic analysis. A stronger field staff will facilitate the collection of data, and if appropriate equipment is made available, the timeliness of the data will be increased.

Each division to be included under each of the three major areas of activity in the suggested reorganization is discussed below.

Service Units of the OAE

Office of the Secretary

The Office of the Secretary currently has a correspondence section, personnel section, finance section, procurement section, and an information and training section. It is proposed that the information and training section be removed from the Office of the Secretary. In its place should be a section concerned with the personnel, finance, and procurement activities of field offices. Perhaps this could be called the field office coordination section. This section could offer appropriate training to staff or field offices. Attaining consistency in the procedures and reports between field offices and between the field offices and the Bangkok offices would be a major thrust of this section. It is expected that the number of field staff in this area would increase. If the correspondence section and the finance section were provided with terminals and access to the computer, the number of Bangkok personnel in these sections could be reduced. The procurement section could benefit from computerizing the records as could the personnel section.

Computer Services Division

The computer section should be removed from the Center for Agricultural Statistics (CAS) and made into a division. It is important that all the OAE staff believe that the computer is almost equally accessible to each of the divisions. Removing it from the CAS should reinforce this idea. The Computer Services Division should remain accessible to the other parts of the OAE rather than ignoring the needs of the other divisions.

In the longer run, the OAE will probably need to go to personal or microcomputers for several reasons. First, microcomputers with a sizeable memory are becoming less expensive all the time. Many of the computer functions the OAE needs or will need can be performed by microcomputers with variable sizes of memory. Microcomputers would not require the expertise currently required to operate the large mainframe computers. Much of the information from the microcomputers would, however, need to be stored in the mainframe system, because data need to be shared by various persons and divisions. In addition, some routines would still require the mainframe. It may be some time before the linear programming and Scientific Package for Social Scientist (SPSS) software packages are fully adaptable to microcomputers. Data management systems, in the near future, will also be more likely to require greater capacity than most micro computers can provide.

Another reason that the OAE should seriously consider purchasing microcomputers rather than terminals is that under the present salary structure it will be difficult to retain staff qualified to operate the mainframe computer efficiently. Upgrading the computer section to a division will permit higher rank and salaries to be attained by the computer staff. Nevertheless, private firms are likely to hire a number of the staff away from the OAE after they have been trained.

Regardless of reorganization, the computer center needs to be able to control its own operations or the efficient operation will be seriously hindered. The computer center needs at least one terminal for every two programmers. In addition, other terminals need to be acquired so that OAE staff can use them to access the computer when other terminals are not available. From the late 1982 until the end of the APP, the computer center had from two to six terminals. At least ten terminals and four microcomputers are urgently needed in the computer center to permit the programmers and others to use the UNIVAC computer more efficiently. Mr. Dale Lefor and Dr. Arthur St. George served as short-term consultants to the computer center and developed specific operational recommendations, which are discussed in more detail in Chapter 7.

Publications and Communications

The publications and communications unit needs to be a separate section within the OAE. Because it is a service unit, it needs to be under the jurisdiction of the deputy secretary-general for services. It should not be a division, but rather should consist of one or more section heads. This section head (or heads) could report either to the office of the secretary or the deputy secretary-general. The exact structure of the unit is not too important in some respects. It should be organized so that eventually its duties will entail more than just seeing that reports are published. It needs to ensure that the reports are distributed to the relevant groups. A set of files needs to be maintained. Also, this group could work with the Computer Services Division and other divisions to see that the appropriate data base is in the computer. Later, library and news release responsibilities could be consolidated within this unit.

Training Programs

Certain organizational and operational skills are needed to develop good training programs. In addition, continuous training becomes a low priority unless it is the primary responsibility of a certain section. In divisions of the OAE

where staff frequently work under time pressures, staff training is apt to have a low priority. These are the areas in which staff training programs could probably result in the largest benefits to the OAE and MOAC. A separate training unit could work with the various divisions to help organize the needed training at the beginning of each fiscal year. Thus, training programs would be scheduled in advance and the short-run needs for a particular problem hopefully would not overwhelm the long-run training needs. This unit would be responsible for coordinating the timing of surveyors obtaining data in the field, but the responsibility for detailed survey training would remain with the commodity and survey specialists in the Center for Agricultural Statistics (CAS).

Data Collection Units of the OAE

As indicated previously, there would be three main data collection units of the OAE. The Center for Agricultural Statistics (CAS) and the field offices would be the main collectors of primary agricultural data, especially agricultural production data. The PID would collect secondary data from other departments, offices, and divisions and place them in the monitoring system. This information would provide the needed information for decision makers with respect to expenditures on projects three times a year. The Division Agricultural Economics Research Division (OAER) also collects a considerable amount of data.

Center for Agricultural Statistics

The Center for Agricultural statistics (CAS) will have a number of its current sections including the computer center, publications, and field operations, removed to another jurisdiction. These are service functions, which the CAS has been operating quite capably, although under the proposed reorganization they should operate even more effectively, and thus make the OAE more effective.

The CAS, however, will have some added responsibilities. The need for training the field staff for the various CAS surveys will be one added responsibility. Ascertaining that sampling error and enumerator errors are kept within acceptable bounds will be a continuing challenge. Designing appropriate samples will undoubtedly become more important, as will giving the assistance in determining questionnaire formats.

Additional effort will be necessary to ensure good working relationships between the CAS and the field offices. Division. The CAS will need to increase its expertise in the use of computers. A rapid response from some surveys will be

necessary. The CAS will also need to provide information for a data base. Finally, the CAS will need to define and refine some of its estimates at the province level. This will result in some reorganization within sections, but it should be relatively minor in terms of effort.

Plan Implementation Division

The Plan Implementation Division (PID) is responsible for financial monitoring of projects in MOAC. Dr. Somnuk has made some personnel changes that have strengthened the division. Progress has been made in providing a computerized format for monitoring. The next step in this format is to link outputs with the financial inputs. Cooperation from other departments is essential to make this monitoring program a success. The OAE needs to work more diligently at promoting cooperation.

Terminals or microprocessors are urgently needed for the PID staff. This would release a number of staff members to do other things and would permit rapid assessment of each project or program once data had been entered. Six terminals probably could be used by this division in the not too distant future.

The PID would probably be the most appropriate division in which to situate program budgeting. Much of the historical and current information will be in the monitoring system. One or more staff members well trained in program budgeting, however, will be needed. Also, the ability to work with other divisions in the OAE and with other offices in MOAC will be an important determinant in whether program budgeting can be located effectively in the OAE and the PID. This, of course, would require another section.

Field Offices

The field offices could be structured with the emphasis on either the zone office or the regional office. The OAE has apparently decided to place the emphasis on the zone office but with the gathering of agricultural statistics the primary purpose of the field offices, it might be more effective to structure them as zone offices rather than regional offices. A comprehensive proposal was prepared by the OAE for submission to the World Bank for support of the expanded reorganization. The proposal was based upon 6 regional offices and 21 zone offices. The emphasis was on the regional structure and included other aspects in addition to the agricultural statistics activities.

In the short-run, the emphasis upon the zone is appropriate. In fact, it could also work in the long-run. The OAE currently divides Thailand into 19 zones. These probably should be expanded to 21 or 23 zones, although subzones could be a workable solution in some cases. Zone offices are appropriate centers for field data collection and supervision. They would not be appropriate for some of the other functions envisioned to be performed in the regional offices. Terminals capable of sending data would be appropriate in zone offices. Although it would be difficult to supply the level of supervision needed for much coding and data entry to take place at 21 different zone offices. Thus, some coding and data entry would still need to take place in Bangkok. Perhaps regional data entry systems could be developed later to help reduce the large amount of data processing in the OAE.

One of the highest priorities of the OAE should be to continue to improve the reliability, comprehensiveness, and timeliness of the agricultural statistics. The first priority of the field offices should continue to be to improve the production estimates, the crop situation reports, and the estimates of prices paid and received. Field offices in the zones should be expanded over time so that they can assume more of the total data collection activities of the OAE. Much proposed expansion of the zone office data collection activities was accomplished with the February 1984 OAE reorganization. Rather than sending survey teams to the field from other divisions in Bangkok, much of the data can be more efficiently obtained by field staff teams. Of course, the training of the field teams is and will continue to be the responsibility of the section or division instigating the survey. It may be better if some survey work, e.g., secondary data gathering from sources in Bangkok, is undertaken by other than the field staff.

A number of operational issues need to be resolved. One is the relationship between the field staff and the other divisions. Who will determine the priorities if more than one unit desires the use of the field staff at the same time? The sample must be approved by one person. These are just a few of the organizational and administrative questions that need to be resolved, yet the task is not formidable, and the system can be organized and administered in numerous ways. But some definite system needs to be developed. Since the 1984 OAE reorganization, these operational issues have been handled at the deputy secretary-general level.

Data Analysis Units of the OAE

The reorganization would establish three data analysis divisions under the jurisdiction of one deputy secretary

general. Actually, it is difficult to be specific about the reorganization of these three divisions. They, along with the CAS, contain the "best trained" staff in the OAE. Yet it appears that at present, none of them are meeting their potential. A brief and rather general description of some possible changes that would permit these divisions to be more productive is given below.

Division of Agricultural Economics Research

Changes are currently underway to effect the reorganization of the Division of Agricultural Economics Research (DAER) along commodity lines. Thus, most of the sections will not be responsible for specific commodities. This appears to be a good change, because most of the questions that OAE staff are asked are associated with commodities. Little can be said at this time about reorganization. It is hoped that Dr. Bruce Wright, a short-term consultant on the project will be helpful in providing assistance in implementing the reorganization. It appears that the DAER needs to increase its expertise in marketing, and in the economics of resource acquisition and use.

A considerable portion of this division's efforts are expended in obtaining data. Analysis of the data acquired, however, has been marginal in many instances, because division lacks access to the computer and has problems inputting the data or getting programs written for the analyses. These are the largest road blocks to this division's attempts to do more meaningful analyses. Access to the computer through terminals and/or microprocessors would do much toward helping staff in this division be more productive and timely. In addition, software packages are needed that allow a wide range of users easy access to data processing programs without requiring them to learn programming languages or depend on programmers. This would enable staff members to process data directly without waiting for the programs to be written. In addition, the microprocessors and UNIVAC could be used as word processors. Some reports with rather standard tables could use previously developed formats and be updated by simple changes and additions of data.

Division of Policy and Agricultural Development Plan

Several sections of the Division of Policy and Agricultural Plan (DPADP) have been oriented toward rather complex models in the past, but these linear programming models have not been sufficiently operational during the past two years to provide answers to policy questions. Now that the DAER is much more commodity oriented, the question of how policy

analysis will fit into the remains to be answered. Actually, the DPADP seems to devote many of its resources to "fighting fires" or to developing models. Very little time is devoted to looking at the agricultural situation or preparing themselves for policy-type questions that may be important in the future.

The DPADP staff needs training in how to approach policy and planning. Most of the staff apparently have not been trained in this area. This division appears to have many talented staff, but they need to operate more efficiently. Perhaps cooperating more closely with other divisions and receiving better and more timely information from these and other sources will make the DPADP able to more quickly and effectively respond to policy and planning issues.

Division of Economic Project and Program Evaluation

The Division of Economic Project and Program Evaluation (DEPPE) has recently had most of its field component transferred to the field offices. This is probably a good move; however, the DEPPE will need to expand its project evaluation capabilities if it is to meet its commitments. If more data on projects being evaluated can be obtained through the field office, rather than by DEPPE staff, more time would be available for actual evaluation techniques to be applied. This division has taken on the role of coordinator for projects that involve several departments, including the OAE. This role certainly is time consuming, but perhaps it is necessary. If so, the role should be recognized more overtly.

The addition of several micro-computers would increase the productivity of this division. Word processing is a needed capability. It would enable evaluations to be forthcoming at a faster rate. Many of the formats are quite similar, and only figures or certain paragraphs would need to be changed.

A final draft of a proposal for a world bank strengthening loan for support services in the OAE was approved late in 1983, but the loan offer was not accepted by the Royal Thai Government (RTG). In February 1984, the secretary general implemented the OAE reorganization plan by reassigning staff, vehicles, and motorcycles to the zone offices from the Bangkok office. Additional funding was not yet available to provide the desired facilities, equipment, and computer capability outlined in the World Bank proposal, making the reorganization a reallocation of resources rather than an expansion.

Specific Reorganization Plans

Anticipating completion of Dr. Faris' two-year assignment in June 1984, Dr. Eber Eldridge was nominated in April 1984 to replace Dr. Faris as the APP chief-of-party and planning and management specialist. USAID, Bangkok, Thailand (USAID/T) did not approve the nomination, and finally rejected it in July 1984, indicating that it would only accept a nominee with previous experience in the OAE. Mr. Wayne Ellingson was identified as the only previous staff member who could make himself available for the assignment with the very short notice. Because Ellingson had strong skills in technical areas, but lacked the administrative experience of the previous nominees, a complementary terms of reference was developed for a short-term consultant to assist with further assessment of needs and development of more specific recommendations for administrative organization and training needs of the OAE. Dr. Fletcher Riggs served on two short-term assignments of six weeks each, and developed recommendations that focus on (1) OAE organization, (2) an OAE training program; and (3) information flow to and from the zone offices.

OAE Organization

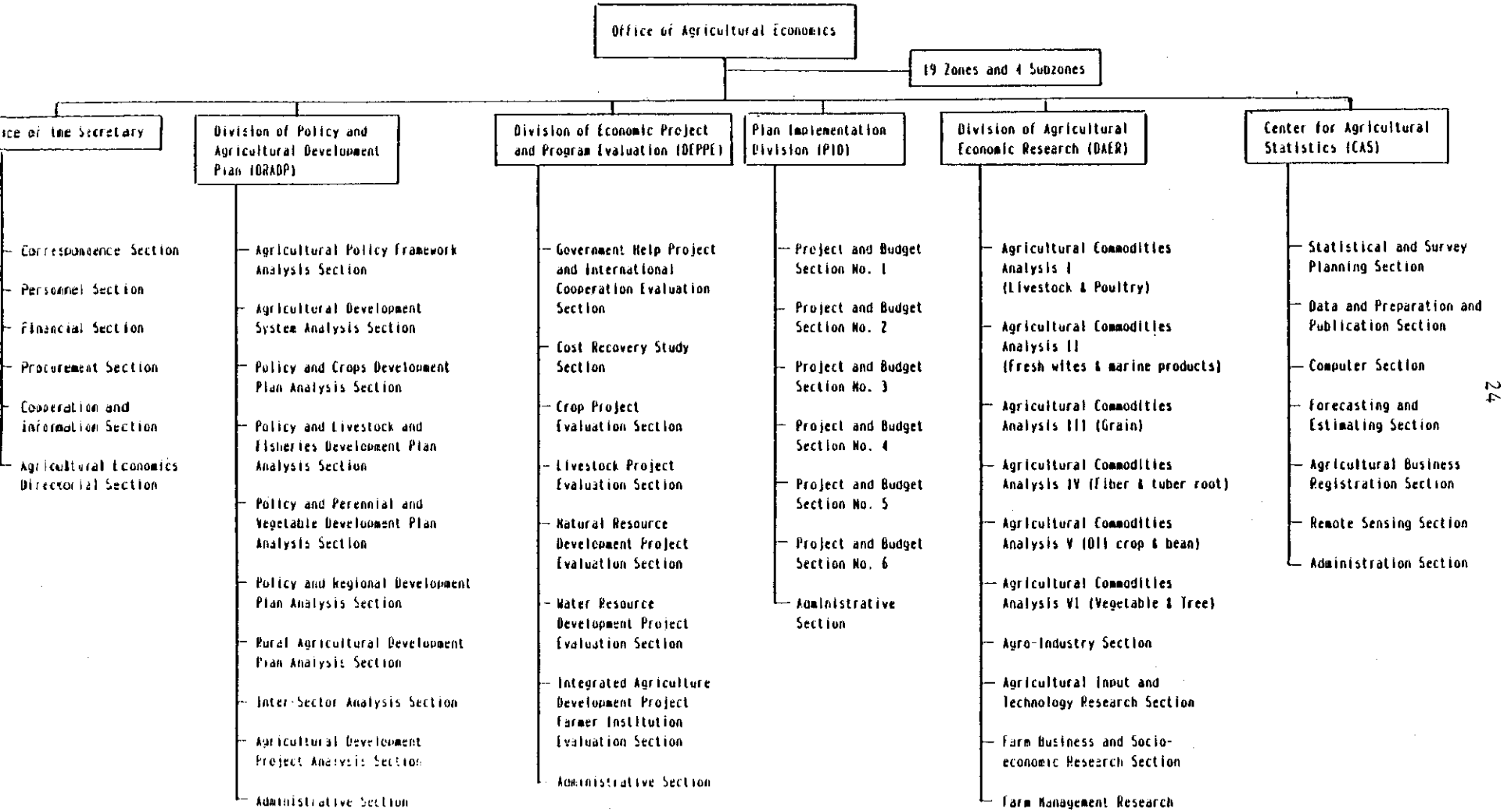
Creating Regional Divisions

After much analysis, it was concluded that the OAE should not attempt, at this time, to create the four regional offices recommended in Dr. Riggs' first report. The primary reason for this conclusion is lack of adequate strength at the zone level. The first task is to strengthen the zones so they can adequately perform the duties assigned to them in the February 1984 reorganization, as shown in Table 3.2. The major functions of the zone offices are:

1. To collect data on the locations of production of of all economic crops and livestock for stratification and use in construction of sampling frames.

2. To collect data on farm production, marketing, prices, and other relevant economic data at various levels, such as farms, wholesaler, retailer, and processor, under the cooperative effort of the concerned technical sections of the responsible divisions and the zone. The collecting procedures for one topic may differ from another. Data may be collected by interview, measurement, counting, weighing, or farm records kept by farmers.
3. To compile basic facts and data relating to agricultural development for incorporation in the publication on important provincial statistics and agricultural economics.

able 3.2. The new OAE organizational structure chart (Feb. 1984)



4. To synchronize the policy framework of the ministry with the agricultural development plan and the development plans of individual provinces, and furthermore, to support the people in charge in coordination of the implementation plans.

5. To coordinate, follow up, and evaluate the progress of major development projects, such as rural development and accelerated development for the rural poor.

6. To study the farm sector development of the provincial development plans and analyze related problems to provide correcting guidelines.

7. To provide surveillance and reports on local agricultural production, marketing, and price movement on a weekly basis, and even on a daily basis in emergency situations such as droughts, floods, or pest infestations.

8. To study the local agricultural economic systems of production, marketing, and agroindustry.

9. To arrange agricultural economics training, with emphasis on marketing and price arrangements, for farmers, with an end view that production meets demand, with a resulting fair price.

10. To prepare a local market and price bulletin and distribute it to the farmers and interested persons in the locality.

These major functions are administered by five subsections as follows.

1. Coordination of Development Policy and Plans. This subsection synchronizes the policies of the ministry and the agricultural development plans with the provincial development plan of a zone. It also supports the people in charge in the coordination of the implementation plans, studies the farm sector plan under the provincial development plan, studies the provincial development problems for correcting guidelines, and compiles basic facts and data relating to agricultural development.

2. Coordination of Monitoring and Evaluation of Agricultural Projects. This subsection coordinates the monitoring and evaluation of major agricultural projects such as rural development and accelerated development of the rural poor. Surveillance of the agricultural situation is done on a weekly done on a weekly basis, or even on a daily basis in the event

of an emergency such as drought, flooding, or serious infestations of crop pests.

3. Zonal Agricultural Economics Involving Local Agricultural Economics. This subsection studies production marketing, farming, and agroindustrial systems. It also organizes training for farmers in zonal farm economics marketing and price arrangements with an aim that production meets demand at a fair price. In addition, it publishes a farm commodity market and price review for the local population.

4. Farm Data. This subsection studies the production location of major economic crops and livestock for constructing sampling by frames. Data are collected on production, marketing, and price from farmers, wholesalers, retailers, and processors based on the prescribed methodology.

5. Administrative. This subsection is charged with administrative procedures, secretarial services, administrative coordination with field and central offices of the OAE and other agencies, and special assignments. The section is divided into two units. Secretarial service and personnel administration is in charge of typing, registering, dispatching, correspondence, filing, official leave, staffing, and control. Disbursement and administration of equipment and supplies is in charge of budgets, supplies, equipment, and vehicles; acquisition, repair, and related records.

There is no longer an organizational problem with the zone offices, but rather a need for training, equipment, and operational management. When zones have been adequately strengthened, it should be possible and appropriate to create OAE regional divisions with both data management and analytical capabilities.

Up-grading the Computer Branch to a Division

The rationale for division status has several aspects. First and foremost is that the level of authority at division level would permit the Computer Services Center (CSC) to serve its users more effectively. Direct and more responsive communications with users would be possible with a division, as compared to a branch, because one layer of bureaucracy between the computer and the user would be removed. This would substantially speed the communications process and shorten the time span between receipt of a

computing task and its delivery to the user. Second, the computer operation would be expanded to include on-line connections with zone microcomputers and other mainframes in Bangkok. A new branch is proposed to handle hardware and software installation, coordination activities, and the problems related to on-line connections. A new and enlarged computer services operation to improve service to users is required. Survey editing functions would be transferred to the CSC as will data-base construction and management. These functions in addition to current computer branch functions. Effective and efficient management and administration of this enlarged computer operation would require division status. The paperwork for upgrading the computer branch has been prepared.

The proposed CSC is organized differently than the present computer branch. It would include 6 and 15 sections as described below.

The data preparation and publication branch of the Center for Agricultural Statistics (CAS) would be transferred to the CSC. Editing and preparation of the data for data entry should logically be under the control of the CSC. For statistical surveys, under the new arrangement, zones are responsible for data collection and field-level editing under the guidance of the CAS. CSC is responsible for all aspects of data processing and for providing processed data to the CAS in a form specified by CAS. CAS is responsible for analysis and publication of reports. A similar set of responsibilities would apply to the work of other divisions requiring field data collection and processing.

The editing and coding section would be in the operations branch. The data bank section and the secondary data compilation section would be in the data base branch.

A new Computer Services Branch would be created to assure timely, accurate services to the users of the MOAC computer. Service to users within OAE, except for the CAS, has not been available consistently, nor has service to other MOAC units. The branch will include sections for program consulting services, data base access and services, and computer services.

A data communications branch would be created to handle both hardware and software installation, coordination activities, and problems related to linkage of zone and other computers to the MOAC mainframe. On-line connections are anticipated with OOAE and Ministry of Commerce computers. The branch would include a hardware and software communications section and a data communications coordination section.

The current programming and systems analysis sections will be included in a new programming and systems analysis branch. The programming section will concentrate on programming applications in OAE. The programming staff providing consulting services to users would be transferred to a new section in the computer services branch.

The computer operations section will be elevated to branch level and include sections for editing and coding, data entry, and operations.

The data base branch will have sections for data base construction, including secondary data compilation; and data base control.

A new administration and training branch will be created, including an administrative section, a training section, and a documentation and publications section.

Branch chiefs of this new division should be given full responsibility for carrying out the duties assigned to them and the authority to do so. This should leave basically six people reporting to the division chief, rather than the current management procedures of the computer branch in which everyone reports directly to the branch chief. It is extremely important that a computer utilization committee be established.

The proposal to upgrade the computer branch must go to the committee on governmental reorganization without a recommendation for the additional staff that will be required to make the division operate effectively. This is difficult to understand, since additional staff will obviously be required. The approval tracks for reorganization are somewhat different than for staff increases. It appears that, as a minimum, the committee should be given the staffing requirements for the division when it is in full operation. If a strong enough case is made for the upgrade, it might be possible to obtain staff approvals over and above the current 2 percent per year limitation. In any case, the OAE must know what all of the staffing requirements are and have a plan for meeting them. A similar situation exists with regard to additional funding for the CSC. Without a request for the necessary staffing and funding increases, or a plan by which they are expected to be acquired, the committee should be expected to reject the proposal.

OAE Training Program

Discussions were held with each division director and with those responsible for zone operations regarding opera-

tional problems and training activities that would relieve the problems. Several directors identified the inability of junior staff to effectively handle the assignments given to them as a problem seriously affecting the ability of the division to accomplish its work in a timely fashion. Problems are more serious at the zone level than in Bangkok.

Possible training activities and approaches were discussed, resulting in a comprehensive list of training activities for the OAE. Where applicable, it was proposed to prepare training handbooks with contractor assistance, and for OAE staff to conduct the training activities. The following list of training activities is not a complete list of needed training, as will be discussed later. Plans should be finalized as soon as possible for training programs in:

1. Cost-of-production analysis
2. Agricultural marketing analysis
3. Research methodology
4. Statistical quality control at zone level
5. Microcomputer training
6. Survey Data Processing System (SUDS) training
7. Scientific Package for Social Scientist, Extended Version (SPSS-X/User Training
8. Agricultural policy analysis
9. Livestock statistics
10. Statistics for monitoring and evaluation
11. Farm income & project analysis
12. Training farmer enumerators
13. Short course in statistics
14. Map reading and air photo interpretation
15. Thai budget and finance
16. Thai personnel management
17. Monitoring and evaluation

The 17 training activities listed above are in priority order. Dr. Riggs developed an information sheet for each training activity, including a brief description of the activity, the number of people to be trained and from which OAE units, the trainers, the duration of the training, and the estimated costs.

The criteria for ranking the activities included Division preferences, activities that are already underway, guidance from OAE senior management, and maximized use of potentially available APP funds.

The emphasis of the training is on strengthening of zone staff. Nine of the 17 activities include zone staff as trainees. Training will be focussed on staff at levels PC-3 to 7. There are 130 staff in this group. Depending on the subject matter content, various individuals of this group will be selected for training. Each is expected to receive

training in at least one of the activities, many will receive training in more than one area, and zone chiefs will be exposed to all of the zone training activities.

Handbooks will be prepared and used in many of the training activities. It has been proposed to contract out the preparation of seven or eight handbooks. OAE staff will conduct the training sessions using the handbooks. Details of the training are provided on the activity sheet for each activity.

The OAE will prepare a detailed terms of reference for each activity contracted out. In addition to specifying the substantive content of the handbook, the terms of reference will include the number of handbooks to be supplied, and the specific dates by when the handbooks must be completed.

It is proposed that contractors be paid in a lump sum to cover staff and clerical costs of handbook preparation and printing costs or 150 copies. This lump sum cost has been estimated at $50,000.

The handbooks can all be completed within the PACD. The OAE will organize and implement an in-service training program for zone staff. The handbooks will be used for cost-of-production, agricultural marketing analysis, and research methodology training. The CAS will conduct the training of zone staff in statistical quality control.

The training program will also include the training in agricultural policy analysis and statistics and project analysis for Division of Economic Project and Program Evaluation (DEPPE) and other staff. This training will also be conducted by OAE staff using the handbooks prepared by the contractor. The handbook and training in statistics for CAS staff would be handled similarly.

SUDS I training must be held in August and September when the SUDS expert will be available. SUDS II, to be conducted by computer branch staff trained in SUDS I, can be scheduled after the PACD and should be conducted simultaneously with micro computer training phase II, both of which are for zone staff. Microcomputer phase I training should begin some time in June, approved by USAID and the Department of Technical and Economic Cooperation (DTEC) of the RTG, and extend intermittently into October.

SPSS-X training should be scheduled after the SPSS-X package is available and operational on the mainframe.

Livestock statistics training should be conducted as planned, with CAS pre-testing in July, a seminar in September, and the training in December. Materials needed

for the December training must be purchased before October 31 in order to be financed by the APP.

Training for farmer enumerators would be conducted by CAS according to present plans. During August and September farmers would be selected by zone staff, brought to zone headquarters for training by CAS staff, returned to their village areas for pre-test enumeration, with the and resulting survey forms checked by CAS and zone staff. Farmer enumerators would then conduct their work.

Map reading and air photo interpretation, Thai budget and finance, Thai personnel management, and monitoring and evaluation training would be incorporated into the OAE's in-service training program as appropriate.

A glance at the list of training activities makes it obvious that this is a very large in-house training operation for the OAE to manage. The present training subsection has not managed (nor was it intended to manage) a training program of this magnitude. The subsection must be strengthened and preferably elevated to branch status. The list of training activities represents a backlog of training that should have been ongoing over the past several years. In July 1985, USAID and OTEC agreed in principle to support the cost of materials, training and computer software packages needed for the first seven items on the training list if the training aids could be received in the OAE and billed before October 31, 1985. The OAE had an active in-service training program in the 1970s. This needs to be reinstituted, but to develop and manage such a program probably requires a training branch.

Surprisingly, with the exception of the computer branch, the OAE has no specifically identified training budget. The reason for this is not clear, but it may reflect the lack of emphasis on in-service training by the OAE.

It is strongly recommended that the OAE reinstitute an active in-service training program and that the necessary staff and budget be made available to make it operate effectively.

The goal of the training program is to strengthen the abilities of the zones and divisions to perform their functions. The following discussions give specific training suggestions, and some nontraining suggestions, for strengthening the zones and divisions.

Strengthening Zones

A major activity of the OAE in the immediate future will be to strengthen the capabilities of the zone staff. At

present, none of the zones have the capability to perform all of the functions assigned to them.

Zone staff have been focusing on collecting statistics but, with poor results in many cases. Other responsibilities of the zone staff are not well understood, even at the relatively elementary level at which they are required to be performed. Past training efforts based on a lecture approach have not been effective. A series of handbooks and training in cost of production, marketing analysis, and research methodology was proposed. The proposal recommended that preparation of the handbook be contracted out and financed by the APP. The actual training, using the handbooks, was to be conducted by OAE staff. In order to use APP funds for handbook preparation, the handbooks had to be completed by October 31, 1985.

The handbooks, with numerous examples and exercises for trainees, were seen as excellent teaching tools and could be used by zone staff as guides for future work assignments. Use of handbooks as guides would standardize the collection and analysis of data and facilitate compiling all of the zone information to obtain a national picture.

A major weakness, at the zone level, was the quality of survey results being sent to Bangkok for processing. A training program was recommended that would apprise zone staff of why it was necessary to submit more accurate data. The CAS editing staff, computer branch staff, and representatives of the user divisions would conduct the training.

In addition, it was strongly recommended that the CAS be allowed sufficient time to adequately train the zone staff on each of the surveys undertaken.

The administrative staff members in most of the zones are new to their jobs. Training for them was proposed in the laws, rules, and regulations regarding financial and budgetary matters and in personnel management. This training was to be given by Bureau of the Budget (BOB) and the Civil Service Commission. Supervision of the survey process, was inadequate in areas including field editing and checking of questionnaires. Some individual in each zone must be made responsible for the quality of data from each survey.

In addition to training and upgrading the qualifications of zone staff, the OAE must find a way to augment numbers of staff at the PC-3 to 6 level. The OAE's three-year plan for utilizing the 15 new positions available each year (2 percent increase) includes 18 for assignment to zones, 11 positions of PC-8 level or above and assistants to the secretary general, and 15 lower level staff for divisions in Bangkok. It is suggested that OAE consider putting those 15 positions

in the zones also, providing a total of 33 new positions at the zone level over the next three years.

One other source of new staff for the zones may be vacancies created by resignation or transfer. At present, 25 vacancies are funded. Unfortunately, most of them (17) are zone vacancies. In any case, vacancies should be watched carefully for possible transfers to the zones.

Neither of these categories is faced with the problem of staff not wanting to leave Bangkok. Transfers from Bangkok to the zones should be explored more fully.

It appears that the Civil Service Commission will approve at least one new position of assistant to the secretary general. The first such position approved will be filled with a coordinator of zone operations. This decision is strongly endorsed.

The possibility of attaining microcomputers for the zones appears more optimistic than it did last fall. Microcomputers and appropriate training will be supplied under the APP for four zones. Six or eight additional zones are expected to be supplied under the EEC project. If these microcomputers are used successfully, it may be possible to supply additional zones with the regular OAE budget.

Strengthening OAE Divisions

A sequence of three interrelated courses has been proposed by the DEPPE. The first would be prepared and presented by DEPPE staff. The second and third courses would deal with the tools and techniques to be used in monitoring and evaluation. The second course would be on statistics for monitoring and evaluation; the third course would be on farm income and project analysis. They would utilize contractor-prepared handbooks, with training conducted by OAE staff. The project analysis branch of the DPADP would also participate in the farm income and project analysis course.

A course in agricultural policy analysis for junior staff of the DPADP has been proposed. The handbook prepared for this course would focus on the work assignments expected to be accomplished by junior staff.

The CAS has proposed a basis statistics course for junior staff of the CAS and other divisions. A handbook would be prepared by a contractor and training would be conducted by CAS staff.

The computer branch will receive several training activities related to the introduction of microcomputers. First, computer branch staff will be trained in the use of microcomputers. They will then train the zone staffs that receive APP-financed microcomputers. Application of the SUDS

in the zones also, providing a total of 33 new positions at the zone level over the next three years.

One other source of new staff for the zones may be vacancies created by resignation or transfer. At present, 25 vacancies are funded. Unfortunately, most of them (17) are zone vacancies. In any case, vacancies should be watched carefully for possible transfers to the zones.

Neither of these categories is faced with the problem of staff not wanting to leave Bangkok. Transfers from Bangkok to the zones should be explored more fully.

It appears that the Civil Service Commission will approve at least one new position of assistant to the secretary general. The first such position approved will be filled with a coordinator of zone operations. This decision is strongly endorsed.

The possibility of attaining microcomputers for the zones appears more optimistic than it did last fall. Microcomputers and appropriate training will be supplied under the APP for four zones. Six or eight additional zones are expected to be supplied under the EEC project. If these microcomputers are used successfully, it may be possible to supply additional zones with the regular OAE budget.

Strengthening OAE Divisions

A sequence of three interrelated courses has been proposed by the DEPPE. The first would be prepared and presented by DEPPE staff. The second and third courses would deal with the tools and techniques to be used in monitoring and evaluation. The second course would be on statistics for monitoring and evaluation; the third course would be on farm income and project analysis. They would utilize contractor-prepared handbooks, with training conducted by OAE staff. The project analysis branch of the DPADP would also participate in the farm income and project analysis course.

A course in agricultural policy analysis for junior staff of the DPADP has been proposed. The handbook prepared for this course would focus on the work assignments expected to be accomplished by junior staff.

The CAS has proposed a basis statistics course for junior staff of the CAS and other divisions. A handbook would be prepared by a contractor and training would be conducted by CAS staff.

The computer branch will receive several training activities related to the introduction of microcomputers. First, computer branch staff will be trained in the use of microcomputers. They will then train the zone staffs that receive APP-financed microcomputers. Application of the SUDS

package will form the specific examples and exercises to be used in understanding how to use the microcomputers.

Other division staff will be included in the microcomputer and SUDS training. The SPSS-X analytical package will be acquired through the APP for both the mainframe and the microcomputers. It is proposed that training in both mainframe and micro SPSS-X packages be provided by a Chulalongkorn University professor.

Two additional training activities proposed by the CAS are work with the livestock department to involve them in OAE's statistics collection effort and further experimentation with the training of farmer enumerators.

Management training for both senior and middle- level OAE staff is proposed. This is intended to increase the productivity of existing staff in supervisory positions. The training would be conducted at NIDA where there are appropriate sources. No charge would be made to government officials. The OAE should plan a program for management training over the next several years and negotiate access of OAE staff to the proposed training.

Information/Communication System Between Bangkok and the Zones

Communications to and from the zones are channeled through the coordination section of the Office of the Secretary. Detailed incoming and outgoing logbooks are maintained on all types of communication whether it be telex, cable, memo, or letter. Telephone calls are tracked, but not as closely. This provides a basis for senior OAE management to know what information is going to and coming from the zones. This system appears to be operating efficiently and effectively. The only things to move outside of this system are technical guidance to the zones by the various operation divisions on specific activities that have been assigned to zones.

Another form of communication between Bangkok and the zones is the regular monthly meeting of zone staff with the staff in Bangkok. These meetings are used to provide guidance to zone chiefs, to convey instructions for specific activities, to provide information from the divisions, and to provide training for zone staff. Such meetings are essential.

A primary objective in setting up the zone operation is for the OAE to be able to provide economic intelligence to changwat governors. For the most part, this capability does not exist in the zones. At present, zone or changwat

problems are referred to Bangkok, an analysis is made by the appropriate division, and the proposed solution is relayed back to the zones or taken the solution to the field by Bangkok staff who discuss it with the governor or other concerned local staff.

The limitations of zone staff in providing economic intelligence at the local level have less to do with communications than with the numbers and qualifications of zone staff. The training activities at zone level discussed earlier will be a helpful means of eliminating these obstacles.

The OAE's publications are sent to the zones on a regular basis. There were 145 published reports during 1984, as listed in Appendix 5. In addition to published reports, other OAE staff reports of importance to particular zones or to all zones are distributed on an ad hoc basis. An example is a summary of the decisions taken at each of the Committee on Agriculture and Cooperative Development Policy and Planning meetings which is usually sent to all zones. In the case of staff work related to a particular commodity, information is sent to the zones in which that commodity is important. This internal distribution seems adequate at present.

However, external sources could benefit from the OAE's publications. Although there are over 200 libraries and Thai organizational units on the regular OAE mailing list, there may be individual Thai scholars and a large number of foreigners who do not know what kinds of publications the OAE is distributing. It is suggested that the publications and communications section publish an bibliography of OAE publications, with an English translation under each title in Thai. A rough translation of the titles for reports distributed during 1984 was left with the section chief, and should provide a good start on a Bibliography for 1984.

Results of the Recommendations

In summary, a large number of recommendations made by APP consultants to assist the OAE in planning policy and systems management have been adopted and implemented by the OAE.

The reorganization plan to decentralize OAE, involving moving a large number of employees, equipment, and vehicles to zone and office locations, was adopted and implemented in February 1984.

The use of computer terminals, microcomputers, and commercial software packages has been instituted to expedite data processing and gain analytical proficiency in order to

assist the OAE provide better and more timely responses to policy issues. Six terminals have been installed at the computer center for several months; microcomputers have been ordered for nine offices, one for the computer center and one especially designed for remote sensing and data processing at the CAS; SPSS-X packages for mainframe and microcomputers have been purchased, as have professional training costs for these packages, as well as SUDS, MS-DOS, DBASE III (Thai/ English), Lotus 1-2-3 (Thai/ English, Thaistar, and T-basic, plus EROS and RIPS for remote sensing. Training materials for several items recommended on the training list are to come from APP funds.

These APP recommendations and their adoption and supplementation by the OAE are making significant improvements in OAE operational efficiency and effectiveness.

CHAPTER 4. ECONOMIC AND DATA ANALYSIS

The focus of the earlier Agricultural Sector Analysis Project (ASAP) was on assisting the Office of Agricultural Economics (OAE) (previously the Division of Agricultural Economics) to develop increased research and analytical capabilities, with special emphasis on analysis of the impact of alternative policies in agriculture. Many quantitative models were developed to assist in the research and policy analysis work during the ASAP. Among these were large regional and national models of the Thai agriculture that provided a comprehensive economic framework with which to study the interactive impact and competition between major crop and livestock enterprises for agricultural resources. The research and models were also designed to measure the impact of alternative production patterns and levels on income, employment, resources, technology, and other issues of concern to the decision makers working with agricultural development in Thailand. The models were used extensively for assessments and recommendations provided as input to the Fifth Five-Year Plan.

One of the four long-term positions in the Agricultural Planning Project (APP) was allocated to upgrading and extending the economic and data analysis research capability initiated under the earlier ASAP. The overall objective of the position was to assist in developing institutional capability to manage data and information in such a way as to provide timely reporting and analysis as an input for research planning and policy decision making. One of Dr. Gary Vocke's first activities was to review the status of the models developed during the ASAP and the current data base, with responsibility for developing a plan of work that would identify the essential models and requirements in order to update them for analytical input into the Sixth Five-Year Plan (FYP-6).

The regional models were found to be no longer operational, and the structure of the national model had been modified extensively. The data in the national model was sufficiently out-of-date to raise major questions about its reliability as a planning tool. Plans were made to complete the necessary coefficient estimates for the regional models, and to restructure the national model so that the models were all current and reliable. Coefficients were to be re-estimated in the national model after the consistent structure had been restored. Progress was made on estimating coefficients for the regional models, and restructuring the national model, but the rate of progress was not sufficient to meet the deadlines for input into FYP-6.

Two major factors were identified that limited progress. First, in the reorganization of the OAE, some of the key

personnel who had provided leadership in developing and operating the sector models had been transferred to other assignments. Second, the increased work load of the OAE, and the high demand for immediate or short-term response to current problems and issues had diverted staff time from the necessary input to maintain and upgrade the models. A short-term consultant was requested to evaluate the personnel and steps necessary to complete the process of bringing the sector models up to date and maintaining them without the previously experienced deterioration.

Dr. Arthur Stoecker, who had extensive previous experience with models, was available for the short-term, assignment. Most of his time was devoted to assisting the National Modeling Group (NMG) to restructure the National Crop Model (NCM).

The NCM consists of a series of zone models, which are then aggregated into the national model. Since the model for a single zone contains approximately 162 rows and 250 columns, a direct aggregation into the NCM would produce a model of over 3000 constraints and 5000 activities. Dr. Stoecker found that the NMG had already initiated activities to clean up the models and to simplify the structure by reducing the number of crops to nine and eliminating questionable constraints, activities, and coefficients. Other crops were to be treated as exogenous to the model, with the resource requirements being subtracted from the available resource base in the model. The other major reduction in the national model size came in eliminating the constraints in each of the zone models that are defined for each zone and again for each region. Dr. Stoecker recommended that some additional constraints and activities needed to be added, such as monthly or bimonthly capital constraints, monthly or biomonthly borrowing activities, machine constraints, and foreign exchange constraints.

In addition, Dr. Stoecker recommended that the Division of Policy and Agricultural Development Plan (DPADP) set both long- and short-term goals relating to the reduction of time required to respond to policy questions. The short-term goals were to (1) add one additional experienced computer programmer to the national staff; (2) increase the amount of terminal access time available to the DPADP to four hours per day during normal working hours; and (3) develop a computerized data base for the data necessary to generate and update the programming models. The long-term goal was to set a one-week response time for policy questions that require only minor changes in the programming models.

The balance of Dr. Stoecker's report was devoted to procedures for estimating various coefficients in the model. Dr. Stoecker received many technical procedural questions

during his assignment. He has recommended that access by the NMG to staff experienced in model construction and maintenance, such as Dr. Kanok and Dr. Somporn, be improved.

A second major activity that Dr. Vocke was engaged in was developing a system of analysis and planning for Ministry of Agriculture and Cooperatives (MOAC) activities that would reorient the research to the commodity approach of policy and program planning which is being initiated by the Royal Thai Government (RTG). This activity was carried out as on-the-job training by working closely with OAE staff in both the Division of Agricultural Economics Research (DAER) and the DPADP.

One crop, soybeans, was selected as the case study for an integrated policy analysis and prototype for other commodities. The first step was to collect descriptive production and marketing data about all aspects of soybean production from farm inputs to transportation and marketing. Information collection involved interviews with various departments and agencies associated with soybean production and marketing to determine the current potential and the constraints on future expansion. Projections for soybean production were made under several assumptions, and then developed into a set of policy and program recommendations. Both technical and economic aspects of soybean production and marketing were considered.

The essence of the commodity policy paper was to develop a research group with comprehensive information and contacts on a single commodity, and with understanding of the problems and constraints from the first input level to the final market destination. This format would then serve as the prototype for other commodity specialty groups with specialized expertise and contacts to respond to policy questions quickly and from a solid information and data base.

The need for a formal commodity situation reporting system was identified, and terms of reference were developed for a short-term specialist in this area. Dr. Bruce Wright reviewed the current methods used by the OAE in reporting commodity situations and outlooks. He found that the OAE currently prepares two reports, one by the Center for Agricultural Statistics (CAS) and the other by the Division of Agricultural Economics Research (DAER). The CAS report is oriented to farmers and production, while the DAER report is oriented to marketing and trade. Dr. Wright recommended the following changes in the two reports:

A. In the CAS report:

   1. As resources permit, complete the installation of the telex system in each zone office. This

will ensure timely receipt of data from the field. In the meantime, transmission could be quickened if coded forms were used to enable deletion of column and row headings in telexed tabular material.

2. Review the scheduling of vehicles to determine whether more efficient use of them and of personnel could be achieved by the concurrent collection of data for the general survey and situation and outlook (S and O) reports. If not, an additional vehicle may be needed in some zones.

B. In the DAER report:

1. Each commodity analyst might review the Reuters Wire. This should ensure that some item a particular analyst may want to include in the current report is not overlooked. When only one person reviews the wire and collects price quotes and general information, relevant detail for a wide variety of commodities may be beyond this individual's capabilities. For example, a change in an exchange rate with a trading partner might overshadow a price change and the individual commodity analyst would recognize this as important while an individual scanning the wire for information by the commodity might overlook it.

2. An attempt to incorporate more statements with analytical content could be made. Instead of just reporting that something happened (e.g., a price increased 5 percent), the report could mention economic factors causing it to happen (e.g., the price increased 5 percent <u>because</u> of a large purchase by a major importer and/or reduced supplies in a principal growing area).

3. Use of a collator in conjunction with the reproduction process (Xerox machine) would speed the assembly of the report and enable the staff to focus on their analytical efforts.

In addition, Dr. Wright also made recommendations for the new Situation and Outlook Information System (SOIS).

1. Construct a calendar for releasing situation and outlook reports (see attachment to Appendix II). The calendar should reflect the idea of providing information to market and/or nonmarket users in time for them to use it in the planning

and execution of their operations. An initial effort might involve adding a one or two page statement for a particular commodity to the existing DAER weekly report. Major commodities (e.g., rice) would appear on the calendar more frequently than minor commodities (e.g., pulses). Conceptually, users might prefer reports on commodity groups (e.g., grains or oilseed crops), but such an effort might be beyond the capability of the staff until it gains experience with a more limited approach (i.e., only one commodity examined in each weekly report).

2. Expand stock-level reporting. The estimate of production may be the single most important component of the SOIS, but for storable commodities the level of stocks frequently has a considerable influence on price. This is especially true when the level of stocks is unusually small or large. Expansion could be of two types: by increasing the number of commodities covered and by increasing the frequency of estimating stock levels of commodities currently covered (i.e., by issuing estimates quarterly or semiannually instead of annually).

3. Continue to develop staff capability. Some of the DAER staff members are fully trained so that they can make a real contribution to a rigorous S and O effort. Others are intelligent and hard-working, as are those in the first group, but could benefit considerably from additional training in economics, especially commodity market analysis. Training could be formal (either in Thailand or abroad) or informal (on-the-job training with the assistance of senior analysts and/or consultants). Periodic trips to growing areas and processing centers would help some analysts develop a better understanding of the commodity and its market. Regular subscription to S and O reports of the U.S. Department of Agriculture (USDA) would provide instructural material as well as access to S and O analyses. Addresses and fee schedules have been provided to the DAER staff.

4. Continue to build the research capability required to support the S and O program. The comments pertaining to the development of staff capability are also relevant to this recommendation.

5. Strive to develop the OAE (both the CAS and DAER efforts) SOIS so that it is recognized by everyone as the best SOIS in Thailand. Even though the OAE is the official source of commodity information, some confusion exists because clients do not know when estimates and forecasts will be released. The current effort reflects good progress in identifying goals, mobilizing resources, collecting data, and preparing and distributing a needed product. Additional progress might best be made by issuing a calendar that identifies when reports will be released (as mentioned in recommendation number 1) and giving the reports a broad distribution. Consideration also could be given to creating an organizational unit that has as its only mission the implementation and maintenance of the "official" government SOIS. The integrity of the SOIS requires that the estimates made by the responsible unit be totally independent and not subject to the influence of special interest groups or the political process. Detailed comments about the configuration of such a unit and its location in the organizational chart of the OAE are beyond the scope of the present terms of reference. Recommendations pertaining to a reorganization that would depict the official nature of the SOIS (for example, the Thailand Agricultural Situation and Outlook Board) should, however, be based on a thorough review of the OAE's present mission and organization and anticipated changes in its mission and organization.

Finally, Dr. Wright developed a reference manual with guidelines for developing a situation and outlook report, including a sample report for soybeans.

Socioeconomic survey design for data collection and processing was identified as another area of high priority need for special assistance, and terms of reference for a short-term specialist were developed. Dr. Tom Lyson reviewed the current major surveys, and concluded that the data collected were appropriate and covered a wide range of information. In fact, he concluded that the amount of data collected exceeded the capacity to process it with the current data processing methods and facilities. Many of his recommendations were intended to shorten and simplify the questionnaire used to ascertain the farmer social and economic situation without loss of needed data. He identified the need for developing a longitudinal data file so that social and economic trends could be identified effectively.

Construction and content of a changwat, amphur, and tambon-level data base was the topic of several discussions.

In addition to the direct survey design, Dr. Lyson, reviewed the programs and software available in the Computer Services Center (CSC) for processing surveys. He strongly recommended procurement of a comprehensive and unified software package capable of processing a wide range of data types. Many programs currently available are difficult to use or limited in capability. Dr. Lyson recommended that serious consideration be given to securing the Statistical Package for Social Sciences (SPSS) because it is "user-friendly," manuals are available in Thai, there are other installations in Bangkok, and support of the system is the responsibility of the company rather than the OAE. During his assignment, Dr. Lyson worked with the staff to develop a sample set of data files and statistical summaries.

In addition to the software package, Dr. Lyson recommended that several additional terminals be added to the system to increase the direct access of researchers to the computer. The two terminals leased for demonstration purposes were used almost constantly. Again, the availability of SPSS or a similar package would allow researchers to process data directly, and take some of the burden off the programmers in the CSC. Finally, Dr. Lyson recommended that a local expert such as a professor or graduate of Chulalongkorn University or the Asian Institute of Technology (AIT), be hired to train the staff in the use of SPSS and to assist with developing data processing methods.

A short-term specialist was requested to assist the OAE with identification of major development issues and priority policy research for preparation for FYP-6. Dr. Leroy Blakeslee provided the technical assistance during a one-month assignment in October and November 1984. The assignment began with a review of current statistics describing Thailand's agriculture and general economy, with the most relevant reports being those of the Asian Development Bank (ADB), the World Bank, working documents prepared for the U.S. Agricultural Presidential Mission to Thailand, and the current five-year economic and social development plan.

Review of recent writings and discussions with OAE staff lead to a long list of development issues, from which a consensus list of the most important was developed. Dr. Blakeslee observed that both importance and consensus seem likely to be main factors in determining the actual attention that they receive in the Sixth Five-Year Plan (FYP-6) and subsequent policy implementation.

Among the positions that seem to have wide support in MOAC and elsewhere are the following:

1. There is a need for a substantial shift in the relative emphasis given to different kinds of crop production research. Specifically, relatively more emphasis is needed on improving crop productivity under rain-fed conditions, and relatively less is needed on research for use under irrigated conditions. Most observers see this not as a call for less actual effort in the latter area, but as a call for more in the former, or for more in both areas with the former receiving the dominant share. The proposed redirection corresponds closely to one favoring greater emphasis on crop production problems in areas of the kingdom where farm income is lowest. It also reflects a recognition that certain upland crops seem to have relatively favorable export prospects.

The types of activities envisioned include crop breeding designed to identify varieties with greater drought resistance or tolerance for variable water conditions, identifying and testing adaptable new crops, possible mechanization developments that permit faster field operations when required by variable weather and research into dry seeding of rice.

In general, this position seems to be correct. it is not clear how rapidly this research reorientation can occur, nor exactly how much on-farm effect it can have over the period of FYP-6. Certainly, much of the effect will not be realized until after 1991, but the change properly can start now.

2. The government needs to take whatever measures it can to increase the availability of key farm inputs at affordable prices. These inputs include fertilizer, improved seed, chemicals, and certain machinery items. The necessary measures may involve import policy, private investment polity, and probably some investments in public sector or cooperative operations. While the need to promote such availability has wide recognition, there is likely to be considerable debate yet to come on mechanisms for doing so.

3. Efforts are required to improve the functioning of existing large-scale water storage and distribution systems to permit more dry season use of irrigation facilities. It is generally agreed that this requires more on-farm development in the form of land leveling and on-farm distribution systems, and better management of public water distribution systems. The latter may be more a problem of developing the right institutions than of investment.

4. Efforts need to continue and accelerate to grant secure titles to land being managed by farmers. Lack of such titles on more than half of Thailand's farm land is perceived as a significant impediment to farmer investment.

5. Development of infrastructure -- principally roads, drinking water systems, schools, and health services -- needs to continue in regions where farms are less accessible and operate under noncommercial conditions.

Among the development issues that are widely discussed, but on which consensus is less complete are the following:

1. Trade policies favoring fewer or no restrictions on agricultural exports and on import of most agricultural inputs are recommended by many. Presumably, some minimal controls would always be necessary in cases where Thailand's negotiated access to a foreign market at a maximum level requires Thai export controls to that market, or where temporary import controls might be agreed upon for initial protection to a new domestic industry. Another proposal currently receiving attention is that for export crops. The government's sole form of market intervention should be through use of export taxes and subsidies, applied under preannounced rules, for price stabilization. Here again, it appears that the intent is to regulate trade in a way that provides better price opportunities to domestic producers than in the past.

At least two sets of arguments seem likely to be raised against these positions. Basic economic intelligence on Thailand and Asian rice markets has still not evolved to a point where there is general consensus concerning fundamental structural questions such as elasticities of foreign and domestic demand for rice in major markets, degree of substitutability between rice from different origins in different markets, amount of market power exercised by different agents in the market and how it is exercised, etc. Different assumptions or perceptions on these matters lead to different conclusions on the effects of export taxes. For a variety of technical reasons, Asian rice markets are particularly difficult to deal with in economic research, but such research efforts certainly should continue.

In the case of rice, the fact that rice export premiums are now being used as revenue for the Farmers Aid Fund (FAF) introduces a source of support for maintaining them in the view of some. As opposed to having the premium go into general revenue, this is probably preferred. In the absence of highly inelastic export demand for Thai rice, however, this seems difficult to defend. This writer's present view is that in consideration of the likely character of export demand for rice, the present farm-nonfarm income differentials, and the nature of the tax system, a good case can be made for lower export taxes and the funding of defensible FAF expenditures from general revenues.

2. At a certain level of abstraction, the idea that there should be less government involvement and more private involvement in the buying and selling of farm commodities and inputs is widely supported. On the other hand, there is considerable support for the idea that government should play a much stronger role in other marketing functions, such as establishing and enforcing grades and standards for key farm commodities, especially those moving into export, and enforcing grades, standards, and clear labeling of purchased farm inputs.

After a four-year absence from Thailand, this observer certainly has the impression of a noticeable change in attitudes and actions on the part of officials regarding the role of the private sector in serving agriculture. There are good examples of cooperation with private interests in delivering information, new practices, and key inputs to farmers.

Support for returning livestock slaughter operations to the private sector seems widespread. Nevertheless, continued existence of major state enterprises, state-promoted cooperative enterprises, and beliefs held by government officials that many private sector businesses unfairly exploit farmers lead me to believe that movement toward more cooperation with private sector interests may not be as rapid as some would like.

Within MOAC, the emergence of the Marketing Organization for Farmers (MOF) as a major operation in recent years is a case in point. To date, its activities seem not to have been very explicitly targeted. There do seem to be possibilities for channeling its activities in a way that may be reasonably consistent with other goals that are generally accepted. Specifically, a focus of MOF activities more on those areas not having well-developed commercial services, in connection with planned infrastructure development in those same areas, could constitute a rational approach to policy for those areas which would receive wide support.

As a final point in the discussion of current development issues, it is the view of this observer that the OAE has traditionally shown a tendency to do research and take positions with a disproportionate emphasis on those matters in which MOAC has had direct interests in terms of programs, projects, and responsibilities. This was certainly understandable. With the changes of status from a division to an Office of Agricultural Economics , however, the OAE's responsibilities have broadened and the focus of interests encompasses a broader range of topics. Nevertheless, the research and policy focus appears still to consider matters of trade policy, price policy, and other issues outside the range of traditional MOAC interests less than it might. It

is also true that the number of staff who are trained in farm management and production economics, the traditional fields emphasized in OAE work, still far exceeds those who are trained in marketing and related fields. This too is a factor in explaining the emphasis given to different activities in the OAE's program. As opportunities arise, the OAE will probably wish to give attention to further upgrading of staff skills and adding additional people with skills in these areas.

Dr. Blakeslee reviewed the OAE's modeling efforts in the context of the NESDB's timetable suggesting that most analytical work for FYP-6 was to be done in January through August 1985. He concluded that it would be important to move rapidly on the many tasks to be undertaken for updating and use of the national crop model in this effort. DPADP staff have determined that existing versions of the model will require modification, both to update coefficients to reflect current conditions and to implement some more fundamental changes in model structure. To a substantial degree, agreement has been reached on changes in structure that are to be made. This will involve removing one set of constraints intended to ensure balance between use of activities representing new and traditional practices, but having doubtful validity. Replacing them will be a set of constraints having a more straightforward conceptual basis related to availability of key inputs needed for adoption of new production practices. Dr. Blakeslee agreed with the desirability of making these changes.

Though the model is necessarily large, it is desirable to keep the structure as simple as possible and to use activity and constraint formulations that can be easily understood. Given the time available and the tasks at hand, it is better to accept some imprecision than to risk getting bogged down in excessively complex detail. Each solution should be expected to provide only estimates of the implied production, resource use, and income consequences of assumed components of development plans within a framework that forces consistency with resource availabilities and economic incentives. It is necessary to recognize that each set of assumptions concerning type and scale of development activities may have different implications for development budgets. One should not expect a simple model solution to search all development budget allocation possibilities and pick the best one. Each solution can indicate only the likely outcome from some stated set of assumptions. Final choices will require that judgement be made in consideration of alternative sets of model results, but the choice itself will not be made by application of any formal quantified decision rule.

Activities are well underway to use the 1981/82 national cost-of production survey to update several types of input-output coefficients in the model. The methods being used

seem to be satisfactory, at least to give first approximation estimates. Two concerns, however, must be expressed about this effort. First, though the information base initially appears to be large (2000-3000 questionnaires), it will actually be a very narrow one for estimating certain coefficients. When questionnaires are sorted to identify those containing information on production of a particular crop using a stated, well-defined technology mix on a particular kind of land in a particular agroeconomic zone, the resulting number of questionnaires will be quite small in some (and perhaps many) cases. Averaging results over such a set to estimate programming model coefficients will produce some with large sampling errors. As second concern pertains to the use of information generated in a single interview session to estimate labor requirements for cropping activities during specific months of the preceding year. Data of this kind can contain substantial errors due to respondent's inability to recall past events accurately.

Due to the above concerns, those staff preparing such estimates must be prepared to subject their computer-generated estimates to further evaluation and possible modification on the basis of comparisons with results from other data sources (such as the farm record-keeping project results) and subjective judgment of persons familiar with field conditions. This is especially true of the labor use coefficients, but it also should be done for estimated fertilizer, seed, and machinery requirements, for yields, variable costs, etc.

Once a model representing baseline conditions has been completed, the work focus will shift to using it for policy analysis. This will require modifying the baseline model to represent yields of individual cropping activities, resource requirements of those activities, resource availabilities, prices, demands, and variable costs as they are expected to appear under some of the more likely sets of assumptions concerning development activities; and then solutions will be calculated.

To be in a position to do this at the appropriate time, several additional activities need to commence at an early date. The following are recommended:

1. Conduct a fairly systematic inventory of projects now ongoing or planned in MOAC and other agencies to identify the following:

    a. New varieties of specific major crops recently released and those which probably will be released over the next one to two years. For each, it will be useful to know its adaptability to specific regions of the country, its likely yield performance

under field conditions with attainable management and input use, and requirements for important non-traditional inputs that may not be widely available;

b. Public and private seed multiplication and/or import plans for the coming few years. In each case it will be helpful to estimate the type of seed, quantities likely to be available, what parts of this country they are adapted to, and plans for moving them into the hands of farmers. This activity should be coordinated with the one just described;

c. Irrigation and land development plans that may or will be implemented during FYP-6, including the scale, type, and location of planned projects;

d. Plans for augmenting fertilizer and other chemical input supplies, together with indications of prices that farmers must pay for them;

e. Plans for development of facilities for processing agricultural products, including their location and capacity;

f. Other planned agricultural development programs that seem significant and relevant.

The above work, will almost certainly require making extensive contacts with staff of the Department of Agriculture (DOA), the Department of Agriculture Extension (DOAE), and other agencies. If arrangements can be made, it would seem reasonable to request assistance from the Plan Implementation Division (PID) and/or the Project Evaluation Division (PED) in completing these tasks.

2. Initiate activities to formulate not only demand projections for the FYP-6 period, but also a set of relative prices at which these demands can be expected to occur. The present and planned versions of the national crop model make use of a profit-maximizing formulation which will include constraints that hold production within stated ranges. These ranges will be identified with market demand levels, and it is necessary that prices used to calculate objective function coefficients maintain approximate consistency with these demand levels.

3. Identify price and export policy changes that it may be desirable to consider and the associated changes in demand and relative prices. Tasks 2 and 3 seem to be ones that might properly be undertaken by some combination of persons from the commodity-oriented sections of either the DPAOP, the Division of Agricultural Economics Research (DAER), or both.

4. Develop the assumptions that are to be considered regarding general expansion of the cropland base through unsanctioned private use of public lands of the kind that has occurred in the past. This information should be assembled to provide a basis for modifying cropland constraints if it is decided to assess implications of some of the positions that NESDB is now taking.

In consideration of the type of information developed in tasks 1 through 4 above, plans must be made for representing these possibilities within the national crop model for FYP-6 consideration. In addition, thought should soon be given to how model output is to be summarized for routine report writing and presentation in order that results can be readily understood by persons not involved in the modeling effort. Such reports should be prepared so that the main features of the solution are readily apparent and not obscured by unnecessary detail. The intent is for the reader to be able fairly easily to form a judgment as to the desirability or acceptability of the likely outcome, taking account of the major budget implications. Consideration of these issues may lead to a decision to develop computer software for report generation from linear programming solutions, or to handle the summarization by providing standardized instructions to clerical staff to guide hand preparation of summaries. If software development is to be undertaken, it should start well in advance of next summer.

Finally, it seems highly desirable to plan for a series of seminars on model results of alternative FYP-6 plans. Certainly, wide exposure of the OAE staff should be encouraged, and participation by other MOAC staff and interested outsiders would be highly desirable. Quite possibly, discussions at such seminars may suggest additional policy choices that may merit evaluation by further reformulations and solutions using the national crop model. Careful seminar presentations by the OAE will be necessary, but the result could be very informative to participants, as well as a highly visible output for the OAE.

It is clear that the activities constituting the FYP-6 modeling effort are sufficiently extensive to create a large research management task that needs to be addressed rather formally. A detailed statement of the revised model structure should be prepared as soon as possible. It should identify (1) the different classes of constraints and the number in each class; (2) the different kinds of activities and the number of each; and (3) the major categories of coefficients that are being estimated. Consideration should then be given to who is going to estimate each class of coefficients, by what method, from what data and other sources, and on what time schedule. At the same time these decisions are being made, plans should be made for work

assignments to be made for the tasks described above related to developing information and procedures for use in policy evaluation after the baseline model is updated and validated.

It is recommended that a set of formal working papers be prepared. These should document in detail (1) the underlying physical and economic basis for the model structure that has been used, and (2) calculation and estimation procedures for each major set of coefficients and for alternative formulations that are used to represent the economic and physical environment expected to exist under alternative policy choices.

These papers should be valuable in maintaining model integrity in the presence of OAE staff turnover. They should also be helpful in explaining the work to interested outsiders and to other staff who may be asked to undertake specific estimation subtasks in the future.

Finally, though the Crop Development Plan Section (CDPS) of the DPADP will have primary responsibility for this effort, its staff is not large relative to the tasks to be completed. Certain recommendations were made earlier for use of additional staff to support of FYP-6 preparation, and other staff members will be desirable, as well, to the extent that arrangements can be made. In addition, it is recommended that arrangements be made for Khun Kittipong, section head for the CDPS, to have ready and continuing access to at least one other individual who has had considerable practical experience in formulating large linear programming models of aggregate economic activity. Such an individual need not have line responsibilities for the day-to-day work. Some sort of consultancy arrangement should be satisfactory. In practice, the questions one must deal with in this kind of work can become fairly complex, and decisions that are made will lead to substantial commitments of research resources in pursuit of very specific tasks. It therefore seems wise to provide for consultation and review of at least some major issues by more than one or two experienced people before proceeding. From among those I know well in the OAE, Dr. Somporn would seem to be an appropriate individual. However, there are also likely to be other suitable candidates whose present assignments would permit such an assignment, but who are less well known to me.

Dr. Blakeslee also recommended activities to provide the OAE with the capability to respond to specific policy issues for the FYP-6, and for future agricultural policy development and administration within MOAC and the general economy. His recommendations follow:

Two objectives have been pursued in suggesting research programs for consideration by the OAE staff. One is to suggest a few projects that seem important to Thailand's

development prospects in the future. A second is to identify a few where successful research and publication programs might give the OAE higher visibility among participants in debate and discussion on development outside MOAC. As noted earlier, for quite understandable reasons, the OAE's traditional research program has tended to concentrate on issues where MOAC has, or is likely to have, a direct role to play. This selectivity sometimes contributes to a situation where the OAE's input and views in certain areas may not be as fully represented as they should be. The following six suggestions are made for possible inclusion in the OAE's future research program:

1. A set of topics in the general area of rice export and trade regulation. The need for research into the effects of rice export taxes on the level of exports and domestic and export prices has been noted earlier. An important related issue is that of the elasticity of price transmission between Bangkok prices and up-country prices or farm prices. This appears to be researchable using time series data for weekly or monthly periods, and it seems like an appropriate topic for other commodities as well as for rice. In fact, they key question is what is the effect of export tax changes on farm prices? Most research to date has focused on measuring effects on Bangkok prices. Successful research along the lines described could further understanding of an important unresolved issue.

Though it is not an easy research task, the current interest in balance-of-payment problems and agricultural trade issues suggest that a useful research program could be structured to examine the net overall balance of trade impacts from both a reduction or elimination of agricultural export innibitors and inhibitors on imports of farm inputs.

2. A farm management study into the effects of farmers having limited rights in their on-farm investment, decision-making, and productivity could provide further insights into the likely results of ongoing programs to grant different forms of land titles to farmers. At this point, it is widely assumed that this effort will have positive effects on productivity, but I am not aware of any significant body of research designed to find out if the effects are likely to be large or small, or what the qualitative character of change is likely to be.

3. Apparently, land titling programs in some regions of the kingdom are proceeding under standards that limit the size of holdings for which land titles are given to 15 rai per family. It appears that in most cases, holdings of this size are not likely to permit farm family income earnings

that are adequate by most standards being applied today. A farm management study to estimate the minimum size of holdings that will provide for a viable farming operation and an acceptable level of farm income in various areas could provide useful information.

4. The use of fertilizer in Thailand farm cropping systems continues to lag behind results in many Asian countries. While it is certainly unwise to assign too much significance to any single factor as a limit on productivity increase, fertilizer use has been found to be a major source of yield increase under a broad range of conditions. Continuing studies into the economics of fertilizer use, specific to individual crops and areas, would seem to be a wise use of resources. Recent claims of substantially improved profitability of fertilization using single-source nutrients rather than compound fertilizers should be examined further. This examination should include economic results under field trials and, if these appear favorable, evaluation of requirements for adjustments in manufacturing, import, and distribution so as to make the necessary materials more widely available at affordable prices.

5. Current programs call for public policy to concentrate primarily on infrastructure development in isolated areas dominated by subsistence agriculture. In part, such programs tend to be viewed as welfare programs, but they are also intended to bring these areas more into the mainstream of commercial activity in later years. Long-term experience (20 to 30 years) in the Northeast suggests that this has happened. An exploratory research program to identify and measure the effects on degree of commercialization of agriculture, and increase in productivity that might come from further infrastructure development could be useful, even though results might not be very definitive.

One might approach this by examining statistical associations between characteristics of geographic regions (regions smaller than, say, a changwat), measuring, on the one hand, changes in commercialization in agriculture and in productivity in agriculture and, on the other hand, degree of infrastructure development. As examples of variables in the first class, one might consider (1) ratio of value of purchased inputs used in farm production to value of total inputs used in farm production; (2) ratio of value of sales of farm products to value of production of farm products; and (3) an index of crop yields in the region. Examples of variables in the second class might include (1) linear road distance per square kilometer of area in the region; (2) school facilities (perhaps classrooms, teachers, or school budget) per square kilometer of area in the region (lagged values of such variables might be more appropriate); (3) health facilities, or personnel or health budget per square

kilometer of area in the region; and (4) density of commercial centers (by some common definition) in the region, or nearness to a commercial center (depending on how large the regions are in the study).

6. Continued and expanded research efforts on farm enterprise and farming systems economics, with particular emphasis on implications of new findings of DOA and other research, seem desirable. The research should focus on examining how new findings fit in with typical farm resource endowments and possible off-farm work opportunities in circumstances where farmers seek to use their resources in the most profitable way.

Dr. James Stephenson was requested as a short-term consultant to provide specific review and guidance for development of the national macroeconomic model, its linkage to the agricultural models, and modifications for quarterly forecasting of key agricultural variables.

The initial macroeconomic model that was developed during Dr. Stephenson's long-term assignment on the earlier ASAP contained 55 equations with 45 estimated and 10 identities. During Dr. Kajonwan's dissertation research at Iowa State University (ISU), the model was expanded to 91 equations, with 68 estimated and 23 identities. With limited computer capacity in the OAE, the model was subsequently reduced in overall size, but 29 value-added equations had been added to disaggregate the agricultural output sector. The Gauss-Seidal model has not been programmed to allow for an expanded number of equations (now 150), and the macro model has been reexpanded and estimated, but has not yet been simulated.

Dr. Stephenson summarized his recommendations, reprinted below, under the three headings: Macroeconometric Modeling, Possible Alternative Modeling Approaches, and Quarterly Forecasting Models.

Macroeconometric Modeling Effort

1. The OAE should continue its macroeconometric modeling effort with the macroeconometric model either being a "stand alone" model or one linked with the national linear programming model. It is my strong recommendation that the linked approach be adopted if the necessary resources can be mustered to perform the necessary research project.

2. Improved regression and simulation computer programs should be adapted to the mainframe UNIVAC computer. Also, a principal components package of sufficient capacity should be obtained, so that 2SLS-PC estimation can be used.

Possible Alternative Modeling Approaches

1. The OAE should begin to familiarize itself with the modeling technique associated with Social Accounting Matrices (SAM). I believe that the OAE has a major potential contribution to make here in that it has access to large amounts of disaggregated data for the agricultural sector. I recommend that if the OAE should approach NESDB with an offer of collaboration, does in fact occur, OAE will enhance its influence in the agricultural planning component of FYP-6.

2. If collaboration with NESDB proves infeasible, the OAE should initiate its own SAM-based modeling effort, with particular emphasis on a large disaggregated agricultural sector.

Quarterly Forecasting Models

1. A quarterly forecasting modeling effort should be established under the guidelines which appear in Appendix B.

2. While the regression approach is the preferable one, in my opinion, for the initial stages of the project, the OAE should begin training its personnel Box-Jenkins time-series techniques, and also acquire the necessary computer software to carry out this analysis.

3. Again, steps should be taken to get all regression computer programs operational on the UNIVAC computer.

CHAPTER 5. PROJECT DEVELOPMENT AND DESIGN

The Agricultural Planning Project (APP) proposal included one long-term project development and design consultant position. The duties of this consultant were to prepare a format for systematic review of projects, develop a system for monitoring and evaluating ongoing projects, and develop a summary reporting system for project budgets. One short-term consultant was requested and provided to assist in review and development of the project-monitoring systems.

One of the first efforts in project design was a study of groundwater utilization relative to other types of water resources. Emphasis was on the poorer areas of the Northeast where farmers have little access to supplemental water resources for agricultural use. In discussions with Dr. Boonkerd, Natural Resources Branch of the Division of Agricultural Economics Research (DAER), it was decided to limit the study to one changwat (Nakhon Phanom) of the Northeast due to limited numbers of personnel to conduct the work. The study was to consider the following:

1. Inventory and location of present and potential areas of surface water irrigation. This would include large, medium, and small irrigation projects, tanks, river pumping, and weir diversion.

2. Evaluate costs and returns to farms presently being served by deep-well groundwater.

3. Evaluate costs and returns to the various types of surface irrigation.

4. Identify areas that potentially might utilize groundwater as opposed to other water sources. Assumptions were that this type of development would be the most costly and would only be an alternative when other methods were not feasible. Other constraints to consider would be water yield per minute, drawndown, quality, and, of course, soil suitability for agricultural production.

Secondary data were gathered and analyzed from studies and reports by the National Energy Administration (NEA), the Royal Irrigation Department (RID), the World Bank, the Ministry of Industry, Howard Humphrey and Associates, Khon Kaen University, the Land Development Department (LDD), the Asian Institute of Technology (AIT), and the Office of Agricultural Economics (OAE).

The project design included a summary of the characteristics of various types of water resource development in the

Northeast. Systems were inventoried by type of system, existing and potential coverage, recent construction costs, internal rate of return (IRR) where known, and priority needs. Land was inventoried by suitability classes for groundwater development under three levels of groundwater availability, with consideration given to other methods of irrigation, such as pumping from streams and rivers, or delivery from tanks and reservoirs. Land was inventoried in five classes, ranging from good paddy-land to forest land. There are four classes of suitability ratings from highly suitable to unsuitable.

A project identification document was prepared which provided the framework for a project in groundwater development. It involved market-garden crop production on a year-round basis, and cooperative ownership of the well based on the experiences in the OAE's Ban Nakah well-water project. Necessary conditions to such a project would be (1) close proximity to market centers to facilitate marketing and (2) multiple ownership of the well to spread the capital costs of establishment, maintenance, and full utilization through use of intensive crops.

During the work on groundwater, a part-time effort was continuing in the Division of Economic Project and Program Evaluation (DEPPE) and the Plan of Implementation Division (PID). The DEPPE is responsible for (1) conducting ongoing and post-project evaluation of projects being executed by the Ministry of Agriculture and Cooperatives (MOAC); (2) providing feedback and recommendations to the Committee on Agricultural Policy and Plans as a result of its evaluation findings; (3) collecting regional and local farm data for use in agricultural planning; and (4) collecting and distributing agricultural marketing information to farmers and interested institutions.

In consultation with the division head, it was decided that the consultant would direct his efforts in the cost recovery and monitoring and evaluation sections. Assistance was needed to upgrade the staff in order to do financial and economic evaluation of projects, make project input and output estimates, and do farm-level analysis. In particular, training was needed in project formulation and design. The division head wanted assistance in developing a short-term training proposal for the staff. The section leader of monitoring and evaluation expressed keen interest in computerizing survey results in order to speed up the economic evaluation process in the division.

A short course on project identification, design, and preparation was presented for the staff of the division. The course consisted of morning sessions held over the period of

one month. The 15 participants worked through actual examples of the following major topics:

1. Defining a project and indicators of criteria assessment

2. Preparing a project identification document

3. Case studies of project identification documents

4. Project preparation, including:

    a. Purpose
    b. Contents
    c. Specific analysis sections

        1. Economic feasibility analysis
        2. Social soundness analysis sections
        3. Technical feasibility analysis
        4. Administrative feasibility
        5. Environmental concerns
        6. Financial planning
        7. Implementation plan
        8. Evaluation arrangements

An effort was made to encourage the use of logical framework matrices as a basis for evaluation in the two sections rather than dwelling only on economic and financial returns. Logframes were also covered in another short course using examples prepared from projects currently under study. "Dairy Farming to Replace Pineapples," a project under study by the monitoring and evaluation section, was used to demonstrate the logframe matrix for project design.

A short-course training proposal was submitted to the division heads of both the PID and the DEPPE for approval and forwarding to the Secretary General for support under the Asian Development Bank (ADB) training grant program. The proposal involved U.S. Department of Agriculture (USDA) short courses to upgrade the staff in financial planning, farm management, economic analysis, logical framework preparation procedures, identification of skills in alternative project components or constraints within components, and management. All courses would be coordinated by USDA/OICD in Washington, D.C. A very similar proposal was submitted for funding under the APP project, which had an allotment of funds for short-course training.

While the evaluation division personnel did a good job in preparing for, and conducting evaluations, there was a considerable bottleneck in the time required for data tabulation and analysis work. However, the monitoring and evaluation section head indicated that the time required for

obtaining services of a programmer to write a program for a study was three months. It was obvious that the user-friendly data base and electronic spread sheet programs could speed up the tabulation work by at least 50 percent. To demonstrate the use of electronic spread sheet programs, a microcomputer was used to compile and analyze data on Zone I of the Sukhothai groundwater irrigation project. It was also used to do a sensitivity analysis on the second medium-scale irrigation project. A paper was also prepared in cooperation with staff of the monitoring and evaluation section on using a microcomputer for project preparation work. The paper was forwarded through the division head to the Secretary General for approval to purchase microcomputers in the section. Microcomputers would serve to nullify the need for terminals connected to the ministry mainframe, which are limited by a poor telephone linkup. They would also be cheaper than terminal purchase, but the request was not approved during the APP.

Much of the work in the DEPPE was in on-the-job training where the consultant assisted various members of staff in two sections. Work was done on the Munroe River integrated rural development project, Songiakolok; Zone I of the Sukhothai groundwater irrigation project; the Lam Nam Ooon irrigation; the dairy farming to replace pineapple project; the Nongwai irrigation project, and on preparation of the divisional request for loan funding under the World Bank strengthening loan. Some specific areas in which staff were assisted are as follows:

1. Delineation of additional resources required under the strengthening loan

2. Preparation of logical framework matrices

3. Partial budgeting

4. Organization and linking of essential tables needed for both financial and economic analysis of projects (This permitted use of calc programs in analysis activities.)

5. Questionnaire design for the Lam Nam Ooon and Nongwai projects

6. Requests to the World Bank for staff training under the 11th irrigation loans

7. Cash flow analysis

8. Preparation of Gannt charts

9. Lecture series to Association of Southeast Asian Nations (ASEAN) short courses

10. IRR and B/C calculation methodology
    Net present worth

11. Economic, financial, net farm, and farm enterprise analysis (differences between)

12. Discounting and shadow pricing

The primary role of the PID is to monitor MOAC projects and budgets to meet the needs of the secretary general, the permanent secretary, and others. The PID provides estimates of budgets needed to run MOAC and has information available on amounts of unused budgets in a fiscal year. It also serves as the contact office in MOAC for loans and grants and keeps records regarding their status.

There is an initial documentation of annual operating budgets and follow-up trimester reporting of status as opposed to plans. Seven sections maintain such monitoring records for 12 ministerial departments and offices, 7 public enterprises, and rural and area development special projects. A separate reporting entity is maintained for the loan and grant allocations.

The division implements certain projects such as the rain-fed project at Chom Tung and Khon Kaen. It also reviews project proposals and prepares terms of references for many of the surveys and studies done by foreign donors and loan agencies.

The consultant assisted in developing a computerized project-monitoring system that would better serve to provide information regarding whether projects were on target and to record funding and allocation, carryover, etc. Assistance was also provided in training personnel in data entry and reporting from the system. Other duties on an ad hoc basis concerned writing and editing proposals.

The Project Evaluation Monitoring System (PEMS) evolved in the early months of 1983 as a result of meeting with the division head when documentation was being completed for the proposed World Bank strengthening loan to the OAE. The basis for the system was the Agricultural Economics Act of B.E.2522 (1979), section 9(6), which stated that the OAE was to analyze and evaluate the outcome of investment made in agricultural projects and make recommendations to the Committee on Agriculture and Cooperative Development Policy and Planning.

The first proposal was submitted to the secretary general in July 1983. It also was a part of the proposal

sent to the World Bank. As the proposal stated, the purpose of the PENS was to strengthen an inherited system. It would include information such as program goals, purpose of the project, planned versus actual inputs and outputs over time, and the results of both internal and external evaluations. It was quite simple in concept and required only the use of the Mapper program and a couple of UTS-400 terminals equipped with a printer.

It later became apparent that the OAE was not interested in an all-inclusive type of monitoring system. It wished only to record financial and physical inputs, the total funds spent, and the amount of carryover. After many additional meetings with the PID, the revised system was submitted to Dr. Somnuk in November 1984. The revised version required four lists for each project -- two to record short- and long-term financial obligations and spendings, and two to record short- and long-term physical inputs.

UTS-400 terminals and printers were rented with funds from the APP project, the headers and command files were written, and PID began using the system.

All PID section leaders and others were trained in the use of the terminals for data entry and extraction of reports. Handouts were developed for a training course and for later reference by the PID staff.

Reports are summarized for all departments each trimester and forwarded to the permanent secretary, the secretary general and the departments. According to the PID, they are also used by the inspector generals when reviewing projects in the ministry.

If the division can obtain microcomputers with a ten-megabyte hard disk, then the monitoring program should be done using either the DBASE II or III program. Mapper is a rather cumbersome data base program that is difficult for the staff to learn, outdated, and not very versatile. It has been found in training courses that PID personnel learn the DBASE theory very quickly. Also, the microcomputers could be located in the PID offices without the need for cable hookups to the main computer.

Reports coming from departments manifest two main problems. The first is that the preparation time of the reports is too long; although when one realizes that one department alone has 270 reporting entities for parts of its project, the three-month delay in getting many of the trimester reports can be readily understood. The second problem concerns the amount of detail given in the reports. For national monitoring, only a summary of major activities should be reported. Page after page of information on a

projects is useful to a project manager, but not for national monitoring.

It was intended that results of evaluation, status of loan funding, project location, project manager's name, status of input target attainment, total funding, etc., were to be placed on the long-term RIDS. Apparently, this is not being done, as all the emphasis is on the current year's budget and activities. Without these additions, the system is incomplete.

A proposal was prepared for both in-country and external training. It was initially submitted as part of the European Economic Community (EEC) grant proposal, which was intended to encourage substitute commodities for cassava. The EEC grant was approved. This topic was also covered again in the request for training manual preparation which was to go to Kasetsart University for completion.

At the request of the secretary general, approximately seven months were spent developing a system and prototype for commodity program-budgeting analysis in MOAC. Because a separate report was written on this topic, the following discussion simply outlines the major components of the system.

The objective was to develop a system by which quantity and cost of activities could be determined by commodity/ resource, major policy, function, and economic area. MOAC commodity committees are to review data summaries for each commodity and make recommendations based on policy guidelines set up by the MOAC Policy and Planning Committee.

Commodity or resource, functional, policy, and geographic classifications were developed that would encompass the bulk of activities in the ministry. Provisions were made for enlargement of the classifications as more departments enter the system. Report forms were designed that could be updated by the departments each year for each project. All activities in a project could be identified with four classifications.

The Department of Agriculture (DOA) and Department of Agricultural Extension (DOAE) were used as trial departments. Classification was completed for all their activities, while funding levels were completed only for approximately 25 percent of DOA projects because of incomplete information. Estimates would need to be made by the project managers who, at this stage, were not involved in the exercise.

A data base was set up to enter all activities by classification, funding, and geographic emphasis. Included were command, index, and other files conducive to rapid

recovery of data. An example commodity report for maize was prepared, based on the availability of data, and a suggested makeup of commodity committees was presented, along with suggested duties and responsibilities.

Training was provided in both the policy and planning and PID divisions and involved section leaders and those who would be doing data entry.

During the last half of the consultant's tour, a system was developed for commodity-oriented program budgeting and policy analysis in MOAC. A detailed discussion of the monitoring and reporting system is presented in a project report entitled "Microcomputer Assisted Development Planning in Thailand," by Winton Fuglie, Center for Agricultural and Rural Development (CARD), Iowa State University (ISU), Ames, Iowa, December 1985. The following comments serve only to outline the major components of the system.

The objective was to develop a system through which quantity and cost of activity efforts by commodity, resources, major policy, function, and economic area can be determined. MOAC commodity committees are to review data summaries for each commodity, and make recommendations based on policy guidelines set up by MOAC Policy and Planning Committee.

Commodity, resource, function, policy, and geographic classifications were developed that would encompass the bulk of activities in the ministry. Provisions were made for enlargement of the classifications as more departments enter the system. Report forms were designed which the departments will update each year for each project. All activities in a project would be identified with each of the classifications indicated above.

The OOA and the OOAE were used as pilot departments. Classifications were completed for all activities in these two departments. Funding levels could only be completed for approximately 25 percent of the OOA projects due to incomplete information. Since this is a new approach to budgeting, the current budgets have not been constructed or broken down into the new classifications. The project managers need to be involved in making the estimated breakdown of budgets into the new classification system, and then in the reporting of project activities based on the new classifications. The project managers have not been brought into the new budgeting system yet, but that is the next stage of the new budgeting process.

A data base was set up to enter all activities by classification, funding, and geographic emphasis. Included were command, index, and other files to facilitate rapid

recovery of the data in the desired summary form. Examples of commodity reports were prepared for maize and soybeans, based on the available data. A suggested format for the commodity committees was presented for the soybeans, along with duties and responsibilities of the committee.

Training was provided in both the policy and planning division and the PID. Section leaders and those who will be doing data entry were involved in the training. Additional training was accomplished through seminars held in July 1985 with key individuals from each of the ministry's 12 departments and offices.

A summary of the work objectives, work activities relating to objectives, and accomplishments is shown in Table 5.1. Accomplishments were made in all areas defined, but accomplishments were greater in some areas than in others.

Dr. Russell Olson was requested to provide one month of short-term consulting in January 1985. The overall objectives of his assignment were (1) to assist the OAE in designing a system for classifying and ranking projects or activities for use in allocating budgets and personnel to achieve development objectives; (2) to recommend changes in the program budgeting system which was in the process of being developed; and (3) to assist in developing criteria and methodology for prioritizing allocations of resources for functional and/or commodity activities. Dr. Olson provided the following review of the project-monitoring system and budget process, with recommendations for future development.

The project-monitoring system was established several years ago and has evolved only recently into a computerized system. Operating departments are required to report on each project in a prescribed format, by giving (1) long-term budget and estimated expenditures for the current year; (2) long-term input targets and targets for the current year; (3) actual activity achievements; and (4) actual expenditures. Items 1 and 2 are due two weeks after the beginning of each fiscal year. Items 3 and 4 are due two weeks after the end of each reporting period. Until recently, the reporting period for items 3 and 4 was the trimester. Beginning in this fiscal year, item 4, actual expenditures is required monthly.

About one year ago, PID began compiling and summarizing the reports on computer terminals linked to the UNIVAC computer at MOAC. Information is entered using the Mapper computer program, which is well adapted for information entry, tabulation, and retrieval. The computerized monitoring system is providing concise information on the status and progress for all projects in MOAC in four summary formats as follows:

1. Long-term financial situation. For each project, long-term financial allotments are shown for use of local and loan funds, cumulative expenditures through the previous fiscal year, percentage of allocation spent and remaining, and project beginning and completion dates.

2. Long-term input targets. For each project, the input target over the life of the project and the cumulative achievement for the last fiscal year, in terms of physical units of input and percentages of input targets, are shown.

3. Annual planned inputs and achievement. Major activities are shown for each project. These include inputs for each activity for the current year, cumulative achievements for each trimester, percent of target achieved for each activity, and, for each project, the percent of all targets achieved.

4. Financial summary for current fiscal year. This shows line-item expenditures for each project, total budget, actual expenditures, and percent of budget spent for each project.

These summaries are distributed, along with narrative statements, to the agriculture minister and department director generals, where presumably, they serve as the basis for allocating budgets among projects within departments and between departments, as well as for identifying deficiencies or problems of implementation. Because of delays in receipt of project information from departments, the summaries are usually not available until two to three months after the end of the reporting period and, therefore, are less valuable as a monitoring tool than they should be.

The PID had completed entry of projects from all departments into the computer data base and has traced budgets, expenditures, and activities back over the past five years. This will provide a view of implementation over the history of each project and will be useful in projecting future budget requirements.

The computerized monitoring system now provides concise information on the status and progress of each project and activity with respect to expenditures and inputs, but it does not give useful information on the results or accomplishments in terms of the effect on national goals.

The Budgeting Process

Thailand began a fundamental change in its budgeting system in 1982. A commitment was made at that time to adopt the Planning Programming Budgeting System (PPBS). Under the

new system, budget allocations would be based on outputs in relation to government policy objectives, rather than on the basis of inputs. It was envisioned that the system would be adopted throughout the government, with all government projects and activities coming under one of eight major programs. The agricultural sector would constitute one program and would include agriculturally related activities in several ministries in addition to MOAC.

Development of the system has moved slowly, but some important steps have been taken. In the past, departments submitted annual budgets seeking incremental increases, without guidelines from the Bureau of the Budget (BOB) regarding policies, priorities, or funding ceilings. A "top-down" budget preparation process was introduced in 1982. Ideally, the process would begin with (1) an estimate of financial resources to be available for the budget year by the BOB, NESDB, the Ministry of Finance, and the Bank of Thailand; and (2) development of program guidelines consistent with the Economic and Social Five-Year Plan for consideration by the cabinet. Upon the adoption of the annual budget policy by the cabinet, the BOB would notify ministries of their budget ceilings for the fiscal year and provide them with guidelines for the budget preparation.

It would be the responsibility of each minister to apportion the ministry's ceiling among the various departments based on the cabinet's annual budget policy and the BOB's guidelines. In MOAC, the OAE is responsible for advising the minister on allocation of the annual budgets among the departments and offices of MOAC and for preparing guidelines to be followed by departments in preparing their budgets.

The budgeting process is not yet functioning completely in accord with the planned "top-down" ideal. During the current budgeting cycle, the BOB did not establish ministerial ceilings in advance of the budget submissions. The OAE proposed, for the minister's approval, budget preparation guidelines and budget allocations among departments and offices of MOAC, assuming an overall ministerial ceiling of 12.4 percent over the last budget. This was approved by the minister and sent to the departments late in December, but perhaps too late to be considered in preparing budgets due early in January. Total budget requests were 41.3 percent above the previous budget, far above the 12.4 percent proposed by the OAE. Some requests were as high as 68 percent above their last budget. Subsequently, the BOB has advised the ministry that its ceiling will be little, if any, higher than the last budget, requiring a substantial adjustment in the budgets as submitted by departments. It is not clear how much influence the OAE will have in this exercise.

The OAE could play a strong role in the budget allocation process. It has a large data base, good computer capacity, and technical staff who could do the analysis for sound budget allocation recommendations. It is likely that the OAE's role in the budgeting process will increase as it demonstrates its ability to deliver quality recommendations supported by good data and analysis. The guidelines proposed by the OAE for the 1986 budget cycle give highest priority to livestock, fisheries, and land reform. This may very well be appropriate but appear arbitrary in the absence of supporting analysis.

Project Classification Systems for Program Budgeting

A. Commodity-based Program Budgeting

The Secretary General of the OAE instructed the Division of Policy and Agricultural Development Plan (DPADP) and the PID to develop a system that would provide a rational basis for advising the minister on budget allocations. Dr. Winton Fuglie has worked with these two divisions since last summer to develop a prototypical commodity program budgeting system. The DOA was used to test the prototype. Soybeans were used as the target commodity upon which to obtain summary data.

The rationale for a programming system based on commodities was that project initiatives are generally made along commodity lines. Policymakers tend to assign priorities to commodities based largely on their need for domestic consumption or their export-earning potential. Requests to the OAE for advice on agricultural program issues are very often related to specific commodities.

The 12 commodities considered most important to the Thai agricultural economy were selected for the exercise. Much of the information needed for identifying projects and activities which relate to these commodities was available from the project monitoring data base of the PID. Additional information on activities for these commodities by geographic regions, economic zones, and major functions (i.e., research, extension, services, etc.) was obtained from the planning division of the DOA.

An encoding system was developed assigning codes for (1) projects; (2) the 12 commodities; (3) functional categories (research, extension, and services), with a breakdown by type of functional activity within each category (e.g., type of research); and (4) geographic areas (kingdom, regions, and economic zones). The system permits search for and retrieval of information to answer a variety of questions about each of the 12 selected commodities. It is possible, for example, to determine which projects include researching a particular

commodity; which projects include a particular type of research (e.g., seed improvement) for a specified commodity; or which projects conduct research on plant protection on maize in a particular region or economic zone. Recently, the DOA has made information available on budget allocations within projects by individual activities, thereby making it possible to determine costs associated with each of the above breakdowns.

Using commodities as the basis for program budgeting has limitations. One obvious problem is that not all projects relate to specific commodities, or even to commodities in general. Irrigation, land development, and land reform, for example, are important activities in the ministry of agriculture that would be excluded in a commodity-based system. This problem can be solved by broadening the commodity classification to include resources and technologies not specific to any commodity. The following classification and coding system is an example of how this might be done:

Commodity, Resource, and Technologies
Not Specific to a Commodity

Code	
10	Crops
11	Rice
12	Maize/Sorghum
13	Cassava
14	Sugarcane
15	Soybeans
20	Fruit
30	Vegetables
40	Livestock
50	Fisheries
60	Forests
70	Natural Resources
71	Land/Soil
72	Water resources
80	Man-made Resources
81	Farm supplies (machinery, equipment, etc.)
82	Irrigation/Drainage
83	Marketing
84	Transportation
85	Cooperatives
86	Credit
87	Administrative system (facilities, staff)

90 Technology Not Specific to Any Commodity

91 Farming systems
92 Other technologies

The foregoing classification system could encompass all activities within MOAC. Some projects will, of course, relate to more than one of the classes. To the extent possible, it would be desirable to break projects down into individual activities that relate more directly to specific commodities or resources.

Another limitation of the commodity-based system, as it has been developed up to now, is that it does not explicitly relate projects or activities to national policy objectives. Modification of the system to do so would be useful. Two things are required: (1) Policy objectives for the agriculture sector need to be established and communicated to the departments; and (2) Each project or activity needs to be identified with, and justified on the basis of, its contribution to specific national policy objectives.

We constructed a framework for classifying policy goals into six major categories. These six categories are intended to cover all policy objectives relevant to the agriculture sector, and every project activity in MOAC should relate to at least one of these policy categories. Outlined below are the six broad policy classes, with primary codes 10 through 60. Under each of the six broad objective classes are examples of the kinds of activities that would address that objective.

Goals = Policy Objectives

10 Conservation and Development of Natural Resources

- Irrigation, drainage
- Soil conservation
- Watershed management
- Reclamation of saline soils

20 Protection of Crops, Livestock, and Forests

- Control of insects, diseases, and pests of crops
- Control of diseases and pests of livestock
- Weed control

30 Improved Efficiency in Production

- Plant breeding for higher yields or lower costs
- Improved production technology
- Improved production management
- Reduced capital costs per unit of production

- Improved supply and quality of farm supplies and equipment

40 Increased Demand for Agricultural Products (Domestic and Export)

- Improved quality and consumer acceptability
- Development of new products
- Export market development and promotion

50 Improved Efficiency in Marketing

- Improved grades and standards
- Development of competitive markets
- Group action -- cooperative
- Supply, demand, and price analysis
- Improved agricultural statistics

60 Improved Income and Quality of Life in Rural Areas

- Structural improvements in agriculture (land reform, farm size, ownership patterns)
- Improved potential for farm and off-farm economic activity in depressed areas
- Production of fruits and vegetables for home consumption
- Nutrition education

B. Classification System for Relating Projects to Development Objectives

The planning division of the DOA recently completed a review of its research program in which individual activities within each project are described and fiscal year 1985 budget allocations among the activities are estimated. Using this information and information from the OAE's project-monitoring data base, we constructed a new data base to include all projects in the DOA classified in the research category. The new system has three features that differ from the commodity-based program-budgeting prototype that the OPADP developed with Dr. Fuglie: (1) Where that system included only 12 commodities in the commodity-coding field, the new system expands the classification to include all commodities in the MOAC program and, in addition, includes technologies not specific to any commodity, and resources (see encoding system, page __ and Appendix III); (2) A new coding classification field is added which includes codes for all national policy goals and objectives (see preceding page); and (3) A field is added for the Thai fiscal year 1985 budgets.

We did not include the geographic coding classification in this exercise simply to save time. Information is available for coding activities on the basis of kingdomwide

relevance or relevance for particular regions or economic zones. Such classification would be useful and should be included in further development of this prototype. We made no changes in the coding classification for the activity functions used in the commodity-based prototype (see Appendix II).

The expanded data base permits quick answers to a variety of questions relevant to the allocation of funds within MOAC. How can this information be used to establish priorities for the allocation of funds and personnel for development activities? First priority will, in any case, be given to ongoing projects receiving donor grant or aid assistance for which there is a continuing commitment for counterpart funds. Beyond that, concern is normally with which projects or activities should be candidates for deletion or decreasing in funding. Thus, a system is needed to identify projects that (1) are redundant; (2) are not vital to a program; or (3) are not relevant to, or inconsistent with, high priority objectives (e.g., a project that increases production efficiency but that is very capital intensive or strongly biased in favor of larger, wealthy farmers).

It may not be possible to develop completely objective criteria for setting priorities among projects, but with reliable data on each project in the program-budgeting data base, the Mapper program can retrieve and summarize information for analysis for more rational recommendations on budget allocation.

Recommendations

This exercise has, so far, involved only the DOA, and only those projects classified in the research category (though some of these include other functional activities). While this illustrates how the system can be constructed and used to answer questions relative to funding allocation, its value will be greatly enhanced as it is extended to include other departments in MOAC. Then, programs having components in two or more departments can be analyzed more meaningfully to identify duplication, opportunities for consolidation, and needs for coordination.

In the meantime, several things need to be done to make the system work effectively:

1. Continue development and refinement of the prototype. Specifically: (a) Revise the coding system for the commodities, resources, and technologies not specific to a commodity. It is apparent that the two-digit code is not adequate to accommodate all commodities, resources, and

technologies, unless some are treated as groups. The coding system we used had only nine numbers for fruits, which is inadequate if each species is to be accommodated separately; (b) Review the functional coding system to see if it needs to be revised and expanded. It was quite suitable for DAD projects but may need revision to accommodate other departments; (c) Review and revise the policy objective classification system. While the six broad classes seem to encompass all national policy goals, it would be useful to include narrower, more specific, objectives under each of the six broad categories. For example, under category 30, "Improved Efficiency of Production," separate sub-objectives might be (i) increasing yield per rai; and (ii) reducing capital requirements per unit of production. One of these may be more consistent with national policy than the other.

2. Update the information available to OAE on each project and include (a) project title and code; (b) name and title of responsible manager; (c) description and of activities and their location; (d) goals and objectives of the project, with annual output targets for each activity; (e) funding, including sources of funding and amounts; and (f) starting and ending dates. This information should be entered on the computer and updated regularly. Responsible staff should be able to contact responsible managers directly for clarification and/or elaboration.

3. Determine how responsibilities for construction and maintenance of the program-budgeting data base, on the one hand, and its utilization for budget allocation, on the other hand, should be shared or divided by the PID and the DPADP. The PID is responsible for the Computer Services Center (CSC) and for compiling most of the information for the program-budgeting data base. The DPADP should have major responsibility for specifying what information should be recorded, summarized, and retrieved from time to time, and for using the data for analysis necessary for rational budget allocations.

CHAPTER 6. AGRICULTURAL STATISTICS

The primary objective of the agricultural statistics component of the Agricultural Planning Project (APP) was to help the Office of Agricultural Economics (OAE) improve the quality and timeliness of its official agricultural estimates for Thailand. Area sampling frame (ASF) construction and the implementation of ASF sample surveys were specified as major development areas that would help attain this objective and improve the overall OAE survey methodology.

A World Bank proposal was prepared by the OAE in early 1983. An important part of this proposal defined the need to construct an ASF for the whole kingdom within a two-year period. Even though the World Bank proposal was not approved, and the OAE approved and adopted the plan of accelerating ASF construction, sampling, and survey research, and made these ASF activities the primary assignment area for the agricultural statistics consultant, Mr. Dan C. Tucker. Mr. Tucker served two short-term consultancies, one week each in January and February 1983, to assist the OAE and the APP staff in developing long-term plans for statistics as part of the World Bank proposal. Then Mr. Tucker arrived in Thailand on May 1, 1983, to start a two-year assignment working in the Center for Agricultural Statistics (CAS), the statistical unit of the OAE. His counterparts were Mr. Rusmee Kasemsap, acting director of the CAS, Mr. Thawach Leelauswanich, Dr. Apichart Pongsrihadulchai, Dr. Wisut Wangworawut, and several other staff in the CAS.

The ASF is a basic technique for collecting agricultural statistics for a quick and comprehensive agricultural information system. It will be used in Thailand to estimate paddy, upland crops, and other types of agricultural products. It will also be used to estimate economic information such as prices, labor, and farm production expenditures. This methodology provides accurate information by taking representative samples from a small part of the total land area. Estimates can be available five to six weeks after the beginning of data collection. These estimates are based on an objective statistical method of data collection and summarization.

The construction of the ASF is carried out in several steps. The first step is the identification and delineation of homogeneous land use areas using all types of available data and maps such as satellite imagery, aerial photography, topographic and/or land use maps. Areas of the same land use type form a stratum. Once these strata have been formed, they need boundaries that are identifiable on the ground, such as roads, footpaths, railways, and rivers. These boundaries are then marked on the map for each stratum, and

the areas within each stratum are identified in a unique way. The next step is to divide these homogeneous strata into sample units. This is done in three steps: primary sampling units (PSUs) are delineated and a small sample of PSUs are selected to be further subdivided into secondary sample units (SSUs) and sampling units (SUs). Again, good boundaries must be obtained on the map at each level.

One sample unit is chosen from each selected SSU from each selected PSU, and the chosen SU is called a segment. The segments vary in size depending on stratum, land use, and population density. The general rule is that the chosen SU or segment should be small enough to be enumerated in one day. In the agricultural area of Thailand, the target size for a segment is 200 rai.

The construction of the ASF ends with the selection of segments that represent the total area. These segments must have clearly recognizable boundaries so the field enumerator will have no problem in deciding which area is inside and outside the segment.

The desired data are then collected from these segments, either by interviewing the farmers, measuring crop acreages, or making crop cuttings. Sing the segments within each stratum are statistically representative of the stratum, the information collected from these segments can be expanded to the total area of the stratum, and stratum totals combined for country totals. Production figures for Thailand will be obtained by summing the results for the strata of each province, the provinces of each zone, the zones of each region, and the regions of the country to produce reliable and the regions of the country to produce reliable and timely agricultural statistics at national, regional, zonal, and provincial levels.

Thailand needs accurate, timely, and objective information on its agricultural production for proper management of its food reserves, imports and exports, and many other planning activities. At present, Thailand uses a village list for sampling, but this methodology does not assure that the universe is completely covered.

The village-list methodology uses a list of villages as a sampling frame, and a sample of villages is selected. Interviewers go to the selected villages, list the farm holders, and select a subsample of farmers for enumeration. This methodology has served the OAE well, but does not take advantage of advanced techniques that are currently available in Thailand, such as satellite remote sensing, area frame, and multiple frame technology.

ASF construction in Thailand is being developed in two phases. Phase I, which was completed in 1985, constructed and sampled three agricultural strata: paddy, upland, and recently deforested land. Phase II will construct and sample strata representing the rest of the country and other nonagricultural areas.

Although ASF was to be used for a number of purposes, the first and most important use was to estimate planted area of rice (other field crops are also being surveyed). Future uses to estimate livestock and poultry will require a sampling of all strata, but to expedite crop estimation, only two strata were constructed. Stratum 10 was sampled for the paddy-land, and stratum 20 (upland) for crops like cassava and corn, in addition to upland rice. However, during field visits to study different strata, the staff discovered the need to add a third stratum to phase I to account for extensive areas of recently deforested land now planted in rice and field crops. Stratum 23 was constructed using recent Landsat imagery to represent these changing use areas.

In June 1983, the CAS hired 15 temporary personnel for the task of ASF construction. The ASF for the total country was to be completed in a two-year period. These temporary personnel were to supplement and support the 12 permanent staff at the CAS. In general, the temporary personnel were young, intelligent, high school and vocational school graduates who were willing to learn and work. The permanent staff included two persons with M.S. degrees, four with B.S. degrees and six with some college training, but no degrees.

Available space for ASF construction consisted of two rooms: a main room, where most of the work was done (10 by 20 meters), and a smaller room where the reflection projector work was done, and where meetings were held (4 by 10 meters). The main room included 16 map and photo cabinets, as well as work space.

Two or more sets of topographic maps (about 4000 maps altogether) at scales of 1:250,000, 1:50,000, and Landsat black and white images were required for stratifying the entire country. These topographic maps were also used to subdivide the strata into primary sampling units (PSUs) and secondary sampling units (SSUs).

Aerial photographs were ordered for selected SSUs to further subdivide the SSUs into sampling units (SUs). Often three or four 1:15,000 scale photos were needed to cover a SSU. A total of 5000 photos at 1:15,000 scale were needed to complete the ASF sample. Once the SSU was subdivided into SUs, a photograph at a scale of 1:5,000 was ordered for field work. The boundaries were marked on the photos and these became a part of the interviewing materials, as well as part

of the ASF frame. About 2500 photos at 1:5,000 scale were needed to complete the ASF sample.

A reflecting projector proved useful to transfer boundaries from one scale material to another scale material on both maps and aerial photographs. In addition, the distortion of aerial photos could be removed by tilting the frame to account for the pitch, yaw, and roll of the aircraft at the time the photo was taken. Two light tables and three regular tables were used almost daily. Five planimeters, magnifying glasses, dot grids, and photographic carrying cases were also used.

Stratification and sample selection were completed, one province at a time. For each province, homogeneous areas of land use form a stratum. The number of strata into which the total region of interest is subdivided depends on the variety and distribution of land use types, and the uses to be made of the ASF. Initially, Thailand expects to use ASF to make national rice estimates, and to research the making of estimates for other field crops at the national, regional, and zone levels. In addition, ASF data were to be used as ground observation for satellite digital-processing and remote-sensing research in general.

In Phase I, only three agricultural strata -- 10, 20, and 23 were delineated and sampled to ensure that ASF primary uses be on schedule. As other uses of ASF that require more refined stratification become established, increased numbers of strata will be defined and sampled during Phase I and Phase II strata as shown in Table 6.1. Stratum 10 will be subdivided during Phase II into strata 11 and 12. Stratum 20 will be divided into stratum 21 and 22, and stratum 30 will be divided into 31, 32, 41, 42, and 60. The division will be done by carefully separating homogeneous areas of land using remote-sensing methods and Landsat imagery. Cities, towns, and administrative and political boundaries are difficult to delineate on satellite imagery, but the latter two usually can be shown on maps.

Land areas smaller than two square kilometers are not separated as a different strata, even though they might not fit the stratum definitions where they are located. Water, village, and inner-city strata (60, 41, and 42 areas) are separated if they are 15 rai or larger.

The importance of good physical boundaries applies to any subdivision of the strata into primary sampling units, secondary sampling units and cannot be overemphasized. Poorly defined sampling frames and boundaries result in poor enumeration. The key to high-quality data collection is to have segment boundaries that can easily be located in the field by interviewers conducting the ASF survey, and by the supervisor carrying out quality control.

Table 6.1. Strata to be defined in sampled during Phase I and Phase II

Phase I	Phase II	Description
10	11	Paddy (75% - 100%)
	12	Paddy (25% - 74%)
20	21	Upland (50% - 100% cultivated)
	22	Upland (10% - 49% cultivated)
23	23	Transitional - recently encroached forest land mixed with forest
30	31	Forest, mountains, area of potential encroachment
	32	Forest, mountains, no agricultural potential
	41	Agri-urban villages
	42	Inner city
	51	Project area for special monitoring efforts
	60	Water

For Phase I, a sample size of approximately 2000 segments (averaging about 200 rai each for strata 10 and 20) was targeted to be able to produce good kingdom, region, and zone estimates. These 2000 segments were tentatively allocated proportional to area in the 73 provinces in Thailand based on 1981 land use distribution estimates by paddy and total field crops. This allowed the 2000 segments to be tentatively allocated by stratum and by province before the ASF was constructed. Because the variability in stratum 20 was expected to be much greater than in stratum 10, a weight of 2.0 was assigned to the stratum 20 area and a weight of 1.0 to the stratum 10 area.

When ASF stratification and measurements were completed by stratum and province, the stratum areas were used for the final allocation of the sample segments to provinces, and strata within provinces. Several guidelines were used to determine the final sample size by stratum and province:

1. No stratum would have less than 5 segments.

2. No province would have less than 5, or more than 50 segments (final allocation had 4 provinces with more than 50 segments because of rule 3 below).

3. The expansion factor, which is derived from $\frac{Nh}{nh}$ sample units, would not exceed 400 for stratum 20, or 500 for stratum 10.

The final sample allocation using the ASF stratification and these guidelines for stratum 10 (paddy) is 972, and for stratum 20 (upland) is 837. The combined sample of 1809 fell slightly below the target of 2000.

The next step in the construction of the area frame is to subdivide the strata into primary sampling units (PSUs), which vary in size depending on the stratum. PSUs were approximately ten square kilometers in stratum 10 and 20, and much larger in stratum 23. PSUs are numbered beginning in the northeast corner, and continue in serpentine fashion from east to west, and north to south, to guarantee that no PSU is left out. The PSUs are then measured, and the area is recorded in square kilometers. After the PSUs are delineated, numbered, and measured on the topographic map, a sample of PSUs is selected.

The probability that a given PSU will be selected in the ASF sampling is proportional to the number of sampling units assigned to it. The specific procedure is described in Cochran (PPS sample selection). The number of PSUs to be selected for a province depends on the sample allocation to each stratum. A PSU may be selected more than once, but a specific SU can only be selected once.

The ASF staff verified segment boundaries in the field before any segments were used in a survey. This step was necessary because boundaries established on maps were often difficult to find, or even nonexistent in the field if the land use had changed. The work provided excellent training for zone officers who needed to become familiar with ASF procedures.

The CAS is the division of the OAE that is responsible for ASF. CAS also has responsibility for survey methodology and questionnaire design for all OAE surveys. The October 1884 ASF survey had three survey forms: Form A, Form B, and Form C.

ASF-Form A lists the names of all tract operators and obtains total land area in each farm and the area of each farm or part of a farm inside the segment. The ratio of land in the segment to total land provides the formula for weighted segment estimation.

ASF-Form B accounts for the area of all land in the segment by tract, crop, and land use. Although major rice area estimates were the primary purpose for the Phase I

survey, ASF produced valuable information for many other crops. The list frame survey, that was conducted concurrently with the ASF survey, collected data only on rice.

ASF-Form C is the exact form used in the list frame survey. It had five sections on rice: Section 1, Major Rice Area and Production of Previous Year; Section 2, Major and Section 3, Major and Second Crop Rice Stocks as of July 31, 1984; Second Crop Rice Sales from January to July 1984; Section 4, Glutinous and Non-Glutinous Rice Consumption; and Section 5, Major Rice Cultural Practices.

For many years, the CAS had a field operations branch, centrally located, with primary responsibility for collecting all data for CAS surveys and other OAE surveys. In February 1984, the data collection responsibility was decentralized. At that time, CAS field operations staff, as well as other OAE staff, were reassigned to 23 zone offices. Zone offices now collect data for most OAE surveys. ASF staff train the zone staff in ASF surveys, help supervise field enumeration, and do some quality checking to see that ASF instructions are followed. An Enumerator Training Manual is prepared for use in each ASF survey. Each enumerator has a copy of the manual to assist in good data collection.

Zone offices send completed survey forms to the CAS, where the editing staff enters tract and segment ID and does some manual editing of data to check for completeness and consistency. The forms are then keyed for computer editing, data expansion, summarization, and sampling error calculation. Sampling in stratum 10 is completed independently from sampling in stratum 20. Samples for five systematic replications are drawn in each stratum.

The OAE conducts a major rice survey each fall in all 73 provinces. In 1984, ASF survey methodology was used instead of list frame in 12 provinces, and was used in addition to list frame methodology in three provinces. Tables 6.2 and 6.3 present the rice area estimates and associated coefficient of variation (CV) percentages from the October 1984 ASF survey for the 15 provinces in the survey, and compare ASF and list frame sample data precision, as measured by the CV, for 15 provinces in the major rice survey. Data precision for ASF was better than the list frame in 14 of the 15 provinces.

The initial investment to construct the frame for ASF survey methodology will continue to provide accurate statistics at lower cost than other methods. Also, with ASF methodology, better procedures exist to control nonsampling errors in data collection and editing.

The ASF sampling units will be rotated regularly to avoid respondent fatigue, and also to avoid introducing bias

Table 6.2. ASF Survey results: Rice area planted, October 1984 (strata 10 and 20)

Province	Rice area planted	CV percent
1. Lopburi	1,060,887	9.5
2. Saraburi	697,034	9.3
3. Chainat	823,737	9.4
4. Nakhon Pathom	568,370	8.4
5. Nonthaburi	166,267	29.4
6. Supan Buri	993,521	11.8
7. Bangkok Metropolis	245,004	26.7
8. Nakhon Nayok	353,284	34.3
9. Pathumthani	318,908	19.4
10. Ayutthaya	928,694	8.8
11. Sing Buri	325,786	8.4
12. Ang Thong	391,797	6.5
13. Chachoengsao	954,007	13.1
14. Chanthaburi	147,358	24.9
15. Trat	80,004	26.4

Table 6.3. Major rice survey: Comparison of area frame and list frame sample size and CV percentage

	Area frame (1984)		List frame (1983)[1]	
	Number of segments	CV%	Number of villages	CV%
1. Lopburi	54	9.5	20	16.7
2. Saraburi	31	9.3	23	18.3
3. Chainat	20	9.4	18	13.4
4. Nakhon Pathom	25	8.4	13	38.4
5. Nonthaburi	5	29.4	10	54.0
6. Supan Buri	39	11.8	15	24.6
7. Bangkok Metropolis	11	26.7	11	29.1
8. Nakhon Nayok	9	34.3	16	17.7
9. Pathumthani	34	19.4	13	22.0
10. Ayutthaya	20	8.8	22	16.2
11. Sing Buri	5	8.4	16	13.7
12. Ang Thong	24	6.5	16	20.1
13. Chachoengsao	16	13.1	16	16.3
14. Chanthaburi	30	24.9	13	35.9
15. Trat	15	26.4	10	56.6

[1]Chanchoengsao, Chanthaburi, and Trat list frame data are for 1984.

from farmer respondents who may become conditioned by many survey visits. Thailand intends to rotate 20 percent of the sample each year, which is one of the five sample replications. For example, replicate 1 is scheduled to be replaced in all provinces in 1988, 1993, and 1998; replicate 2 in 1989, 1994, and 1999; replicate 3 in 1990, 1995, and 2000; replicate 4 in 1991, 1996, and 2001; and replicate 5 in 1992, 1997, and 2002.

In addition to rotating ASF sampling units on a specific schedule, the area frame should also be reconstructed at scheduled time intervals to update the changing land use in the kingdom. Also, as new major Landsat data and other frame materials become available that improve the definition and quality of land use stratification, ASF sampling efficiency can be improved. Thailand expects to reconstruct the ASF, working one region at a time. A new frame is scheduled to be constructed at 16-year intervals for the Central Plains Region, starting in 1990; for all provinces in the Northeast Region, starting in 1994; for the Northern Region, starting 1998; and for the Southern Region, starting in 2002. Thailand's carefully planned schedule of rotating sampling units and reconstructing the ASF will keep this advanced methodology productive and viable indefinitely.

Tied to the ASF segments, many other surveys, such as objective yield surveys, remote sensing digital processing of satellite data for geographic areas, and multiple frame surveys in which lists for special items can be assembled for "extreme" or large operators, or in which separate estimates can be made for the farms on the list, and farms not on the list (using ASF), and combined later.

An important philosophy or estimating policy associated with ASF survey methodology is being implemented by the OAE. ASF surveys produce their best estimates, as determined by sampling error calculation, at national level, then at the region, zone, and province levels, in that order. As a result, the OAE intends to set the official estimates from the ASF survey in this sequence: National, region, zone, and province. List frame surveys, especially those being conducted jointly between the OAE and the Department of Agricultural Extension (DOAE) will assist the OAE in setting estimates, mostly at provincial and lower levels.

As scheduled, Phase I of the ASF has been constructed for all 73 provinces in Thailand. An ASF sample has been selected for all provinces, and three ASF surveys have been conducted in the Central Plains Region, including five provinces in October 1983, 15 provinces in October 1984, and 15 provinces in January 1985. An ASF survey is to be conducted in September 1985, including 34 provinces with 840 sampling units in all regions and agroeconomic zones in

Thailand. This will be the first ASF survey conducted by the zone offices in the Northeast, North, and South during the APP.

Even though OAE zone office staff are well acquainted with collecting data for list frame surveys, ASF surveys will be a major challenge, and much more complicated and difficult for them the first year they are implemented, and perhaps even for another year or so after that. ASF surveys are technically more exacting. Many new techniques and concepts must be learned and implemented correctly; many new materials and special equipment (such as topographic maps, aerial photos, and compasses) must be learned so data collectors are oriented correctly to using these tools in many kinds of land use areas in Thailand. The ASF survey will barely have been introduced to OAE staff in most of Thailand at the time the APP ends. Therefore, an ASF survey specialist should be assigned to return to Thailand and assist OAE on a short-term consultancy during the major fall surveys in 1986 and in 1987. The ASF consultant would be responsible for assisting OAE staff to solve any problems that have surfaced, reinforcing ASF concepts, and broadening the use of ASF methodology into many other useful information needs, such as objective yield survey, remote sensing ground truth, livestock and poultry surveys which must include village stratum sampling and multiple frame surveys, which combine area frame and list frame sample surveys and utilize the strength of each in a practical methodology.

This ASF short-term consultancy should be approved. It will reinforce the ASF methodology and help to establish it firmly in the OAE estimating program, which will improve the quality of official agricultural members for Thailand.

Mr. Tucker's terms of reference broadened substantially in early June 1984 when he was appointed APP Chief-of-Party, replacing Dr. Ed Faris. Also, the APP evaluation team report in July 1984 gave the project additional guidance in ways to make it reach its best performance, and to be more effective in meeting APP objectives during the final year of the contract. Ten short-term consultants served on the project from June 1984 until October 1985. Mr. Tucker spent a large amount of time performing administrative tasks and meeting arrangements associated with helping these short-term consultants adapt to the environment quickly and be as productive as possible. Their individual accomplishments were extremely valuable to the OAE and the APP, and are described in more detail throughout the report.

Chief-of-Party duties required Mr. Tucker to prepare proposals and justifications for many commodity items and OAE training needs that were consistent with enhancing the APP objectives. He also presented these proposals, and had many

official communications and meetings with Iowa State University (ISU), the OAE, the U.S. Agency for International Development (USAID), and Department of Technical and Economic Cooperation (DTEC) staff, and also with many other agencies and companies to work out the specifications and details of procurement, and to stimulate action to get the proposals completely implemented before October 31, 1985, the end of the APP.

Mr. Tucker designed an ASF sampling procedure to select a probability sample of rice fields for objective yield crop cutting procedures. He worked with Dr. Wisut and his crop objective yield staff in implementing these procedures. Mr. Tucker edited OAE Publication 202, "Agricultural Statistics of Thailand," in order to improve the English tabular and narrative presentation.

Two short-term consultants were used on the App for agricultural statistics and related activities. Mr. William Wigton served two tours to assist the CAS remote-sensing staff design forms, implement ground truth procedures, and process some Landsat data using the new RIPS system. Mr. Bruce Graham also served two tours as an agricultural statistics data analyst, working with the CAS for six weeks in January and February 1984 and for another six weeks in February and March 1985.

During Mr. Graham's first tour, considerable time was spent in reviewing specific series of CAS estimates, and a number of practical analytical techniques were demonstrated using CAS data for case studies. Mr. Graham presented four formal lectures with emphasis on general principles of data review, such as identifying unusually large changes from year to year, discovering internal inconsistencies in sets of data, and using all available independent check data and commodity expertise to find possible solutions. Use of time-series charts was illustrated for several commodities, as was the practice of maintaining survey results at the higher levels of aggregation, while making adjustments to data at the lower levels of aggregation to smooth out unreasonably large changes.

Mr. Graham was impressed by the high level of technical competence of the CAS staff, particularly of those in leadership positions. The knowledge and skills needed for designing surveys, selecting samples, and collecting and processing survey data are available and being used well. The annual Agricultural Statistics Yearbook is an extremely useful publication which provides a large volume of information on many subjects. The inclusion of data at the province level for major commodities is commendable; many developing countries publish only national estimates or, at most, regional data. Both the headquarters and field staff have

been observed working diligently at their assigned tasks. The basic framework for an excellent system of agricultural statistics is in place, and the system is working.

Some problem areas within the agricultural statistics system need to be improved. Most important is the lack of credibility of the statistics. For many items, such as corn, estimates are made and circulated by several organizations other than the CAS, and there is confusion on the part of data users as to which figures are correct. There is also a problem with delays in publishing the results of the CAS surveys, which causes potential data users to search for other sources of information instead of waiting for the official CAS reports. The CAS staff is well trained in mathematics and textbook statistics, but most are not experts in their familiarity with farm crops and livestock. CAS statisticians also need more training and experience in the review and critical analysis of survey data. A combination of sampling and nonsampling errors sometimes produces estimates that do not meet the test of credibility, even though the survey was well designed. Good knowledge of farm commodities is useful in detecting such cases and devising sensible adjustments. Based on his consultancy, Mr. Graham made the following recommendations for improving performance of CAS procedures and quality of estimated statistics.

1. The most important need is to increase reliability, and thus the credibility of the end-of-season estimates. Adoption of the Area Sampling Frame (ASF) now under construction will be a definite improvement over the list sampling frame in estimating land use and major crop areas. The chief weakness of the list frame is its incompleteness. Additional expansion of the objective yield crop cutting work by the CAS will be a major improvement over the older subjective method of depending upon farmer opinion for estimating crop yields. The current sample of farms needs to be supplemented by a list of large commercial producers of poultry and hogs. Achievement of all of these improvements is well within the capability of the CAS.

2. A second need for increasing the credibility of CAS statistics is a systematic review of the historic data, and revision of the data which do not meet the test of reasonableness. For example, in the latest yearbook, the data on numbers of horses are very poor. The data on numbers of buffalo appear to be reasonable at the kingdom level, but several zones and provinces show year-to-year changes too large to be considered believable by an informed data user. The long-term series of coconut estimates needs revision for the years before the CAS started making annual sample surveys. It would be desirable to make the needed historic revisions before the long-term statistics are placed in the computerized data bank.

3. Many of the survey questionnaires used by the CAS are too long and complex. They need to be shortened and simplified. Experience has shown that long questionnaires are difficult for the data collector and the farmer-respondent, and they are also costly and time-consuming to edit and process. A short questionnaire, containing only the essential items of information, will provide better quality data and permit faster processing of the survey results. The CAS technical leaders recognize the need to simplify questionnaires, but they will need administrative support in their efforts to achieve this goal.

4. The need to shorten the time between survey dates and publication dates is also recognized within the CAS. Lack of timeliness seriously reduces the value of current statistics for planning and decision making. It would be useful for the CAS to publish a schedule of release dates for several major reports, as is done by the U.S. Department of Agriculture (USDA) and then to schedule the necessary activities to meet the announced release dates. Such a step would be favorably received by data users, and would enhance the reputation of CAS as the source of official information.

5. The improvement of early season crop forecasts should be a longer range goal. It is, however, necessary to achieve reliability in the end-of-season estimates before spending much effort on forecasting. It would be useful for the CAS to expand its program of making objective yield observations on immature crops in order to accumulate data on patterns of plant growth that will later be needed for constructing mathematical models to convert the early season counts into predictors of final season fruit counts and weights.

Mr. Graham made a six-day trip with eight CAS staff members to several changwats in the Central Plains and Northern regions of the kingdom. The primary purpose of the trip was to discuss methodology and procedures for objective yield forecasting and crop cutting of specified crops, based on observation of growing conditions and harvesting methods. Secondary purposes were to visit several CAS field officers for consultation and delivery of supplies and instructions, and to observe the general condition of Thai agriculture in both the lowlands and the uplands during the dry season. Mr. Graham pointed out that there are two general considerations that must not be overlooked when undertaking objective yield forecasting and crop cutting estimation procedures.

First, objective yield technology is expensive in terms of time, travel, and equipment required. The technology will give excellent results, but only if each operation is performed with care and close attention to detail. Objective yield forecasting based on observation of immature plants is

considerably more complex than crop cutting mature plots. Several years of historical data are needed for constructing objective yield forecasting models, and counting of immature plants and fruits is difficult to do. On the other hand, crop cutting plots that are mature is relatively easy and gives useful information immediately, with no dependence on prior year's data. Crop cutting is the primary method for making an authoritative assessment of yield at the end of the season, and thus of enhancing the credibility of SAS statistics. Thus, it would seem that CAS would be prudent to put major emphasis on crop cutting at this time, and to experiment with objective yield forecasting on a very limited scale. It is easy to expand the forcasting later, after the crop cutting techniques have been perfected and several years of observations on immature plants have been accumulated.

Second, it is necessary that staff members who design the objective yield survey forms and procedures be thoroughly familiar with the commodities being measured. It is particularly important for staff members who have not had practical experience of living and working on a farm (this category includes a majority of CAS personnel) to read, study, discuss, ask questions of experts, and to make first hand observations of all the operations of growing, harvesting, and processing the commodities for which they have responsibility.

The CAS is now doing some objective yield forecasting, as well as crop cutting for corn. It is recommended that the forecasting work be expanded to include preharvest observations and forecasts two months and three months before harvest, in addition to the current program of forecasting about one month before harvest. The procedures used by the USDA Statistical Reporting Service (SRS) for forecasting corn yields have been thoroughly worked out and used with good results for many years. Mr. Graham recommended that the CAS expand the objective yield forecasting on corn, but proceed slowly on the other crops. Corn is the easiest crop on which to do objective yield forecasting, as the counts and measurements are easier than on soybeans, groundnuts, and longan, for example.

Mr. Graham concentrated on the CAS weekly report on crop condition, marketing, and farm-gate prices during his second tour in the CAS, working closely on a day-to-day basis with Mr. Prakobkit and Dr. Apichart in reviewing this reporting system and developing recommendations for improvements. The reports, as currently issued, are well organized and contain much useful information. The CAS has succeeded in establishing an excellent record of regular, on-time performance by the field office personnel, editors, writers, data processing, and report reproduction units in Bangkok, and the completed report is delivered early on Monday morning without fail. A sense of urgency and attention to timeliness are

essential features of a good system of current statistics; it is necessary for the CAS and the OAE to develop a similar time discipline in preparation of other major statistical series. The following changes were suggested for the weekly reports:

1. Collect price data using the midweek day of Monday as a reference date for the Friday to Thursday week.

2. Show price changes in relative terms as percentages rather than in absolute terms of Baht and Stange.

3. Develop a method for adjusting report region prices which are clearly inconsistent.

4. Develop methods to reduce inconsistent price changes caused by "no sale reported" and change in product price.

5. Shorten the narrative on pages 1 to 3 to one page only, emphasizing padding prices and other significant changes.

6. Improve readability and appearance of tables and time series charts on commodity prices.

7. Consider modifications to related reports, including:

   a. Discontinue publication of quarterly summary, or convert to annual summary if essential;

   b. Shorten weekly research report for most weeks, but expand when world situation news is available.

Mr. Graham also reviewed the organization and operation of the working groups for improvement of agricultural statistics. He had several discussions with Dr. Apichart on general problems of setting up a review group to analyze and review Thailand agricultural data and produce reliable estimates. Procedures used by the USDA's Crop Reporting Board were reviewed in detail, and possible adaptations to Thai conditions were discussed. Dr. Apichart has been given a number of publications from the USDA's SRS. He has had some experience working with the U.S. system, and a five-week training period in the United States during the summer of 1985 was tailored specifically to fill any gaps in this understanding of the operations of the USDA Crop Reporting Board. Several general principles were noted as essential features of a system of current agricultural statistics:

1. Establishment of a Schedule of Releases. The basis for the system is the need for accurate and timely information by decision makers -- those who formulate government policies and also farmers and traders who sell and buy farm commodities. It is essential to set up a schedule of reports than meets these needs. Otherwise, the data user will search for other sources of information because they cannot depend upon the official reports being available when needed.

In order to meet release dates, the procedure is to calculate the time needed for each step in the process of preparing the estimates -- including data review by the board at the central office, data processing, transmission of data from field to central office, field review, compilation of reported data, data collection, training, printing of questionnaires and manuals, writing of survey materials, design of sample and survey. A timetable of operations is prepared with time allotted for each step in the process. One person is designated as coordinator, with responsibility to see that deadlines are met, and with authority to take corrective action if needed.

It is suggested that CAS follow a procedure similar to this, starting in 1985 for a few major reports. This year would serve as a trial period to discover where bottlenecks may occur, and to adjust time allowances realistically. Once the system has proven that it is workable, the OAE/CAS should publish a calendar listing a few major reports and intended dates of publication. Once the calendar is released to data users, the burden is on the statistical agency to deliver the report on the announced date. The process demands the same kind of discipline which the OAE/CAS has already demonstrated in preparing the weekly report of farm gate prices.

2. Membership of Review Board. It is recommended that the review board have a permanent chairman and secretary, both with strong technical skills in statistics and knowledge of agricultural commodities. Mr. Graham agrees with Dr. Apichart's proposal that current Thai board is too large for a technical review process, and that the maximum size of the board for any given commodity group should not exceed 12 persons. The USDA Crop Reporting Board operates with a permanent chairman and secretary, plus a rotating group of eight members.

3. Board Operations. It is essential that board meetings be scheduled well in advance of the meeting date. Members serving on the board must give preemptive priority to this task and be isolated from interruptions and other duties. The board in the USDA is locked up in isolation during the review process and preparation of the report for public release. Each board member should be required to make an independent appraisal of all the survey data and other

information available, including the opinions of the field officers where the data originates. The chairman then conducts a review and leads discussion of the findings of each member. Differences are reconciled by consensus or by the chairman's decision, if consensus is lacking.

In reviewing survey data from probability surveys for which estimates will be made at differing levels of aggregation (such as kingdom, region, and province), the proper procedure is to work "from the top down." The kingdom estimate is established first, because the level of aggregation is highest here and the coefficient of variation is lowest. The totals for the regions are then set, with the conditions that the regions must add up to the previously established kingdom total. This "top down" procedure is repeated until estimates are established for the lowest level of aggregation needed. The USDA's Crop Reporting Board establishes national and regional totals, then delegates to commodity specialists the task of making state totals conform to regional estimates.

It is recognized that the recommended "top down" process of review and adjustment is difficult for nonstatisticians to appreciate and understand. Most persons trained in other disciplines prefer the notion of perfecting a small, manageable unit, then adding up a larger number of smaller units to obtain any level of aggregation desired. An educational effort will be required to convince members of the review board in Thailand to accept the principle that the "top down" method is best.

4. Estimates and Forecasts. As the OAE/CAS begins to formalize its survey review procedures, it is important to make distinctions between end-of-season estimates and preharvest forecasts. For forecasts, there is always a considerable element of uncertainty, and the task is to make the best possible appraisal of events that have already occurred. To do this by use of sample surveys, of course, involves both sampling and nonsampling errors. Some of the most effective and practical means for minimizing these errors were discussed with Dr. Apichart and his staff.

Mr. Graham held two informal training sessions for CAS staff and other interested persons from MOAC. The first session was devoted to a review of CAS historic data on buffalo inventory. It included discussions of how to determine standards of reasonableness, how to detect internal inconsistencies in a data series, use of age and sex distributions in assessing livestock statistics, and finally the statistically sound method for revising historic data, working from "the top down." The second session was used in reviewing the 1985 series of weekly reports on Farm Gate Prices of Paddy. Again, some standards of reasonableness

were set, based upon knowledge about the commodity under study. A procedure for identifying unreasonable reported data, and adjusting it, was demonstrated, discussed, and is now being used by the CAS.

Mr. Wigton, Mr. Tucker, CAS statisticians Thawach Leelasuwanich, and Dr. Apichart Pongsrihadulchai prepared a publication entitled "A Guide to Area Sampling Frame Construction Utilizing Satellite Imagery in Thailand." This publication provided the essential ASF concepts and decisions concerning the optimum ASF sample allocation and size to accommodate OAE needs, while also considering the agency budget and staff constraints.

Mr. Wigton worked with the ASF staff in Uthai Thani Province, researching some new sampling and data collection procedures with a primary purpose of developing an improved ASF methodology for upland crop area estimates. The research reinforced the idea that the closed segment procedures should be used for crop area estimation, and for ground truth to be used in remote sensing.

Mr. Wigton also prepared a plan to use Landsat data to estimate paddy, upland crops, and forest encroachment. In this plan, he learned that Thailand has recently spent 8.7 million dollars to obtain a Landsat receiving station, and 1.6 million dollars annually to maintain and operate the receiving station. The only justification for this vast expenditure is if satellites can improve Thailand's ability to manage its resources. Agriculture and forestry are the two resources that are dynamic enough to justify the repetitive nature of Landsat. For mineral exploration, one or two images every five years is sufficient because there is little change. Agriculture is dynamic and changes every month. Likewise, forecast encroachment or deforestation changes occur monthly. The satellite data collected at the Thailand receiving station are Multi-Spectral Scanner (MSS) data and Thematic Mapper (TM) data.

Crop identification and area estimation using Landsat technology are extremely challenging, but good progress has been made. Each day the same crop has a different spectral signature because of filtering by the atmospheres. Also, green vegetation reflects energy with very little variation between crops. Without extensive systematic ground observation, it is hopeless to use satellites to estimate crops. However, the ASF data to be collected on the ground provide the necessary objective ground truth observations to support satellite digital processing.

Area land parcels are selected in each province that represent the agriculture in that province. Interviewers to go to the representative parcels and identify each field, as to

crop type and land use, and collect other pertinent data. This ground truth data must be located in the Landsat image. The signatures are taken from the Landsat image and stored in the computer to be used by the computer to locate all fields that have similar signatures to the identified crops in the representative land parcels.

Since most crops have similar signatures, there is an unknown amount of misclassification. A classified Landsat image in its state of containing an unknown amount of misclassification is worthless since the misclassification rate is usually 30 to 40 percent. However, representative ground truth can allow the analysis to unscramble the misclassification results because the fields are observed where ground truth is available and analyzed to determine how the computer misclassified in these fields. Since these field areas were selected to represent the entire province, the data for the entire province can be corrected for misclassification.

A model is developed between the ground truth and computer-classified Landsat data. Once the relationship is established with the ground truth sample, which accounts for about 0.5 percent of the total land area, it can be used to estimate areas of individual crops for the remaining 99.5 percent of the land area where no ground data are available. Thus, Landsat technology can improve ASF crop area estimates at provincial, regional, and national levels when implemented carefully.

CHAPTER 7. COMPUTER SYSTEMS

The Agricultural Planning Project (APP) proposal included one long-term computer science consultant position. The duties of this consultant were to upgrade the system and programming skills of the Office of Agricultural Economics (OAE) Computer Center Services (CSC) staff through formal and on-the-job training. The consultant was also to assist in developing efficient production control and computer center management. Unfortunately, the computer science position was deleted from the APP long-term consultant positions when the U.S. Agency for International Development (USAID) made a budget reduction during the first few weeks of the project. Eventually, this very important component of the APP was serviced by five short-term consultants, who are listed below. Their contributions and recommendations are discussed in more detail throughout the chapter.

Consultant	Periods Served
Mr. Dale Lefor	June-July 1983 March-May 1984
Dr. Ken Nicol	November-December 1983 April-May 1984
Dr. Arthur St. George	March 1985
Dr. Fred Baker	August 1985
Dr. Larry Kinyon	September 1985

The APP also made a major contribution to the CSC by advising the OAE on computer-processing hardware configurations, by procuring many basic computer hardware components, and by arranging and contracting the necessary training to support the APP recommendations. Some of the significant APP computer support actions were:

1. Rental of four Sperry terminals, starting in early 1984, to initiate interactive training and processing using Mapper software with the UNIVAC 1100/60 mainframe computer.

2. Procurement in July 1985 of five 256K Sperry microcomputers with 10MB disk drives and Epson letter-quality wide-carriage printers;

3. Procurement in August 1985 of one 64K Spectral Data RIPS Landsat microcomputer data processing system with EROS and RIPS software, including training in hardware and software systems by Spectral Data staff.

4. Rental in September 1985 of The Scientific Package of Social Scientist, Extended Version (SPSS-X) soft ware system for the UNIVAC mainframe computer.

5. Purchase in September 1985 of the SPSS package system for MS-DOS microcomputer systems.

6. Procurement of SPSS-X training by a Chulalonghorn University computer science professor.

7. Procurement of training for microcomputer systems, including programming in MS-DOS DBASE III, Lotus 1-2-3, Thaistar, and Thaibasic.

8. Procurement in August 1985 of the Survey Data Processing System (SUDS), an agricultural survey, edit, summary, analysis processing system developed by the U.S. Department of Agriculture (USDA) for use on microcomputers by developing countries, and including training by a USDA consultant using demonstration data from several OAE surveys representing different statistical designs.

9. Consultant development of special systems/ programming software to upgrade old software systems and to satisfy special needs, such as cost-of-production survey processing.

These nine APP computer support activities are only part of the total computer science contribution made during the project term. These actions have institutionalized the OAE staff with significantly updated and improved computer technology, and have provided the necessary tools and training to increase CSC staff productivity. As a result, the OAE is much better prepared to satisfy the CSC mission to serve not only the OAE but the growing computer-related needs of other departments in MOAC. The computer science component made a strong gain near the end of the project, and in the long-term it could easily be the most meaningful and lasting contribution made to the OAE and the Ministry of Agriculture and Cooperatives (MOAC) by the APP.

Mr. Dale Lefor, a consultant from Sperry-Univac, USA, served two tours, in June and July of 1983 and from March through May of 1984. The primary objective of this consultancy was to access the current hardware capability of the CSC, assist with system programming and modification, and

make recommendations for future development of the center. Mr. Lefor made numerous recommendations, in collaboration with the Sperry-Univac office in Bangkok, but many of the recommendations were not consistent with the recommendations of other consultants on the project. Mr. Lefor tended to function as a representative of Sperry-Univac, rather than as an independent specialist under contract to the OAE and Iowa State University (ISU). While the consultant apparently was qualified for his assignment, either the company or the individual did not clearly understand that Mr. Lefor had been hired as a private consultant, and the confusion led to a lower performance level than was expected.

Dr. Ken Nicol served two consultancies in November and December of 1983 and April and May of 1984. His primary assignment was to work with the Division of Agricultural Economics Research (DAER) staff to design a system and program to process cost-of-production survey data for crops, and another system for livestock. Even though he worked mostly with DAER commodity and price economists, his products were systems and programs to be run on the OAE mainframe computer, and therefore, he assisted the CSC staff to increase productivity by assisting in the development of some urgently needed specialized programs.

Dr. Arthur St. George served a one-month assignment during March 1985. He reviewed and evaluated CSC operations including staffing, training needs, hardware, and systems programming development, and he made several constructive recommendations. The OAE and USAID responded positively to many of Dr. St. George's recommendations and used them to actively guide procurement of equipment and training during the last half-year of the APP. Dr. St. George's terms of reference had six specific duties, but two of these had highest priority:

1. Prepare recommendations for short- and long-term development of administrative and managerial procedures, operating system, application programs, data processing procedures, and staff training for the CSC and on-line network and data communication; and

2. Develop guidelines for managerial structure to facilitate continued growth of data processing capability in the CSC. Principal among these is the concern over establishing an on-line network between the center and outlying zone offices, and the data communications between them. Associated with this is the need for the center to develop into a department or branch like others in the OAE, and subsequently to serve more clients in OAE through an interactive data base.

Based on Dr. St. George's review of the CSC's operating system, procedures, applications software, staff training, and resources, the CSC's limitation to perform the short- and long-term tasks demanded of it stem not from inadequate staff size, but rather from the lack of structure in the organization. More specifically, there is a lack of direction and lack of job and career objectives for professional staff. These problems, combined with severely outdated hardware and software and lack of training on their use, results in a center that is inefficient and unprepared to meet the challenges of the future. Two major forces affect the data processing environment: (1) a continued growth of demand for services and the corresponding need for more hardware and software; and 2) the rapidly changing technological environment. These factors have a much greater than normal impact upon the CSC because it is at least seven years behind current standards of data processing, and is being asked to move forward to encompass current and future data processing needs in a very short time frame. Too many centers are driven by client demand to perform tasks and acquire equipment at a rate far greater than their ability or capacity will allow. The result is chaos, and the ability of the CSC to provide service suffers all the more.

There is a predictable evolution of systems in most production data processing organizations. Knowledge of this evolution can be useful as a planning tool. The typical evolution is:

Manual Systems	Automated Systems	Data Base Systems	On-Line Systems	"Usable" Systems
1	2	3	4	5

The last stage does not imply that previous systems were not usable; but, the emphasis in stage 5 is on a much higher degree of usability, including user-friendliness. Also implicit in this evolution is the increasing sophistication of hardware, software, and staff training.

The OAE CSC is being asked to move from its present position in Stage 2 through Stages 3, 4, and 5 in one leap. This is not only impractical, but unworkable given the center's current level of resources and staff training. It would be wiser for the center to concentrate first upon establishing a strong working structure, implementing production control procedures, training the staff, acquiring the necessary hardware and software, and then moving forward. It is, however, likely that the demands for service will outpace this orderly progression. Therefore, the term of reference with the highest priority, on-line network and data communications, is considered first.

Viewed in its simplest form, this priority requires the establishment of a key to disk system from a remote site. In its more complex form, it requires data manipulation at the remote site (the zones), then file transfer (upload) to the host machine at the CSC. Again, given the limitations of the center and the inadequate resources at the zones, it will be more sensible to implement the simple form first.

The CSC recently acquired five Sperry 400 microcomputers through the APP. While these will allow the center to move eventually to the complex form, initially they should be used by the remote sites as "dumb terminals," simple data transmission devices. While it may appear obvious that since the microcomputers and the mainframe are made by the same vendor, Sperry, there should be no communications problems, this is usually not the case. In many ways, data communication is the most problematic issue in computing. Therefore, the center should acquire support from the local Sperry office to implement the system.

Two concerns surround the implementation of the simple form. First, the CSC is acquiring 2400 baud per second (BPS) modems to operate with the microcomputers. As the speed of the modem increases, it is increasingly important to send the data across "clean" dedicated data transmission lines. It appears that 2400 BPS is the slowest modem feasible, given the future plans of the center. This speed will require a quality lease line, but apparently a successful test has been made of modern linkages between some zones and the mainframe.

Second, and more important, is the issue of system performance, which is translated as the response time for users accessing the system to transmit data. It is obviously unacceptable for someone at a zone site to wait five to ten seconds for the mainframe to acknowledge having received the data. While this is unlikely to occur initially, the longer term plan is to have up to 23 microcomputers linked to the mainframe. The current hardware supports only 32 input-output lines, and it is clear that the machine's resources could be saturated unless very tight scheduling is imposed. This raises an issue that is central to all of the priorities mentioned in the terms of reference: The ability of the current machine to adequately and efficiently perform the required tasks, and to meet the future needs of the OAE.

Assuming that the technical problem of modem-mainframe is solved, and this problem should present no difficulty if the modem test results are valid, the next issue is that of training. Now is the time to train CSC staff on the use of microcomputers. The two senior staff members and the programming staff should be given microcomputer training immediately. This training should include experience with whatever software allows the microcomputer to function as a

dumb terminal. The next step is for the CSC staff to train the staff in the zone offices. The microcomputer training should consist of elementary and advanced DOS commands, input/output operations, diskette care, file backup, and security. Also, due to the conditions under which the microcomputer will be used, hard-disk moving problems should be covered.

After the microcomputers are functioning, it is important that an evaluation be made to ensure the integrity and quality of the data. Presently, the CSC staff responsible for entering survey data into the computer has an error rate of 5 percent. As a means of contrast, the norm is 0.5 to 1.0 percent. Obviously, this rate is unacceptable. Keying of data is not a job requiring particularly high skills, job, so the source of this very high error rate probably lies in the salary and motivation of the data entry personnel. Although beyond the scope of this report, it is vital to remedy this problem at once. An error rate this high is simply a waste of time, since these errors are corrected by staff whose time could be better spent. Also, programmers currently write a program each time an error check is made. Commercial software, such as Mermac, is available to do this task, and such a program should be acquired.

When the error rate has been reduced to an acceptable level and the CSC staff feels competent with the microcomputer, microcomputer-mainframe communication should be initiated. This will allow staff at the zone offices to edit data, then transmit it to the mainframe. Eventually, zone staff could also do simple statistical processing of the data.

The move to the more complex form will require a program that allows for file transfer. If Sperry does not recommend a particular program, Dr. St. George recommended "Kermit," a program available in the public domain at minimum charge. Kermit works on most microcomputers and mainframes, and it is sufficiently flexible to allow for change if the CSC later decides to upgrade its hardware. Self-tutorial training is available for Kermit, but the center staff could also seek outside assistance from an institution like the Asian Institute of Technology (AIT). If file transfers of data are successful, it is important that a data base system be ready to receive and archive the data.

If editing is required at the zone level, it is imperative that an easy, self-teaching program be used; center staff are in no position to provide such training in the immediate future. If SUOS will run on a Sperry microcomputer with MS-DOS, and if it will export a transportable file to the UNIVAC mainframe, it seems adequate. If not, the staff should use a more general program, such as SPSS-X.

The second highest priority item for this consultant, an "interactive data base," is closely related to the first. There is obviously a need for numerous types of data bases at the OAE, but the most pressing need is for a data base that includes the survey data. Other data bases needed include the more standard ones, such as budgets, personnel, and inventory. Currently, no data base exists in the center in the accepted meaning of the term. What does exist is a loose collection of independent files representing different surveys. As a consequence, much human and machine time is wasted performing tasks available on commercially developed data base management programs.

Interactive data base management systems that allow for dynamic update of data are state-of-the-art packages. Such a package assumes the user, in the case the CSC, has already planned and created the structure of the desired data bases and is probably using the data base in a batch (not an on-line) mode. This assumption is not operative in the CSC.

With regard to the data base package itself, there are two basic choices: (1) to purchase the software or (2) to write it from scratch. Frankly, records of computing centers that have written their own packages show few long-term successes. Given the already strained resources of the OAE computer center, there is little choice but to purchase a package. Accepting this, there are some general guidelines the center should follow in selecting a package. Although vendors can mislead buyers, one should always ask for references, preferably from organizations with machines and problems similar to those of the center. Another criterion for selecting a package is benchmarking, which is measured execution of one or more samples of the work typically demanded of the package. The center should have these samples of work available before contracting a vendor. Samples might include various types of administrative records, personnel, supply, inventory, and so on. Next, it is vital to look toward the future and determine if the package will meet the needs of the CSC in three to five years. It is very difficult to convert from one data base management system to another, and this is a good reason to develop a long-range plan for the use of the package. Since there are a number of technical considerations in selecting a package, the center's two senior staff should be trained in data base technology; if necessary, outside trainers should be brought in. Without such training, no informed judgment can or will be made.

On the basis of current and future needs, and especially in light of the training need, the center and other departments of the OAE that have microcomputers should obtain and use two specific packages: Lotus 1-2-3 and DBASE III. The former package handles budget and related tasks; the latter will handle all data base needs for the foreseeable future.

Both packages are easy to use, interact with the user, have readily available source books written about them, come with self-tutorials, and have available extensible training by professionals. A move to microcomputers should be made. Essentially, they are seen as a complement to the existing or future mainframe. Given the size of the survey data base, it makes more sense to retain it on the mainframe with an appropriate data base package and download samples to the microcomputer for analysis. With vendor support, this should present relatively little trouble. The first software on a MOAC network probably should be electronic mail, however. This will safely introduce MOAC to microcomputer and pave the way for Lotus and DBASE III.

The third priority for Dr. St. George was to give advice on upgrading the CSC. This priority involved several interrelated issues. Any discussion of upgrading the center must focus on the adequacy of the hardware and software, as on well as the organizational structure and operating procedures. The conclusion is demonstrably obvious and can be stated before the discussion: The CSC must move soon to replace the UNIVAC by a machine more compatible with the users' needs, such as an IBM or DEC. The CSC must also establish and implement normative administrative tools, such as project management, quality assurance control, job scheduling, training, and proper use consultation.

Without current and appropriate hardware and software, all the other issues relating to the CSC's operation are moot. Given the relative inexperience of the center staff in such endeavors, the selection of new hardware and software is a major responsibility, best left to a professional consultant, who would rely on input from the center and the OAE. The actual cost of the UNIVAC is high, and the cost in programmer time required by use of an inappropriate machine is unmeasurable. For the current rental price of the UNIVAC, several models of DEC and IBM computers are available that are much more powerful and better suited to the needs of the CSC and the OAE. These machines also run software packages that are much more efficient in their use of programmer time. In addition, the UNIVAC is limited by memory, storage, and processing power -- all considerations for the future needs of the CSC and the OAE. Therefore, it is urgent that the UNIVAC lease be renewed for no more than one year, during which time the CSC staff should work with a consultant to select a new machine.

Fortunately, the situation with regard to software is not as serious. In terms of conversion to a new machine, all or nearly all of the CSC's programs written in Fortran IV with no assembly I/O routines, can be run on a new machine. It would, however, be foolish to do so: At present, nearly all of the programmers' time is consumed in modifying

subroutines of a Fortran program written ten years ago. This a dramatically inefficient use of time, and it also results in lack of motivation and reduction of productivity. While the center has a number of application programs, they are quite dated, slow, and totally unsupported by the vendor. In addition, documentation for these programs is so poor that few of the staff can learn to use the packages. Thus, in moving to a new machine, it is critical that the center also adopt new, powerful, user-friendly packages. There can be no valid argument against replacing the CSC's stand-alone Fortran programs with packages. Software packages dramatically reduce development time and cost, and maintenance is provided by the vendor.

Since 70 percent of the CSC's workload is devoted to survey data processing, and since this figure is unlikely to decrease substantially in the future, the center should acquire either SPSS-X or SAS. Both packages have features that replace virtually all of the present Fortran programs, including report writing. SPSS-X does not have as extensive a number of statistical programs as SAS, but it is available for microcomputers as well as for mainframes, including the center's UNIVAC. SAS does not run on the UNIVAC, but it is the best statistical package available. The SAS package is available with a set of economic forecasting and time-series programs, and has graphics capability. Since it is possible to convert SPSS-X files to SAS files, and since SPSS-X currently runs on microcomputer, the package should be purchased for both the mainframe and microcomputer.

In addition to survey processing, the CSC produces numerous reports with a program called Mapper. This is a very old, unsupported and poorly documented program. Its most serious drawback is that it operates in an interactive mode, thus consuming valuable CPU resources. With the possibility of the addition of more terminals and/or microcomputers to the machine, continued use of Mapper will seriously degrade the processing power of the system. The center should replace Mapper with a newer, easier to use, report writing program that operates in batch mode. Reporting Writing Generator (RPG) would be a good choice.

The CSC will, in the future, assume responsibility for more production-type jobs, such as personnel records and payroll. The addition of production jobs to the system will require more memory and storage. While the center is in the process of acquiring these, it is likely that most of the new resources will be consumed by the new software necessary to run the production jobs. Where feasible, and subject to certain restrictions, these production jobs should be performed on microcomputers. Payroll is not efficiently done in this way, because microcomputer printers are too slow. Personnel records are efficiently done on a microcomputer,

but this raises matters of privacy and security. In many ways, security on a microcomputer, at least with floppy disks, is better than on a mainframe; because the disk can simply be locked in a vault.

A functional review of the CSC operations clearly reveals that the center is rapidly moving into a more sophisticated and complex computing environment. It is acquiring new hardware at an accelerating pace. This new environment will require new managerial and planning tools, many of which are absent at present in the center.

First and most important, is the lack of stated CSC goals and objectives. Without such a statement, the CSC's growth will be chaotic and inefficient as it tries to respond to all of the needs of its clients. The CSC cannot be all things to all clients; no computing center can, and it is critical that the CSC begin setting priorities among its goals and objectives. From such a statement also comes a planning document. Dr. Wisut's ongoing effort to produce a three-year plan for the center is strongly supported. At this time, the center appears to be in a reactive position, merely trying to keep up with surrounding events. The center should take a more active and aggressive role in determining its capabilities with existing staff and resources and what kind of expansion will be required to meet the growing expectations being placed upon it.

As the center begins to expand the scope of its operations, it must give serious thought to determining the administrative and managerial procedures necessary for successful data base and processing.

The current organizational chart for the CSC includes a branch chief (Dr. Wisut), 15 data entry staff, 7 programmers, from 0 to 2 systems programmers, 5 operations staff, and 2 training staff.

The organizational structure is that of a very small, centralized computing operation with a broad span of control, that is, a large number of employees report to a single manager. In some areas of data processing, such as operations, where the work tends to be simple and straightforward, a large number of subordinates, perhaps from 10 to 30 can report efficiently to a superior. At the computer center, however, all 29 permanent employees officially report to the branch chief, Dr. Wisut. The principal reason for this is the large gap in technical expertise and management experience between Dr. Wisut and the remainder of the staff. This gap results in a defacto choice of a single person to make policy and technical decisions.

The experience of most data processing organizations is that as technology advances and as computing power is distributed to clients previously dependent upon the central computing site, the highly centralized structure becomes unworkable. This is beginning to occur in the OAE, with the Land Development Department (LDD) acquiring its own multi-user microcomputer work station. In anticipation of this trend, the CSC should create several managerial positions to oversee several of the departments that presently report directly to the chief. Also, the organizational structure of the programming area needs to be changed to meet the anticipated transfer of client needs from custom-designed programs to consultation on applications packages, many of which will be running on the client machines. The proposed organizational chart to accomplish these goals is as follows:

Branch Chief	Dr. Wisut
Systems and Applications Programming Manager	Mr. Winai
Programming Systems Training Supervisor	(to be named)
Production Manager	(to be named)
Operations Supervisor	(to be named)
Data Entry Supervisor	(to be named)

In addition, the programming should be subdivided into two areas: 1) consulting, and 2) applications. When microcomputer are initially placed in the OAE, two staff members will be sufficient for consulting positions. At first, these consultants will spend most of their time answering simple questions, but they should progress to a point where they provide information on subjects such as equipment purchase, software selection, and project design. They will, of course, handle questions on the major mainframe applications packages and conduct classes to train the users. The application programmers will spend the majority of their time designing and writing commands for packages such as SPSS or SAS. This contrasts directly with what currently takes place. Of the seven programmers, two are allocated to training; however, one of these is Mr. Winai, who trains only some of the time. The other trainer programs when not teaching.

A most disturbing situation is found among the programmers. Most of their time is taken up making relatively minor modifications to Fortran subroutines, which, in turn, are linked to a major program written ten years ago. This is an

enormous waste of talent, and productivity would increase markedly if the same amount of time were spent on a package.

To improve efficiency, there should be a manager to supervise the data entry and operations activities. Initially, this manager would do little more than relieve Dr. Wisut of some daily supervision responsibilities. As the zone offices assume more of the responsibility for survey data editing, however, the CSC's data entry staff will have more time to allocate to other departments of the ministry. In these endeavors, they will need the leadership and guidance of an immediate supervisor.

Because of his seniority at the center and his high level of technical competence, Mr. Winai should be appointed as one of the managers. In many ways, he now performs some managerial functions, although he lacks any real decision-making authority. No other internal staff member was identified to promote to the other managerial position, but given the extensive informal organizational structure of the center, an internal staff member would be preferable to an outsider.

Turning to a review of the specific departments within the CSC, some inadequacies clearly stand in the way of the center achieving high productivity and staff morale. If remedy of these inadequacies is not given the highest priority, the CSC will be unable to cope with the anticipated growth in hardware, software, and client demands.

The most serious inadequacy is lack of staff training, and it is felt most heavily in the programming department. This department is of central importance to the CSC, because it is, or will become, the principal source of contact with clients, either through programming assignments or consultation. With one or two exceptions, the programming staff currently is functioning at a minimal level of experience in Fortran, their primary language. Based upon an examination, they are functioning at a similar level with their use of the two other most used packages, Mapper (a report writer) and MPS (linear programming). Virtually none of the staff have a working knowledge of microcomputers or the major packages certain to be a focal point of future computing, SPSS-X and SAS. The staff will be unable to train zone officers or microcomputer users or to provide problem consultation when they do not know much about microcomputers. The CSC should contract with an organization such as the AIT to provide training in MS-DOS and communications. Now is also the time to train the staff in microcomputer applications packages that are certain to be used by the ministry in the near future; spread sheets (for example, Lotus 1-2-3) and data base (for example, DBASE III). At the mainframe level, the staff should be trained to a much higher level of competence

in Fortran and system utilities. At a lower level of priority, but vital to the CSC's desire to move away from a heavy dependence on Fortran, the staff needs to be trained in the use of major applications packages, particularly SPSS-X. Inasmuch as one of the local universities runs this package, this should not be very difficult. The most serious deficiency immediately facing the programming staff is not its size, but its level of training. An illustration of that point, although the analogy has limitations, is the University of New Mexico Computation Center, which relies heavily on packages as opposed to languages, has a programming staff of 12, and supports 8000 mainframes and 900 microcomputer clients.

Training for the CSC staff would have a positive impact upon the second problem area, employee motivation and morale. Discussions with the staff reveal that they are unhappy with their work. This stems from three sources: (1) the choice of mainframe; (2) lack of training; and (3) lack of project management and organizational planning.

UNIVAC represents a career block, because it is far from being a major mainframe vendor. This, combined with what appears to be less than satisfactory level of support from the local vendor representative, results in the programmers' inability to move to other career positions. For this and the other reasons mentioned earlier, the OAE should move away from UNIVAC.

Until another more supportive vendor is found, the CSC should contract with the AIT and local academic experts to immediately upgrade programming skills. Although not an ideal solution, the staff should be encouraged and given release time for self-study. A small investment in training will result in a large improvement of performance.

Finally, observation of the programming staff, reveals that project management controls and a plan of development should be implemented. Currently, Mr. Winai functions as an informal project coordinator. He needs to assume a more direct managerial role in the group, with clear support from Dr. Wisut. Without this influence, the group currently displays work and project habits that would be unacceptable in virtually every other computer center.

Projects need to be assigned on the basis of such factors as individual programmer strengths and weaknesses, a clear description of the project objectives, and appropriate scheduling of tasks. Mr. Winai knows the specific factors contributing to success or failure in the group. Therefore, he should begin to exercise more control over projects and the work habits of the staff. Specifically, he needs to implement a more timely review of the project status, and

insist upon complete and accurate project documentation. The latter point is important, because the staff spends most of its time rewriting programs. Successful documentation should have allowed by this time for more reliance on previous work and less "redesigning of the wheel" each time. To this end, Mr. Winal should create a simple method of generating and updating documentation, with the goal of making a standards manual for all programmers to follow. Again, if packages are adopted, this will save programmer time in the long run by making it easier to explain to users where the problem lies.

There is a serious deficiency in the systems department. In general, the two individuals in this group perform standard systems functions, such as monitoring the system and seeing that it remains operational for the maximum possible amount of time. Two areas of deficiency exist; the first is more serious than the second.

First, current plans call for a communications link between the CSC's UNIVAC and the DOAE's IBM. To accomplish this, the center must install a DPC unit, a programmable "black box", that performs necessary translation work. This is a sophisticated piece of machinery that will require the work of a systems analyst specializing in communications. Two other areas of development also require network and communications skills: (1) the linking of microcomputers in the zone offices to the UNIVAC mainframe; and (2) the establishment of a microcomputer network in the OAE. For these and future projects, the CSC should acquire a systems-level programmer with experience in communications, specifically binary synchronous and SNA protocols.

The second deficiency is not now critical but will become so as the CSC expands the current machine's memory and storage and begins to service a larger number of clients with diverse needs. This expansion will require implementation of capacity planning, one of the most basic activities any center can perform. Capacity planning involves knowing how much work the hardware does today and how much it will be expected to do tomorrow. There are different formal methods of capacity planning, all of them beyond the scope of this report. Regardless, the center should contract with a professional consultant to develop a capacity planning methodology. Such a methodology will contribute to a wide area of applications, but is fundamental to the acquisition of new hardware, especially to the justification of cost. It is now common practice in most computer centers to track CPU utilization and to forecast demand from 6 to 24 months ahead. This should be done by the center. Common concerns that emerge from capacity planning include: (1) the ability to analyze response time as additional terminals are added; (2) determination of when the existing CPU should be upgraded, and for how long; (3) determination of when addi

tional memory should be added and how much, for how long, and at what price; and (4) determination of what additional peripherals will be needed, and when to support users, especially with disk storage.

A comprehensive capacity plan from a consultant should include:

1. A description of the UNIVAC's current performance, including the utilization of individual and combined performance of all hardware and software;

2. An analysis of the current workload characteristics;

3. A study of future workload requirements and the hardware configurations necessary to support them;

4. An analysis of the UNIVAC's response and/or turn-around time for various applications;

5. A means for predicting the future performance of the hardware and software; and

6. An ongoing process for providing information about the system to the center's management, so that there are no surprises or sudden deteriorations in services.

The training department consists of two persons. These individuals, however, function as programmers when they are not training, which is about six months out of the year. With the addition of microcomputers to the MOAC and the zone offices, the amount of time they must spend training will escalate, the CSC's management should prepare for a reduction in their programming contributions. This can probably be compensated for by increasing the productivity of the other programmers along the lines described earlier.

The operations department of the CSC appears, for the short term, to be adequately and competently staffed. In addition to performing normal console, intervention, and bursting activities, the operators restart the system after a crash with instructions from the system. The main concern here is the impact on operations as a result of the projected growth of the CSC. As the center expands its available services, the number of jobs run will expand exponentially. The center currently processes an average of 50 jobs every 24 hours. This number could easily triple in less than one year and could increase even more if the staff begins to use the system for training purposes. Next, with the addition of microcomputers and other computer links to the system, an increase will occur in the need for operator intervention to reinitialize the line or communications controller. These

two factors suggest the need for center management to request an additional operator in the three-year plan.

Finally, the data entry and editing department is appropriately organized with 16 permanent employees working three shifts. Three of these people function as supervisors. The keypunch or data entry operation from a terminal results in an error rate of 5 percent, which is about five times the expected rate. The cause of this relatively high error rate is difficult to determine. The staff's working environment and hours are comparable to those of a typical data entry operation. Discussions with the CSC's senior staff have indicted that at least part of the problem may be due to work habits, motivation, and lack of incentive. These factors are, however, characteristic of many similar data entry operations. The staff does take fewer short breaks; data entry necessitates short breaks about every 1.5 to 2.0 hours.

Far more serious, and demanding urgent attention, is the estimated 30 percent error rate in the raw survey data obtained and processed from the field offices. The next survey should be closely monitored to determine whether most of the errors are made in the field, and what steps can be taken to correct them. In some cases, a simple solution, such as improved legibility of completed interview forms, may be recommended. Clearly, if corrective action is not taken, the editing staff will soon have no time free for other MOAC projects.

A review of the OAE data base, consisting of the agricultural surveys, reveals that the CSC currently stores about 40 surveys, and will add about this many more each year from now on. These surveys are, for the most part, stored on tape and loaded into the machine as the need arises. In a very inefficient fashion, one of the software programs (Mapper) has the ability to combine files. In short, as the term is used in computing today, the OAE does not have a data base or a data base management system, but urgently needs one.

A large number of management systems is available. Because this report cannot compare them, the reader is referred to one of the best comparative reports available, DATAPRO. The principal concern is that all of the data base packages require substantial amounts of storage and memory, and even more training. Given the already clear need for training in other priority areas, it is infeasible for the CSC to install and maintain a comprehensive management system.

A compromise is to acquire a multiuse package that can substitute for most of the CSC's languages and packages. The recommended package is SPSS-X. This package would allow the

CSC to create a data archive of the sample surveys, update it dynamically, compute elementary and advanced statistics on it, and write reports from it. This package would free up approximately 60 percent of the programmers' time now spent on rewriting Fortran programs. The initial cost of generating the archive is low compared to the payback in savings of programmer and machine time. If plans proceed to add six megabytes of storage, SPSS-X will operate effectively for the short term. Depending upon MOCA's data access needs, the long term may favor the acquisition of a true, on-line, interactive data base management system. Prior to this, however, a commitment must be made by MOAC to staff training, and to increasing the memory and storage of the mainframe system. SPSS-X, unlike the predecessor SPSS, has much greater power and flexibility, including the ability to select different types of sampling schemes. Finally, SPSS-X can, if necessary, be used in conjunction with a locally written program to produce custom output.

A microcomputer network is recommended for MOAC. A principal concern of the ministry is to have on-line data bases that can be accessed easily and quickly. Two factors suggest that while storage of the entire base should remain on the mainframe, the access with microcomputers would be more appropriate. First, the current hardware and software will not adequately support an on-line data base. Further, the acquisition of such hardware and software, plus the staff training to support it, means implementation of the system at least 18 months from now. Secondly, given the generally low level of data processing experience in the ministry, any on-line system must be user-friendly, very well documented, and extensively supported by the vendor. The major micro data base programs qualify in all three areas.

By placing microcomputers in each ministry office and at the CSC, and by linking them together in a network, staff will have access to the large survey data base on the mainframe, in addition to having the opportunity to create data bases for their respective offices, to share these data bases and communicate with others on the network. These advantages clearly outweigh the problems and costs of sorting all data base files on the mainframe and accessing them with terminals. Other than the very large survey files, all of the ministry's data bases can be stored on hard disks.

It will be very important for the training department in the center to provide a considerable number of individual tutorials in the beginning. Although microcomputers are user-friendly, many first-time users are intimidated, and it is vital that these individuals not be discouraged from continuing. Two techniques are important here: 1) to provide locally written and tested documentation on how to use the microcomputer and several applications packages; and

2) to be sure, in the initial work with each office, to use the office's data in an application that is relevant to its area. A very effective first step would be to put all of the division directors and their staff on electronic mail.

After the users are comfortable with electronic mail, an interactive, on-line data base of personnel should be created should be created, using Lotus 1-2-3 for this activity. Lotus can also be used to train division staff to keep their own dynamically updatable budgets and supply inventories. Finally, one of the best statistical packages available, SPSS-X, should be acquired for both the mainframe and the microcomputers. Using this package, staff could transfer samples of surveys from the mainframe to their microcomputers for processing. In this fashion, SPSS-X functions as both a data base management system (interactive on the micro-computers) and as a statistical analysis package.

In the United States, with many resources for support, computing centers still rely heavily on vendors for hardware and software support, including courses and on-site consultation. In Thailand, where resources are limited,, it is even the more critical that the OAE center insist upon more vender support. This request should come from the secretary general of the OAE, whose position should be sufficient to persuade the current vendor representative to provide more and better support.

The issue of statistical consulting is only tangentially related to the terms of reference, but there is a problem that is deserving of mention. Frequently, staff from the research branch come to the CSC asking for assistance in running a job. Invariably, the job is a statistical analysis, sometimes being run on the CSC's borrowed copy of SPSS. Also invariably, the question involves the use of either a time series or multivariate analysis technique. To a passive observer and consultant to these interactions, two points are clear. First, the CSC should not be in the business of providing statistical consulting. Second, the research branch needs statistical training, or should obtain advice from qualified staff.

The CSC is in need of professional assistance to ensure that the Sperry 400 microcomputers communicate with the Sperry-UNIVAC mainframe. A purchase order contract could be written to acquire this assistance. If this is done, the following tasks would be required:

1. Verify the results of an earlier test, which showed that no problems exist in using telephone lines to transmit data to the mainframe at 2400 BPS.

2. Assist the center in evaluating microcomputer communications packages, and in acquisition of one appropriate to its needs.

3. If necessary, supervise the conversion of the communications package to the capability of printing Thai characters. The users manual must also be in Thai.

4. Using benchmark data from the center, perform tests to demonstrate that the package allows the microcomputer to function: (1) as a terminal, and (2) as a microcomputer to upload and download files of data. The latter should not be single-line transmission. Data should be transmitted in ASCII and BINARY modes. Verify data integrity.

5. Write a short user's manual relevant to the level of package use in the zone offices.

A consultant or company should be hired to train the CSC staff in the use of microcomputers. Each person should receive no less than eight hours of instruction on basic operating techniques, the details of which are outlined below. In addition, each person should receive at least four hours of instruction on the communications package that is eventually selected. At a later time, the staff should receive no less than six hours of instruction in advanced MS-DOS, including file structures, command and Auto.Exec files, and subdirectories. Microcomputer training should include (1) care of and powering up the machine, (2) care of floopy and hard disks, (3) booting up the operating system; (4) use of basic MS-DOS commands, including utilities, file copying and backup procedures, (5) hardware and software error diagnostics, and (6) installation of hardware including cables.

The general objectives of Dr. Fred Baker's consultancy were to assist the OAE center to implement SUDS on the OAE microcomputer network and to train the staff in its use. Specifically, the following duties were identified:

1. Provide the SUDS system including Megabasic and Microstat software;

2. Implement SUDS on the OAE Sperry 400 microcomputers;

3. Assist the OAE staff to enter present OAE surveys into the SUDS system;

4. Assist with training the OAE staff in the use of SUDS;

5. Prepare a "cookbook" operational manual for SUDS; and

6. Prepare an end-of-tour report indicating accomplishments and recommendations.

Dr. Somnuk Sriplung, secretary general of the OAE, also identified two more areas for special consideration. These areas related to the effective use of SUDS for processing survey data and its interface with existing OAE programs on the mainframe. Specifically, the tasks were to indicate, to whatever extent possible, what steps should be taken to implement the use of SUDS for survey processing, and to indicate what additional hardware and staff would be needed to support the use of SUDS.

During the first week of the SUDS training, the Sperry 400 microcomputers were still tied up in customs; however, there were four Corona microcomputers available for concurrent training in SPSS, MS-DOS, Thaistar, DBASE III, and Lotus 1-2-3. After the Sperry 400 microcomputerss were received at the center, there was no difficulty in the operations of SUDS, Megabasic, and Microstar. Each of these packages is now fully operational on the OAE's Sperry 400 microcomputers.

One limitation of SUDS is its inability to generate unbiased variance for multistage designs. In the applications for which it was designed, area frame surveys using either replicated systematic sampling, paper stratified sampling, or simple random sampling were to be processed in lesser developed countries which have limited, if any, access to mainframe computers. User-friendly data entry, editing, and summarization procedures were implemented by using a series of menus arranged in the sequence used for processing the data. Some of the OAE surveys are List Frame surveys which use two- and three-stage simple random sampling designs. The area frame surveys are used to produce closed segment estimators and weighted segment estimators. At present, SUDS does not have a feature for efficient processing using a weighted segment concept. After installing SUDS with its original features, the extensions needed to process these additional types of surveys were investigated. Formulae needed for these modifications were identified and test data were processed.

During the initial stages of SUDS implementation, data were entered from questionnaires with two- and three-stage designs. It was verified that the necessary estimates of totals could be produced with the existing SUDS software. Variances were ignored. A new program was developed to facilitate the transfer of SUDS data to Microstat, since the 16-bit version is designed to provide more precision (and required more storage) than the 8-bit version with which SUDS

had previously interfaced. Thus, by the end of the second week, a fully operational SUDS system was available. The modifications to permit calculation of multistage unbiased variance were begun during the last week, and in comparison with OAE printouts, the modifications were successful for two-stage designs. There was not sufficient time to finish the three-stage modification.

The SUDS training also required some training in the use of microcomputers. The simultaneous training in MS-DOS provided some assistance, but the staff members had not been able to sharpen their skills before the SUDS training began. After a slow start, the training was able to proceed with complete attention to the SUDS system, and to concentrate on its specific features and options.

The development of SUDS expertise in the OAE center began with a presentation to about 25 OAE staff, including some persons from the zone offices. The presentation included a general background of SUDS, its capabilities and limitations, the reasons for its creation, the various options for its use, the types of statistics it produces, and a demonstration of SUDS on a microcomputer.

Three categories of users were identified: (1) the CSC; (2) the Center for Agricultural Statistics (CAS); and (3) the zone offices. In-depth training was provided for three OAE staff members who had been identified as the SUDS experts at the CSC. Three commodity specialists from CAS brought questionnaires from coffee and duck-egg surveys so that the SUDS techniques for processing could be applied to OAE data, and then compared with values calculated with other procedures. These three OAE staff members did not have any experience with microcomputers, so some time was spent in giving them the background information needed to provide them with limited capabilities needed to use SUDS. The conflicting training in MS-DOS, Thaistar, DBASE III, and SPSS-X prevented full-time attendance by zone staff, but they did have the opportunity to see and to try the data entry process. The limited exposure to SUDS is not considered a handicap for the work expected in the zone offices. CSC staff members are now capable of training these zone staff members in the necessary steps for data entry, editing, and summarization in the zone offices. CSC staff members received training in the following areas:

1. Preparation for using SUDS: determination of the statistical design for the survey, division of the questionnaire document into SUDS sections, and development of the range/consistency tests for the edits;

2. Use of SUDS to enter the survey questionnaire parameters and the edit tests, procedures for changing these parameters, and the resulting ramifications for the data entry process;

3. Data entry and editing in both interactive and batch modes, with the opportunity to delete selected questionnaires or entire segments;

4. Summarization of the questionnaires to the various levels of the statistical design, including the options available for printing the results and the structure of the different diskette files which can be accessed by Megabasic programs for the creation of special reports or additional statistics;

5. Conversion of SUDS data sets to files that are directly readable by the Microstat statistical software package;

6. Training in the use of Microstat and various features of its data management capabilities, including file creation, modification, variable transformations, file merging, and a variety of statistical procedures; and

7. A concentrated description of Megabasic with special programming assignments to illustrate the major features that are unique to Megabasic and to processing of data on microcomputers. In addition, the assignments were typical of those that would be appropriate for access and analysis of data created by SUDS.

Although only three weeks were available to concentrate on all of these points, the assigned CSC staff were able to grasp the concepts of SUDS, Microstat, and Megabasic. They understand, can use, and can teach each of these software packages to other members of the Computer Center staff, the CAS staff, and the zone office staff.

The three CAS commodity staff can now access SUDS and Microstat on the microcomputer, and enter and summarize data. They entered the questionnaire design and edit parameters for the coffee and duck-egg surveys, and assisted in the summarization process. They are at a level where they are users only; They have not been exposed to the complete system or file structure of SUDS.

During the training period, a review was made of other kinds of OAE survey documents, including both area frame and list frame forms. Data from a second crop rice survey with two-stage design, and another with a three-stage design, were

entered and expanded to obtain changwat totals. A cost-of-production survey was analyzed, and an was attempt made to evaluate the usefulness of the type of data collected and the manner in which the data were analyzed. SUDS can be used to process these data, but inclusion of all the data items on the document is questionable.

Dr. Baker accompanied the OAE staff on visits to the zone offices in Lop Buri, Chai Nat, and Nakon Sawan to evaluate conditions in these three offices, as they relate to successful microcomputer operation. The offices are crowded, poorly lighted, and poorly designed. Open windows permit dust, rain, and humidity to accumulate inside the buildings. There are not sufficient power plugs in the offices to situate a microcomputer in favorable locations. The office staff have heavy workloads during the times when survey data would be entered and processed, so there could be lengthy delays in meeting a deadline close to data collection.

The staff members have had little experience with microcomputers, and the limited training in Bangkok will mean little if these individuals cannot practice on a machine periodically. With a core of individuals from the CSC to assist and train staff during the first two or three surveys, there should be no problems in mastering the steps for SUDS processing in zone offices, but any attempt to place a Sperry fixed-disk microcomputer in these zone offices would be risky during unfavorable weather conditions. A major priority would be to find new office space with a stable power supply, in which to set up a fixed-disk microcomputer. Line conditioners and plug surge protectors could be used to control problems caused by inadequate electricity conditions.

Assuming that SUDS processing is feasible in both Bangkok and zone offices, the problem of data transfer still exists and must be solved. The optimum situation is to have telephone lines of a quality sufficient for one microcomputer in a zone office to talk to either the microcomputer or to the mainframe in the CSC. It has been established that 2400 BPS is about the only reliable rate, although some concern still exists about that rate. Sperry terminals, but no microcomputers, have been used for communication to the mainframe from the zone offices using modems. An alternative is to send or carry data diskettes from a zone office to the CSC, where ASCII files can be sent between the UNIVAC and Sperry 400 microcomputers by way of a direct cable connection.

The proper form for file transmission between mainframe and microcomputer must be ASCII files, either as card images or as an SPSS portable file. With the addition of SPSS/PC, it will be possible for SUDS data to be converted to an SPSS file, and then transmitted to the UNIVAC, or for data on the

UNIVAC to be downloaded to the PC, and then analyzed with SUDS data. In both cases, no actual testing has occurred with SPSS files.

The major difficulty with SUDS processing is the lack of terminals to support all of the activities of the computer center in Bangkok. With the broad training given staff in the use of word processing, spread sheet, and data base packages, the competition for microcomputers will be continuous to sharpen skills and to complete work assignments. Statistics packages that run on the microcomputer can be used for short analysis, and circumventing the use of the mainframe. This activity, however, also conflicts with the previously mentioned competing tasks for the microcomputers. The alternatives are (1) to continue to use the mainframe for most applications, leaving the microcomputers for the short, special purpose jobs and those jobs that cannot be done on the mainframe; and/or 2) to purchase more microcomputers.

With the increasing capabilities of low cost microcomputers and the powerful software that either has been developed or will be developed in the future, more microcomputers would be a significant asset to the OAE. Without equipment on which to practice and to acquire experience with the new packages, the skills of the recently trained staff will suffer. It is not wise to rent microcomputers as a stop-gap measure because the cost is exorbitant. New machines can be purchased at the cost of a few months rental. The final decision should depend on the workload of the computer center staff.

It seems worthwhile to consider the management of the SUDS system on the Sperry 400. The SUDS system consists of 16 program files, one parameter file, and various user-created parameter and data files. The Megabasic interpreter and the MS-DOS utility ASSIGN.COM are also used in the implementation of SUDS. The entire program system (without DESIGN and the user-created files) should be stored on a MASTER diskette and kept in a safe place. BASIC08 and ASSIGN can be retained in the root directory on the fixed disk, and can be accessed via the PATH: statement. The PGM files should be stored on the fixed disk in a subdirector called MSUDS (master SUDS). Whenever a new survey is processed, then a subdirectory can be created; all files in MSUDS should be copied to it ,and the general processing steps should be followed (after a PATH: statement). A separate subdirectory should be used for Megabasic program development.

Once a set of operational survey parameters has been created, these parameters should be listed on the printer (hard copy), and the complete set of programs and parameter files backed up on a floppy diskette. The hard copy and

diskette should be used as a survey backup. An additional hard copy can be included in the documentation of survey processing. Copies of the survey backup can be distributed to zone offices if any processing is to occur at these locations (BASIC08 should also be available); zone offices would then only need to enter and summarize their zone data. Copies of the data files (both questionnaire and aggregated data) can be sent to the OAE in Bangkok kingdom summaries.

When the coffee surveys were processed with SUDS, two data entry section staff members entered the data with no prior experience with SUDS, except 30 minutes of training in how to enter data, how to make corrections, and how to use the short cuts in data entry. Then the staff entered 52 survey documents in about 55 minutes.

The SUDS survey data processing system was developed by USDA/SRS for use on 8-bit microcomputers in the lesser developed countries. More recently, SUDS has been converted to run on 16-bit microcomputers using MS-DOS. The particular application was intended for IBM/PC machines, but it appears that there is no significant problem in extending the usage to IBM compatibles. In particular, the consultant and center staff tested SUDS during the month of August on Sperry 400 microcomputers with one floppy disk and on 10 MB fixed disk, and had no difficulty.

The procedures for using MS-DOS SUDS are similar to the 8-bit versions, but somewhat simpler with respect to hardware specifications. Conversion to Microstat-compatible files is less complete because SUDS runs with 8-bit precision and the default precision for Microstat is 14-digits. The header must be generated from Microstat instead of SUDS.

Before using SUDS to enter data, three preliminary steps must be taken. First, the identification of the statistical design for the survey is used to determine the hierarchical list of variables in the first section of the questionnaire. If the survey has already been administered, these variables must be determined and located on the form.

Next, the entire survey document is divided into sections that are identified to SUDS as either fixed format, code value, or table format. The type of section will depend on completeness of response, the physical organization of the questionnaire, and the interrelations of the statistics in terms of range/consistency tests. For sections of data where one would expect less than half of the possible responses, code value sections may be necessary to enlarge sections to include the essential items. One should, however, consider the potential for nonsampling errors to occur if the data entry staff skips around on the questionnaire to enter data. For this reason, it may be difficult to tailor SUDS to

existing survey documents. Remember that there is more than one way to apply SUDS to each survey, but that the various ways will differ in efficiency of data entry and in the application of range/consistency tests.

Finally, the range/consistency tests should be determined and outlined prior to entry of the questionnaire parameters. It may be necessary to revise the questionnaire parameters based on the specific tests required, and on the type of section.

Dr. Lawrence Kinyon provided a one-month short-term consultancy in September and October 1985. The major purpose of Kinyon's assignment was to interface the SPSS-X program routines for processing survey data with the Fortran programs currently being used in the OAE. Evaluation of the capabilities of SPSS-X, the terms of reference, and problem are as in processing OAE surveys led to the following conclusions:

1. SPSS-X, while it should be used for more of the routine statistical analysis functions of the OAE, is not an appropriate tool for processing the OAE's agricultural surveys.

   a. Designing programs for each type of survey, as defined in the terms of reference, does not alleviate the problem of needing to tailor the programs to each survey when it is structured differently.

   b. The variance formulas for multiple stage surveys require capabilities that are quite cumbersome or impossible in SPSS-X. Any change in survey structure would lead to more problems than in the current Fortran programs.

   c. Defining the file structures and data transformations to produce the detailed summaries now obtained would be no easier than with the current system.

2. The survey designs frequently used by the OAE can be included in one hierarchical design framework which can be incorporated into one general purpose survey processing package using the basics of the current system.

3. Solving all of the survey processing problems outlined by the OAE would require much longer than the four-week duration of the assignment. Thus, generalized programs were developed to address as many of the problems identified in items 1 and 2

above as possible. Remaining problems were discussed with pertinent OAE computer staff, and written comments were left with the staff.

Three programs were developed to assist in processing surveys by the OAE staff. The first program was a generalized system to set up files and store the necessary sampling information to properly weight each unit in the survey. This program will handle the sampling information for any survey which uses simple random sampling in a stratified, two-stage cluster, or a three-stage cluster survey design. Ideas for modifying this program to also handle systematic sampling for these designs were also discussed with the OAE staff.

The second program developed was a system to edit identification numbers, check to see that all units sampled are in the data set (or in the case where not all units had pertinent data, that all of those that did are in the data set), and to ensure that the data are in the proper sequence for processing. This program makes use of the sampling information stored above.

The third program was a system to calculate the survey estimates (population total, variance, percent reporting, mean, etc.). This program will process data from any survey which uses simple random sampling in a stratified, two-stage cluster, or a three-stage cluster survey design. Modifications to the variance calculation would also allow this program to be used to process surveys where systematic sampling is used.

Each of these programs are to use a series of parameter cards to identify the structure of the survey. The edit program uses additional parameters to define what specific checks to make and how to make them. The processing program uses additional parameters to define what is to be calculated and how to do the calculations in a generalized input routine. An additional option is available for a user-supplied input routine.

Preparing parameters to run these programs should significantly reduce the time required to process most surveys. Time was spent explaining to the OAE staff the programs and how to use them. Efforts were made to test the programs, but time constraints, made it impossible to test all possibilities. Program listings and user documentations were prepared and submitted to the OAE.

Dr. Kinyon offered the following additional comments and recommendations:

1. With the Gauss-Seidel program for a nonlinear system of simultaneous equations, the users should evaluate changes in the variable under consideration, which are consistent for the variable, not constraining consideration to a 1 percent change.

2. SPSS-X should replace older programs for statistical analysis where possible. An obvious program to replace is the old REGD program for regression analysis, unless two-stage least squares analysis is needed which SPSS-X can do.

3. The current computer system is being used near capacity. Major decisions must be made about what to do with it and concerning compatibility issues with various microcomputer systems to be used with the mainframe.

4. SAS should replace SPSS-X as soon as possible. SAS has indicated that a Sperry compatible system will be available in late 1986. Thus, SAS will be available for both IBM and Sperry systems at that time, as well as for other equipment. The types of economic analysis undertaken by the OAE are, in most cases, not possible to process with SPSS-X, but possible with the ETS module from SAS. Both the basic SAS system and ETS module would be required. This system will handle both univariate and multivariate time-series analyses and linear and nonlinear systems of simultaneous equations. In addition, all the basic statistical analyses performed by the OAE can probably be handled by SAS. SAS would probably not be suitable for survey processing for much the same reasons that SPSS-X is not. However, the MATRIX procedure in SAS may be powerful enough for some purposes.

5. If IBM equipment is obtained, the survey should be reevaluated and a determination made as to whether it is actually needed or not. If less detail were included in the surveys, processing could be streamlined and estimates obtained in a more timely manner.

CHAPTER 8. FUTURE NEEDS AND DIRECTION

The Office of Agricultural Economics (OAE) has now had the benefit of two long-term projects to provide technical assistance in developing research and policy analysis capability. Every indicator is that there have been substantial changes in the capability of the staff, the range of activities in which the OAE is requested to participate, and the volume of activities in which the OAE is actually involved. The OAE has a large staff of highly trained personnel relative to agricultural research units in most developing countries, and the OAE is using some of the most sophisticated equipment, statistical designs, and research techniques being applied throughout the world. All who are involved, however, will quickly admit that performance still can be improved substantially.

Questions still surround the quality of statistical estimates produced by the OAE. Lack of timely of reporting continues to plague the office on some activities. The limited extent of publication and distribution of analyses concerns some users within the Royal Thai Government (RTG), and some outside observers. The role of the OAE in agricultural policy and analysis and its relationship to activities in the NESDB, is a clouded issue in the minds of some observers.

None of these issues are unique to Thailand, and none have escaped discussion by the OAE, the Agricultural Sector Analysis Project (ASAP) team, the Agricultural Planning Project (APP) team, and numerous other cooperating agencies. The environment for data collection, research, and policy analysis is extremely fertile in Thailand. While the organizational charts may not be as formal as some donors would like, the reality is that the OAE has had a very significant impact on agricultural research and policy analysis in Thailand over the last decade. Maybe one of the most serious faults of the OAE is that it has been too busy doing policy analysis to explain to donors and other critics what the scope and purpose of its activities are. In any competitive environment there are willing critics, and in an open economic, social, and political system that opportunity should exist.

The OAE is like any other growing and productive organization. The Office could literally use hundreds of additional staff, many years of long-term technical assistance, many months of short-term technical assistants, more advanced training for current staff, new and better equipment, better facilities, and huge increases in operating budgets. But within the constraints of reality, it is our responsibility to identify the areas of needs that seem most consistent with maintenance of the capability that has been

developed, and with providing for the future development and growth of the OAE to meet the growing research needs of the RTG.

Unfortunately, there was substantial slippage in productivity in certain areas between the ASAP and the APP. Part of this was due to reorganization which moved key personnel to new areas of responsibility, and part was due to the lack of professional reinforcement required to support growth in any organization. The project design was faulty for both the ASAP and the APP in that both failed to provide for continued short-term technical assistance for the staff after the long-term staff assignments were completed. While the role of long-term technical assistant is to institutionalize capability with the host staff, it is well recognized that three- or four-year projects do not provide enough time to send qualified personnel abroad for advanced training and return them to fully implement their news skills in the host country. In many cases, the newly trained staff barely return to the country by the time the long-term consultant is packing for departure.

Ideally, projects would be designed with short-term consulting on the front end of the project to allow for interaction and selection of key personnel for advanced training, long-term technical assistance would occur when the trained personnel return, and an extended period of short-term consulting would occur at the end of the project to reinforce procedures and address new issues that inevitably arise. Continuity in returning consultants provides an opportunity for host staff to maintain a professional link with the outside world, and puts some pressure on the host staff to maintain standards that have been achieved, or to reach for goals that have been established. It also provides some junior staff with increased leverage when the administration is aware that the technical consultants will be returning to review progress.

The OAE administration and the APP staff discussed the future resource and technical assistance needs of the OAE in some detail during the ISU administrative visit in July 1985. More is always preferred to less, but the following represent the mutual assessments of the immediate and realistic needs:

1. Long-term consultants would be desirable in several areas, but do not appear to be critically needed unless major new areas of responsibility are assigned or defined in the OAE.

2. Short-term consultants would be desirable in several areas, and probably would substantially enhance the productivity of the resources that have already been invested by the RTG and outside donors.

3. The desired short-term consultants are listed in order of the perceived need as of July 1985:

   a. Statistics and Data Collection. Continued support is needed for the full implementation of the Area Sampling Frame (ASF) on a national basis for all major commodities and special surveys, and for the remote sensing activities. Two assignments of four to six weeks each per year for the next two years, and one assignment per year for the next two years are needed.

   b. Policy Analysis. Assistance is needed in defining policy alternatives and modifications to the quantitative program models to assess the alternative impact of various policies. One assignment of six to eight weeks per year for the next four years is needed.

   c. Proper Budgeting. Continued support is needed for building the data base that has been initiated, for expansion of the coding system to include other departments and projects, and for design of more effective input and output report forms. Two assignments of four to six week each the first year, and one assignment per year for the next two years are needed.

   d. Computer Center. Assistance is needed with the system review and the design of upgraded facilities with the integration of the mainframe and remote terminals or microcomputers to minimize user access, and software consultation is needed for selection and implementation of user-friendly packages that will standardize some of the routine data processing and analysis work and minimize the custom programming load which currently is associated with each new survey or data set. One assignment of six to eight weeks each year for the next four years is needed.

   e. Training for Zone and Regional Offices. Assistance is needed in all aspects of organization, data collection, use of terminals or microcomputers for communications, data transmission, and preliminary data checks and survey processing. With the decentralization to zone and regional offices, the training will be extensive and it would appear that a consultant would be most effective if used to help develop the training materials that were used in field training, and to train a small group of training staff that would actually schedule and conduct the field training in conjunction

with specific field activities over several months or years. One assignment of six to eight weeks per year for the next three years is needed.

4. The statistics center, the computer center, and several of the divisions have urgent needs for additional microcomputers and terminals to alleviate a critical bottleneck in data processing (data entry). The usefulness of the technology was demonstrated by renting terminals through the APP, and even with software that was not particularly user-friendly, the terminals were in high demand. Increased numbers of terminals and microcomputers, combined with improved software and communications packages, would significantly increase the productivity of the professional and support staff.

5. Additional RIPS equipment is needed to complement the equipment that was purchased at the end of the AP. It was recognized that the APP purchases were the bare minimum needed to conduct the types of screenings proposed by the OAE, and in fact, they represent a reduction in quantity recommended by consulting specialists. Concern about the effectiveness of this state-of-the-arts technology should quickly be removed with the current equipment in operation, and with realistic assessments of the actual workload possible. Currently, it is anticipated that most of the RIPS processing components should be duplicated at the earliest opportunity.

6. The mainframe computer must be upgraded soon, and the expiration of the current contract represents an excellent opportunity. Outside assistance would be desirable, but funding for this major and long-run investment probably will have to come from RTG funds.

APPENDIX I

APPENDIX 1. TECHNICAL STAFF AND CONSULTANTS

Appendix 1.A. Long-Term Staff

	Name	Position	Assignment	PY
1.	Dr. J. Edwin Faris	Planning and Policy Managment	07/82-06/84	2.0
		Chief-of-Party	07/82-06/84	
2.	Dr. Gary Vocke	Economic and Data Analysis	07/82-06/84	2.0
3.	Mr. Winton Fuglie	Project Development and Design	08/82-07/85	3.0
4.	Mr. Dan C. Tucker	Agricultural Statistics	05/83-10/85	2.5
		Chief-of-Party	07/84-10/85	
		Total Long-Term Staff (Years)		9.5

Appendix 1.B. Administrative Support and Consultation

	Name	Position	Starting	PM
1.	Dr. Keith D. Rogers	Project Manager	07/82	0.75
2.	Dr. Earl O. Heady	Project Director	04/83	0.10
3.	Dr. Keith D. Rogers	Project Manager	05/83	0.75
4.	Dr. Keith D. Rogers	Project Manager/Acting Director	06/84	0.75
5.	Dr. Keith D. Rogers	Project Manager/Acting Director	08/84	0.50
6.	Dr. Keith D. Rogers	Project Manager/Acting Director	07/85	1.00

Appendix 1.C. Short-Term Consultants

	Name	Position	Starting	PM
1.	Mr. Dan C. Tucker	Ag Stat/Area Frame	01/83	0.25
2.	Mr. William Wigton	Remote Sensing	02/83	1.00
3.	Mr. Dan C. Tucker	Ag Stat/Area Frame	02/83	0.25
4.	Mr. William Wigton	Remote Sensing	05/83	0.75
5.	Mr. Dale Lefor	Computer Systems & Data Management	06/83	2.00
6.	Dr. Ken Nicol	Crop & Livestock Budgeting	11/83	1.25
7.	Mr. Bruce Graham	Data Analysis	01/84	1.50
8.	Dr. Thomas Lyson	Socioeconomic Analysis & Survey Design	01/84	1.50
9.	Mr. Dale Lefor	Computer Systems & Data Management	03/84	2.50
10.	Dr. Ken Nicol	Crop & Livestock Budgeting	04/84	1.50
11.	Dr. Bruce Wright	Commodity Analysis	05/84	2.50
12.	Dr. Leroy Blakeslee	Policy & Marketing Analysis	10/84	1.00
13.	Dr. Fletcher Riggs	Management & Information Systems	10/84	1.50
14.	Dr. James Stephenson	National Econometric Analysis	12/84	1.00
15.	Dr. Russell Olson	Program and Policy Budgeting	01/85	1.00
16.	Dr. Arthur Stoecker	Quantitative Economist & Data Analysis	02/85	0.75
17.	Mr. Bruce Graham	Agricultural Statistics & Data Analysis	02/85	1.50
18.	Dr. Arthur St.George	Computer Center & Data Base Base Management	03/85	1.00
19.	Dr. Fletcher Riggs	Management & Information Systems	05/85	1.50
20.	Mr. Fred Baker	Computer Center Systems &		

	SUDS Data Processing	08/85	1.00
21. Dr. Larry Kinyon	Computer Systems Programming	09/85	1.00
22. Mr. William Wigton	Remote Sensing	09/85	1.00
	Total Short-Term Consulting (Months)		27.25

APPENDIX 2

APPENDIX 2. OFFICE OF AGRICULTURAL ECONOMICS COOPERATING STAFF

Appendix 2.A. Office of the Secretary General

	Name	Position
1.	Dr. Somnuk Sriplung	Secretary General
2.	Mr. Nguen Srisurak	Deputy Secretary General
3.	Mr. Narong Chuprakob	Deputy Secretary General
4.	Mr. Winai Tayyaitieng	Chief of the Office of Secretary
5.	Mr. Vaiyavuth Surapruik	Chief of Personnel Section
6.	Mr. Nipont Dilokkunanant	Chief of Coordination and Information Section

Appendix 2.B. Division of Policy and Agricultural Development Plan (DPADP)

	Name	Position
1.	Dr. Thongchai Petcharatana	Director
2.	Mr. Kitipong Surainrungsikul	Chief of Policy and Crops Development Plan Analysis Section
3.	Dr. Kanok Katikarn	Chief of Agricultural Development Plan Analysis Section
4.	Dr. Prasit Itharattana	Chief of Regional Development Plan Analysis Section
5.	Mr. Prasit Supradit	Chief of Agricultural Policy Framework Analysis Section
6.	Mrs. Yowarate Bandhukul	Senior Economist
7.	Dr. Aroon Auansakul	Chief of Agricultural Development Project Analysis Section

Appendix 2.C. Division of Economic Project and Program Evaluation (DEPPE)

Name	Position
1. Mr. Thawat Lelanuja	Director
2. Mr. Chamnong Vathana	Chief of Government and International Cooperation and Evaluation Section
3. Dr. Banterng Masang	Chief of Integrated Agricultural Development Project and Farmer Institution Evaluation Section
4. Mr. Phonwat Thaomahawong	Chief of Natural Resources Conservation Development Project Evaluation Section
5. Miss Sirinart Chaimun	Economist 4

Appendix 2.D. Plan Implementation Division (PID)

Name	Position
1. Mr. Chamras Ungkarplaong	Director
2. Mr. Surasak Tongpian	Chief of Section
3. Mrs. Patcharaporn Sunawin	Chief of Section
4. Mrs. Orwana Vongkomolshet	Chief of Section
5. Mr. Sudhep Indhapanya	Chief of Section
6. Mrs. Vannapha Yongchareon	Chief of Section
7. Mr. Phudhiphong Suraphruk	Policy & Planning Analysis Officer
8. Mr. Triboon Thanuthep	Policy & Planning Analysis Officer
9. Miss Sirikul Sangsakulrojna	Policy & Planning Analysis Officer
10. Mr. Thanu Suvarnin	Policy & Planning Analysis Officer
11. Miss Jintana Tiradumrongkul	Policy & Planning Analysis Officer
12. Miss Woramon Phaopaisan	Policy & Planning Analysis Officer

Appendix 2.E. Center for Agricultural Statistics (CAS)

Name	Position
1. Mr. Rusmee Kasemsap	Acting Director
Statistical and Survey Planning Branch	
1. Dr. Apichart Pongsrihadulchai	Chief of Branch
2. Mr. Chanchai Towiwat	Statistician 4
Data Preparation and Publication Branch	
1. Mr. Sun Permpongsri	Chief of Branch
2. Mrs. Puangsri Saibang	Statistician 5
3. Mr. Porntep Sangsuwan	Statistician 6
Computer Branch	
1. Dr. Wisut Wangworawut	Chief of Branch
2. Mr. Winai Hirunsri	Computer Programmer 6
Forecasting and Estimating Branch	
1. Dr. Apichart Pongsrihadulchai	Acting Chief of Branch
2. Miss Buppha Mongkulsin	Agriculturist 5
3. Mr. Motree Muangprom	Statistician 5
4. Mr. Montol Jeamchareon	Agriculturist 5
5. Mr. Prakobkit Phusirimongkul	Agriculturist 6
6. Mr. Boontham Phonyiam	Agriculturist 5
Remote Sensing Branch	
1. Mr. Thawach Leelasuwanich	Chief of Branch
2. Miss Supawan Kuchaisit	Agriculturist 5
3. Mrs. Thanomsri Rangsikanbhum	Agriculturist 5
4. Mr. Supan Karnchanasutham	Agriculturist 5
5. Mr. Wichan Amarakul	Statistician 4

Appendix 2.F. Division of Agricultural Economics Research (DAER)

	Name	Position
1.	Dr. Supote Dachates	Director
2.	Dr. Boonkerd Budhaka	Chief of Agricultural Resource Section
3.	Mr. Boontam Prommani	Chief of Farm Management Research Section
4.	Mr. Wiraj Jamjanya	Economist 6
5.	Mr. Chamnong Siddhidamrong	Economist 6
6.	Miss Chintana Sudaiwon	Economist 6
7.	Miss Pilai Panumatmonton	Economist 5
8.	Mr. Danai Taipanich	Economist 5
9.	Miss Prachumporn Suchatanon	Economist 4
10.	Mr. Ophas Pansema	Economist 4
11.	Mr. Nakorn Yimsirivattana	Economist 3