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AN EVALUATION OF THE DEVELOPMENT AND UTILIZATION OF AN ANALYTICAL MODELING CAPACITY IN THE DIVISION OF AGRICULTURAL ECONOMICS, MINISTRY OF AGRICULTURE AND COOPERATIVES, THAILAND

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Prepared by a

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for

Department of Technical and Economic Cooperation

and

United States Operations Mission

Bangkok, Thailand

January, 1975

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An Evaluation of the Development and Utilization of an Analytical Modeling Capacity in the Division of Agricultural Economics, Ministry of Agriculture and Cooperatives, Thailand

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The team was favorably impressed with the progress being made on the modeling effort. It appears that the models being developed are appropriate for policy, program and project analysis. The data being collected for the sector analysis are appropriate and are being treated with due regard for reliability and consistency with other available data. It is the team's impression that the analytical capability in the Division of Agricultural Economics (DAE) is currently being used for agricultural policy and planning purposes, in the preparation of the Fourth Five-Year Plan and at the national cabinet level on policy issues involving agriculture and for policy issues posed by other agencies. The team is impressed with the degree of effectiveness of the linkages that already exist between the analytical modeling capability and important decision making bodies. The team believes that the analytical modeling capability being developed by this joint project is being institutionalized in the DAE to a truly remarkable extent. They regard this as one of the most successful characteristics of this project and conclude that the effects of this joint effort are likely to be long-term in nature. They made 9 recommendations, the primary one being that the analytical modeling project continue to be supported by the Thai and U.S. governments.

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I. General Introduction

While the population density of Thailand is not high at the present time, relative to many countries of the world, the rate of population growth (approximately three percent) is one of the world's highest--leading to population projections of more than twice the current population for the year 2000. Approximately three fourths of the Thai labor force are employed in the agricultural sector, and rice and other agricultural commodities predominate in the exports of Thailand's export--oriented economy.

It is an oversimplification and yet the essence to say that Thailand's economic destiny is a function of two opposing variables--agricultural productivity and population growth. In even more gross and simplistic terms, Thailand's economic future may well depend upon whether or not its people must consume what otherwise would be its exports.

We of the evaluation team are grateful for having been permitted by the Department of Technical and Economic Cooperation (DTEC) and the United States Operations Mission (USOM) to review U.S. assistance to, and economic cooperation with, Thailand in this important sector analysis project in Thai agriculture. Such assistance and cooperation are variables of small magnitude relative to the basic variables that will determine Thailand's economic future, but such assistance and cooperation can be highly productive if used to affect these more basic variables. Projects

such as the one we have reviewed may affect significantly Thailand's chances of achieving its great potential.

It is thus with a special sense of responsibility and concern for our own inadequacies, particularly in view of the single week provided for this exercise, that we, as an evaluation team, have conducted this review. The review was conducted at the request of DTEC and USOM by a team of Thai and U.S. economists in accordance with terms of reference agreed upon in advance and which provide the basic organizational framework for the succeeding section and for the main body of the report. These terms of reference preface the third major section of this report.

Evaluation Team Cooperation

The Evaluation Team was comprised of the following individuals:

(1) Dr. Chinnawoot Soonthornsima (co team leader), Economic Affairs Officer, United Nations, Economic and Social Commission for Asia and the Pacific.

(2) Mr. Dulyaroj Lirkvarakom, Technical Service Division, Department of Technical and Economic Cooperation

(3) Mr. Lane E. Holdcroft, Chief, Rural Development Division, Bureau for East Asia, Agency for International Development, Washington, D. C.

(4) Dr. W. David Maxwell, (co team leader) Dean, College of Liberal Arts and Professor of Economics, Texas A&M Univ.

(5) Dr. Alan M. Strout, Professor of Economics Massachusetts Institute of Technology.

(6) Dr. George S. Tolley, Deputy Assistant Secretary of the Treasury, Washington, D. C.

(7) Dr. Virabongsa Ramangkura, Assistant Professor of Economics, Chulalongkorn University.

Dr. William C. Merrill, Agricultural Economist, Economic and Sector Planning Division, Bureau for Technical Assistance, Agency for International Development, Washington, D. C., assisted the evaluation team as an observer.

Major Purpose of the Review

The major purpose of the evaluation was to review the progress being made on a joint Thai-U.S. effort, in the Division of Agricultural Economics of the Ministry of Agriculture and Cooperatives, to develop in this unit the capability necessary to construct and utilize a complex of large scale, computerized, econometric models--including a national linear programming model of Thai agriculture based on zonal and regional models, demand analysis models for various Thai agricultural products, transportation and marketing models for major Thai commodities, regional development models, and a macro model linking the national linear programming model to selected segments of the non-agricultural sector. Construction of such models is an interrelated, iterative process, the validity of the models increasing with replication and with the construction of interrelationships between models.

II. Summary of Conclusions and Recommendations

Summary of Conclusions

1. The appropriateness of the agricultural sector model complexes now being utilized and those being developed under this project for policy, program, and project analysis and the appropriateness of the data being collected for the sector analysis (A 1 and B 1 of the Terms of Reference).

The team was favorably impressed with the progress being made on the modeling effort. This progress is especially impressive in view of the particular manner in which it has been achieved. Much of the Iowa State University (ISU) Team effort has been devoted to improving the analytical modeling capability of their Thai colleagues in terms of understanding, constructing, and using the sector model complexes. Thus much of the progress of the modeling effort has been made by Thai staff members of the Division of Agricultural Economics(DAE), thereby assuring that a long-run capability is being built into the DAE.

It appears that the models being developed are appropriate for policy, program and project analysis. The major policy goals related to Thai agriculture concern the increasing of productivity and incomes within Thai agriculture and improving the distribution of income between the agricultural and non-agricultural sectors. Progress toward the use of the modeling capability on policies directed to goals such as these is

encouraging. The same is true for agricultural planning as a whole. For broad planning purposes the model is very close to being operational in the sense of capability of providing valuable insights to analysts and decision makers engaged in economic planning.

The work plan of the project is ambitious and we have been impressed with the diligence of the ISU Team and DAE personnel engaged in this project. Nonetheless, Thailand has many important problems concerning rural development on which this modeling capacity could provide good insights when it is more fully developed (for example, the allocation of resources devoted to the provision of health and educational services in the rural areas). We would hope that this capability can be applied to some of the broader rural development problems when time and other resources permit.

The data being collected for the sector analysis are, in our opinion, appropriate and are being treated with due regard for reliability and consistency with other available data. Much interest in these data has been evinced in other units of the Thai Government, in international agencies, and in university circles, all of whom might well be able to use these data for Thailand's benefit.

We therefore recommend that a greater effort be made to publish and widely disseminate, as soon as possible, the data secured by the DAE, as well as the studies produced with the assistance of the capability being developed--even though they must be labeled as preliminary.

2. Prospective uses and usefulness for the analytical capability developed--to the Ministry of Agriculture and Cooperatives (MOAC) and other entities of the Royal Thai Government(RTG) --including assessment of Thai bureaucratic capability and mechanisms for coordination and integration of analytical work into the decision making process; and the effectiveness of U.S. assistance to the Agricultural Statistics Center data collection, processing and publications program. (A2 and B2 of the Terms of Reference).

The team is concerned that the current and prospective users of the analytical modeling capability being developed in the DAE, as well as the DAE itself, have an informed awareness of the nature of the results to be expected from an effort such as this. They should all understand, at least to some extent, the basic assumptions and limitations of the approach so that they can appreciate accurately its potentialities. In furthering this objective the DAE should make every effort to present its results in simple language in terms of objectives, assumptions, and choices of alternatives.

It is our impression that the analytical capability in the DAE is currently being used for agricultural policy and planning purposes. It is also being used in the preparation of the Fourth Five-Year Plan. It is being used at the national cabinet level on policy issues involving

agriculture and for policy issues posed by other agencies. While it is difficult to isolate the specific contribution of the ISU Team in this respect--since they operate as an integral part of the DAE--their role in developing and continuing to build the analytical capability is quite evident and they have worked in collaboration with their Thai colleagues on many of the issues posed.

We have every expectation that these uses of the analytical modeling capability in the DAE will continue and, in fact, increase as the modeling effort and the strengthening of this capability increase. Thus the usefulness of the DAE to the MOAC and to other governmental units such as the National Economic and Social Development Board (NESDB) and the Council of Economic Advisors can be expected to increase.

Governmental bureaucratic structures pose problems of policy implementation in every nation. The RTG is no exception. The fact that a proposal is being considered to upgrade the DAE to an office is, at least in part, a recognition of the need to integrate analytical work into the decision making process. Such work is integrated now to a considerable extent, but due in large measure to the relationships between particular people. The fact that institutional changes are being contemplated, for the same objective, may indicate a more formal response to the problem.

We also note with particular pleasure the suggestion that a continuing liaison committee be created to assure coordination within MOAC and between DAE and such entities as NESDB, other units of the RTG, and the universities.

The success of the modeling effort depends strongly upon the quality of the data secured. At present the quality of the available data varies widely and substantial efforts to improve the quality of agricultural statistics is badly needed. We have learned that the quality of the work performed by the Agricultural Statistics Center has improved substantially in the last year--both in terms of quality and timeliness. In our opinion, however, the U.S. should assist the Center by providing short-term and/or intermediate-term technical assistance to improve the area sample frame procedures, the data processing and computer coding, the sampling procedures, and the accuracy of field data collection.

3. Identify other activities, linkages, that would facilitate full utilization of analytical capability being developed for decision making (A3 of the Terms of Reference).

We are impressed with the degree of effectiveness of the linkages that already exist between the analytical modeling capability and important decision making bodies. To the American members of our team these linkages are different and more personalized than those to which they are accustomed but these linkages are remarkably effective.

In large part this is due to the fact that a small group of people who are well acquainted with each other do so much of the decision making work in Thailand. But now this group of important people have to communicate concerning something that--despite their wisdom--is not familiar to all of them. Perhaps the world's wisest man does not

know what the term "econometric model" means. The problem is thus that of building bridges of understanding so that this intellectual machine can make its limited contribution to the welfare of Thailand.

One thing that should be done is to develop an analytical modeling capability at the agencies closely connected with agricultural development --or, if it already exists at such agencies, at least a part of it should be devoted to securing familiarity with the DAE modeling effort. In essence what is needed in such units as NESDB, the Bank for Agriculture and Agricultural Cooperatives(BAAC), and the Ministries of Commerce, Industry, and Communications are "translators" who understand the modeling effort and know something of its strengths and weaknesses, who can take policy questions and pose them in a form appropriate to the models and then translate the insights gained from the model complexes into terms useful to the decision makers. The liaison committee, discussed elsewhere in this summary, should also be beneficial in this regard.

It would also be very helpful if the statistical collection work of the DAE were linked more closely to the corresponding activity occuring in other governmental units such as the National Statistical Office (NSO) and the ministries.

4. The degree of institutionalization of analytical capability in the Division of Agricultural Economics, MOAC--staffing, budget, facilities--and the role of U. S. assistance. (A4 of the Terms of Reference)

It is the impression of the evaluation team that the analytical modeling capability being developed by this joint project is being institutionalized in the DAE to a truly remarkable extent. We find this to be among the most successful characteristics of this project and we conclude with confidence that the effects of this joint effort are likely to be long-term in nature.

The very fact that this effort has been so well institutionalized, however, has contributed to the impression we have that knowledge about this project is not sufficiently widespread--that there are other units and other people that should better informed about this project--its nature, its progress, and its capabilities. When outside people are interested and concerned but have insufficient information, this may lead to poor information taking the place in their heads that good information should fill.

We conclude that the RTG has shown its commitment to this project by its material support, that U.S. assistance and economic cooperation have been wisely used, and that the degree of institutionalization of the analytical modeling capability in the DAE is very good.

We recommend, however, that more attention and resources be devoted to communicating to other units and people the nature and results of the work that is being done. Data collected should be published despite their limitations, and publications such as the northern Thailand study and the recent annual report should be widely disseminated, despite their preliminary nature.

We have been favorably impressed by the effectiveness of U. S. assistance and economic cooperation to date. The major components of U. S. assistance and cooperation relate to the ISU team and advanced training for the DAE staff in the U. S. Both have greatly enhanced the institutionalization process.

We recommend strongly that U. S. assistance and economic cooperation be continued. We also have some more detailed recommendations concerning the nature of this support. Discussion of these recommendations is contained in the third major section of this report.

5. Adequacy of this activity and activity B below (Agricultural Statistical Data Base) to achievement priority joint goal of improving productivity and incomes of the poorest half of rural people (A 5 of the Terms of Reference)

Special problems exist in pursuing, within the modeling effort, the special interest of the RTG and USG in improving the productivity and incomes of the poorer half of the rural population. While the models being developed are designed to provide insights on proposals affecting

farmers as a group and to provide insights on proposals affecting the farmers in individual zones and regions, much more basic research must be done if the effort is to provide insights on proposals affecting the lower half of the rural income distribution. This problem is less severe, of course, to the extent that the poorer half of the rural population are concentrated geographically.

Even so, a great deal more basic research is needed before the model complexes will be able to shed their maximum light on policy proposals designed to achieve this goal.

Recommendations

1. That the analytical modeling project continue to be supported by the RTG and the USG.

2. That the mix of skills provided by the ISU team be modified in order to strengthen the policy analysis work of the DAE. This could be accomplished by the addition of a senior policy analyst as team leader. The policy analysis work should be further strengthened by the addition of a rural development specialist who would focus upon use of the analytical modeling capability to assist in the analysis of policy issues relating to the provision of social services to the rural population and also relating to rural industrialization and other aspects of integrated rural development. These skills can be added to the team without a net increase in man months of technical services, as detailed in the third

major section of this report. It should be noted that flexibility in staffing in terms of skills is desirable; e.g., it may be possible to recruit an individual who can adequately perform both the Marketing Specialist and Demand Analyst functions.

3. That short-term or intermediate-term technical assistance be provided to the DAE for the purposes of increasing the accuracy of data processing, improving sampling procedures, and developing more accurate field data collection procedures.

4. That the RTG and USOM consider sponsoring another project review a year from now which would not only monitor the further progress achieved in model construction (particularly of models other than the zonal models) and in improvement of basic data but would also focus on "utilization" and at that time make recommendations with respect to the staffing of the U.S. component of the DAE for the last two years of the five-year project.

5. To provide well-coordinated and effective use of the modeling capability of DAE (within and outside MOAC) it is recommended that a continuing liaison committee, consisting of DAE and the major users or potential users of information from DAE (including the Projects Division, NESDB, the Bank of Thailand (BOT), and academic institutions) be created to exchange information and views, progress reports, statements of needs requirements, and other matters of common interest.

6. That communication with, and access to, the results of the work of DAE be further improved by:

(a) the addition of a staff member in each of the units related to agricultural development and national planning (or his assignment to this function if already present) who has the requisite skill and training to serve as a communications specialist between the analytical modeling activity of the DAE and the agency in which he is employed.

(b) expediting the publication and widespread dissemination of DAE data and publications to other interested agencies of the RTG, the academic community, international agencies, et al., even though such data and such publications must be labeled preliminary. Current examples of publications that should receive widespread distribution are the Northern Thailand Study, the Research Strategies Report and the recent ISU Annual Report.

(c) cooperating more directly with the academic community. The DAE should present seminars for the benefit of interested scholars at Kasetsart, Thammasat, Chulalongkorn, et al., and also for its own benefit. Similarly, it should provide access to its data and studies to the graduate students working under the direction of these scholars, again for their benefit and also for its own benefit.

(d) presenting the results of the DAE modeling effort in simple language which indicates the immediate objective of the particular study presented, its assumptions, the alternative policies or strategies

considered together with the rationales for their rejection, and an indication of how these results relate to the government's development objectives or policies.

7. That the statistical data collection work of the DAE be linked more closely to the corresponding activity occurring in other governmental units such as the NSO and the ministries.

8. To assure coordination within the MOAC in the process of project and program implementation, a more clear-cut division of duties and responsibilities, and a clearer statement of procedures should be made and this information made known to those who work in the DAE and the Projects Division and in other relevant agencies.

9. That the modeling capability be devoted, when time and resources permit, to a broader range of policy issues related to rural development, including the provision of health, education and other social services to the rural population and rural industrialization.

III. Detailed Project Review

The present major section is organized in accordance with the terms of reference which were followed in the detailed project review. These terms of reference were the following:

A. Agricultural Sector Analysis. Evaluate:

(1) Appropriateness of agricultural sector model complexes now being utilized and those being developed under this project for policy, program, and project analysis.

(2) Prospective uses and usefulness for analytical capability developed--to the Ministry of Agriculture and Cooperatives (MOAC) and other entities of the RTG--including assessment of Thai bureaucratic capability and mechanisms for coordination and integration of analytical work into the decision making process.

(3) Identify other activities, linkages, that would facilitate full utilization of analytical capability being developed for decision making.

(4) The degree of institutionalization of analytical capability in the Division of Agricultural Economics, MOAC--staffing, budget, facilities--and role of U.S. assistance, and

(5) Adequacy of this activity and activity B below to achievement priority joint goal of improving productivity and incomes of the poorest half of rural people.

B. Agricultural Statistical Data Base. Evaluate:

(1) The appropriateness of the data being collected for the sector analysis;

(2) The effectiveness of U.S. assistance to the Agricultural Statistics Center data collection, processing and publications program; and

(3) Thai personnel numbers and grades and necessary budget in relation to present and future role of the Agricultural Statistics Center and role of U.S. assistance.

(A 1) Appropriateness and Usefulness of the Modeling Effort for Policy, Program and Project Analysis.

Many have misconceptions about the policy role of linear-programming models (as well as other large-scale, economic-technical models). In general, linear-programming models have proven most successful when dealing with processes in which the technical relationships are complex but well known and understood, where the vagaries of human behavior are relatively unimportant, and where the goals sought are unambiguous, non-contradictory, and quantifiable. Under these circumstances models can produce "best" solutions with some degree of confidence and acceptability. Examples include the most efficient operation of a highly automated factory or industrial process, choice of queuing rules for a ship unloading facility, selection of an animal feeding program for maximum weight gain at lowest cost, and transportation systems of many varieties.

When such conditions are not met (as is true of the models being developed for use in Thailand) questions cannot be answered except in very tentative and carefully qualified ways. The LP or other modeling results must be used with great caution and care. What can be done under these conditions is to work out some of the implications of certain changes in current policies or of the introduction of new policies, activities, or projects. Correctly spelling out the key assumptions is very important. The list of assumptions, if complete, is usually extensive, crucially important, often quite restrictive, and easily ignored by the users of the results. As model specification is improved and better data are incorporated the list becomes less restrictive - but a completely valid model for all conditions can never exist in the economic or social fields.

At the present time or in the near future the DAE models should be able to provide useful insights on a wide range of important questions. These insights must be carefully judged in light of other analyses, internal consistency, common sense, and the limitations of the basic assumptions. Important assumptions at present include: (1) for producing a particular crop the effects of substitutions among inputs (human labor, fertilizer, water, animal power, land, etc.) cannot be reflected in the model, (2) the choice of crops and technologies within an agro-climatic zone are limited (in the model) to those technologies and crops already existing within the zone, and (3) consumer behavior in response to price and income changes is not directly reflected in the sector model (although implicitly

reflected in the demand analysis models).

The question of the appropriateness of the sector model, despite its limitations, for policy, program, and project analysis raises immediately the further question, "Relative to what?". One would also prefer to answer the question in terms of a particular policy, program or project analysis (as well as particular portions of the model complex). It is, however, a proven technique that has been used with what are regarded as beneficial results on the general range of topics posed by the question.

The key issue in evaluating the DAE/ISU effort in Thailand is whether the modeling capability will provide an effective policy analysis tool. Preliminary results from the LP models for the northern zones have already been obtained and oral reports and discussions with members of the DAE/ISU group make it apparent that progress toward securing initial results for all the 19 zones is being made rapidly. The rate of progress of the model construction work is impressive. Limited operational models are available, and will become available increasingly.

Whether the modeling effort will become an effective policy analysis tool in Thailand, however, depends upon the appropriateness of the models for analyzing the particular policies that are likely to be considered by the Thai government and, obviously, upon whether they are actually used in such instances. It is our conclusion that there are policy questions appropriate to the models and that they are likely to be used to analyze these questions to an increasing extent as the analytical modeling capability develops.

Nonetheless, while the models themselves should prove to be useful tools for policy, program, and project analysis, these uses must always be subjected to careful qualification and can only be developed and tested through continuous trial and experimentation. This implies that the user-education and model-testing phase of the project should receive priority attention over the next few years.

The list of problem areas and policy possibilities includes, but is not limited to, pricing of agricultural commodities, irrigation development and water use, agricultural credit, policies towards inputs (most particularly fertilizer), land development, and government expenditures aimed at providing services to rural parts of Thailand.

One use of the modeling capability being developed is to provide insights on the question of major alternative broad strategies toward agricultural development; for instance, in deciding on the relative emphasis to be placed on irrigation, credit, and other major policy thrusts. This use relates directly to planning. One of the main advantages of an overall model is that it forces consistency in viewing alternatives, while still forcing a look at the whole. This use of the model being developed offers the exciting prospect of making agricultural planning a tool for seriously weighing options and assisting the guidance of programs subsequent to the planning exercise. We were pleased to learn that special efforts are being made to give the model a limited operational capability for use in connection with the Five-Year Plan.

The modeling capability can also be used, as it is developed, to assist the analysis of specific policies being contemplated on a current basis. This is in addition to, and often apart from, longer-term agricultural planning. We understand that this developing capability has already been used on questions such as the location of the farmers' markets.

The model component area breakdown into 19 zones indicates an attempt to reflect the variety of conditions that affect Thai agriculture, with provision for securing insights into farmer choices in response to conditions thought likely to be affected by policy changes. The farm programming, transportation, and marketing models are well designed and show promise of providing operational results relatively soon. The macro modeling effort, linking agriculture with the remainder of the economy, is less far along and will probably require at least a two-year model construction period. This ambitious effort involves questions of the total growth of the Thai economy, the demand implications on Thai agriculture and, most importantly, the division of the population between agriculture and non-agriculture, as affected by events throughout the economy.

Rural development, both in terms of industrialization outside of Bangkok and the provision of social services for rural people might profitably be included in the total analytical modeling effort. Rural development planning could aim to optimize the provision of educational, health and related services at specified levels and at minimum cost. Rural industrialization could examine firm profitability using the same

optimization techniques as those used for farming, and considering groups of activities to take account of economies of scale in urban activities. Such an expansion of the modeling effort would require the surmounting of significant technical obstacles as well as an expansion of the personnel and other resources devoted to the total effort.

(A 2) Prospective Uses and Usefulness of the Modeling Capability to Various Entities of the Thai Government - Including Bureaucratic Capability and Mechanisms for Coordination of Analytical Modeling Work into the Decision Making Process.

That DAE is increasingly being called upon to do the important policy analysis pertaining to agriculture is apparent, and in much of this analysis the modeling capability of the DAE/ISU team is being utilized. While the necessity for caution and care in interpreting and evaluating the results of such models has been stressed at various points in this report, it has not been stressed that the form in which these results are presented can do much to further their effectiveness. The DAE should present its results in terms of immediate objectives, the assumptions upon which recommendations are based and some analysis and open discussion of the alternative policies considered. The recommendations should be related to the government's development objectives. Presenting the results in proper form will further the uses and usefulness of the modeling capacity.

At present the quantitative economic models are being used by the DAE for:

(1) agricultural policy and planning purposes in the Ministry of Agriculture,

(2) the preparation of the Fourth Five-Year Plan,

(3) policy purposes at the national (Cabinet) level,

(4) policy purposes in other agencies, and

(5) general reference.

It is anticipated that this quantitative economic analysis will continue to be used basically as it is now but that the range of users and uses will broaden as more agencies become aware of the nature of the DAE's work and the type of analyses being undertaken. This conclusion is based partially upon the assumptions that (1) the DAE will be able to retain its key staff members and (2) changes in the bureaucratic structure during the next few years will result in increased coordination and cooperation between the DAE, the MOAC and other government agencies. The bureaucratic relationships both within the MOAC and between the MOAC and other agencies is extremely important in determining both the uses and usefulness of the DAE's agricultural sector analysis work.

Within the MOAC, the DAE and the Projects Division are both staff organizations which report to the Under-Secretary and share responsibility for project and program formulation and implementation. The DAE provides overall studies for strategy and policy development, as well as other

technical matters, for the use of the Projects Division in the project and program formulation process. The Projects Division assists other agencies in the MOAC in preparing and coordinating projects and programs based upon targets, strategies, and the agricultural development framework provided by the DAE. The Projects Division scrutinizes proposed projects as a part of its responsibility for project and program appraisal and sector plan preparation and is also charged with monitoring implementation of the sector plan and evaluation of project progress. The DAE has the additional responsibility to assist in evaluation of progress by collecting data for this as well as for more general purposes. This relationship between the two divisions is not always clearly understood and should be emphasized and publicized so that the division of work among these divisions would be more apparent.

With respect to policy matters, in contrast to the process described in the previous paragraph, the DAE (as a staff and technical organization unlike other divisions) assists the top management of the Ministry and of the Departments by providing economic analyses for their policy recommendations. Thus the potential uses for the DAE's modeling capability within the MOAC are large.

The DAE also assists the NESDB in preparing a national macro model with linkages among its various sectors and provides agricultural strategies and policies and detailed projections of the agricultural sector. Similar assistance from the DAE to the NESDB is provided each year for

the Annual Plan. The DAE also provides assistance to the NESDB on an ad hoc basis on policy recommendations affecting agriculture which require complex economic analysis.

Decisions on national policies are typically made by the Cabinet. The Council of Economic Advisors to the Prime Minister makes policy recommendations to the Cabinet as does the MOAC. Since the Director of the DAE is currently a member of the Council and since the DAE provides the economic analysis for policy recommendations of the MOAC, the analytical modeling capability of the DAE may have a large influence on policy recommendations. This is even more the case since the Deputy Under-Secretary of MOAC is also Deputy Minister. While some of these relationships might be altered by a new government, agricultural development will remain the country's top priority and the role of the DAE is not likely to be greatly diminished because of its role as an important staff organization of the MOAC.

In the future the DAE is likely to become the "think tank" of the MOAC and its analytical model building capability is likely to become an even more important tool for policy decisions reached at the national level. It will continue to be the basic reference source for studies and statistics in the field of agriculture and will have an increasing role in the construction and implementation of national plans.

Hopefully the DAE will adopt new characteristics and behavior as it becomes more prominent. Its data and studies need to be more readily

available to all users and it needs to make other entities more aware of its operations. We note with satisfaction the proposal for a liaison committee that would link the DAE more effectively to the other units with which it works.

(A 3) Other Activities, Linkages, that Would Facilitate Full Utilization of Analytical Capability being Developed for Decision Making.

There is little that we can add, from the information gleaned from our brief review, to the discussion on this point contained in other parts of this report. The proposed liaison committee and "translators" at the relevant units would facilitate greater utilization of the analytical modeling capability by increasing the linkages between DAE, NESDB, BOT, other Thai Government units concerned with agricultural and national development, international agencies, and the universities. The more that the DAE/ISU efforts are opened to outside scrutiny, the more quickly the basic statistics will be improved and the less likely will be the chance of serious errors of analysis and interpretation. This external scrutiny, to be effective, must be friendly, well informed, and constructive. While "opening up" the DAE will bring costs in terms of staff time and short-run bureaucratic dangers, the benefits to be gained by a more open modus operandi far outweigh the costs.

Linkages between the universities and the DAE/ISU effort could be built by such devices as the presentation of seminars, the timely publication

and widespread dissemination of data and studies (even though preliminary), assisting graduate students in gaining access to information relevant to their theses, and in other ways.

Other activities that would facilitate decision making by their inclusion in the modeling effort have also been suggested even though they may be somewhat unrealistic in terms of the resource constraints on the modeling effort itself. The area of rural development conceived more broadly than in the present effort is a case in point. Planning for the provision of health, education and other social benefits to the rural population, as well as rural industrial development, are activities that might well benefit from this type of modeling activity.

Ultimately, however, the success achieved by the modeling effort will depend upon what is known about people's behavior. To date, this knowledge is sketchy at best. The large resources needed for model development should not be allowed to detract from an even more basic activity--research on human behavior. In the interest of the modeling activity itself, exploratory studies utilizing data already collected by the DAE should be encouraged even when the direct usefulness of these studies to current policy questions may not be entirely clear, and many additional studies should be undertaken at the micro level of producer/consumer behavior where such behavior has been identified as critical to the development and understanding of the analytical models.

(A 4) Degree of Institutionalization of Analytical Capability in the Division of Agricultural Economics, MOAC--Staffing, Budget, Facilities and the Role of U.S. Assistance

1. General

The Evaluation Team has found the degree of institutionalization of analytical capability within the DAE to be among the most successful characteristics of this project. In comparison with similar efforts in other developing nations, this aspect of the project can be considered very successful, particularly in view of the relatively short time (17 months) since the arrival in Thailand of the ISU technical assistance team. It should be noted that the success to date has been possible only because of the earlier efforts in developing a trained Thai manpower resource base.

2. Indicators of Institutionalization

Institutionalization of a useful sector analytical capability in the DAE appears to have progressed very well over the past 17 months, particularly with reference to the development of Thai staff capabilities. Although it is difficult to quantitatively measure the degree of institutionalization of this analytical capability in the DAE, in the absence of more precise baseline information, the following provides some indication of progress made to date.

a. Manpower Development

Both in terms of numbers and quality, the DAE staff growth has been impressive. In recent years, the DAE staff has increased from about 300 to 725, and currently 243 have the BS degree, 37 the MS degree

and one possesses the Ph. D. In addition, 17 DAE staff members currently are in training in MS programs and four in Ph. D. programs in the U. S. The following table indicates the growth in DAE professional and project staff since 1967.

DAE STAFF GROWTH

	Government Officials					Other Employees				
Year	1st Grd	2nd Grd	3rd Grd	4th Grd	Total	Permanent	Temporary	Project Account	Total	Grand Total
1967	2	30	84	71	187	42	29	70	141	328
1968	2	61	128	71	262	81	38	54	173	435
1969	3	61	141	91	296	92	34	105	231	527
1970	2	90	138	102	332	67	21	69	157	489
1971	5	95	102	98	300	87	34	71	192	492
1972	6	144	71	97	318	106	55	158	319	637
1973	6	146	74	98	324	129	42	145	316	640
1974	8	150	66	106	330	158	91	146	395	725

The approach used by the ISU Team, in which each ISU technician (both long and short-term) works with a group of Thai researchers on a continuous daily basis appears to have provided an integrated cooperative research effort that has resulted in an on-the-job training environment (via personal tutoring and research leadership) that has rapidly upgraded the professional capabilities of the Thai staff members. The informal training opportunities to improve technical skills provided in this environment have been complemented by ISU Team-led formal classroom teaching in the DAE in-service training program--in economics, statistics, linear programming, econometrics, simulation methods and computer programming. The following table indicates the in-service training provided in the DAE over the past 16 months:

In-Service Training Program Taught by ISU Team

Subject Matter	Number of Students	Number of Hours
Fortran Programming	41	50
Linear Programming	40	25
Statistical Demand Analysis	30	25
Simulation	30	25

The long-term effort of the USOM and other external donors to provide Thai students with graduate level and short-term training in agricultural economics has provided a critical mass of talent that has been a significant factor in the progress of this project. USOM's contribution is shown in the following table.

USOM PARTICIPANT TRAINING IN AGRICULTURAL ECONOMICS

Field of Training	Returned					In States				To Go				Grand Total
	Obs 1-3 mm	OJT 6 mm	MS 24 mm	PhD 42 mm	Total	OJT	MS	PhD	Total	OJT	MS	PhD	Total	
FY 1963-69														
Ag Econ	5		11		16			4*						16
Ag Credit	11				11									11
Ag in general Econ	16		6		22									22
Ag Management			1		1									1
Marketing	2	7	2		11									11
Farm Mgt & Prod Econ	8		1		9									9
Farm Mgt & Accounting			1		1									1
Horticulture			1		1									1
Marketing Info Service	2		1		3									3
Total	44	7	24		75									75
FY 1970-75														
Ag Econ	4		2		6		7	2	9					15
Ag Development		1			1									1
Ag Market News		2			2									2
Production Econ			1		1						1		1	2
Econometric Stat			2		2									2
Economic Marketing			1		1									1
Statistics		2	2		4		4		4		1		1	9
Market Development		1			1									1
Institutional Econ							1		1					1
Price Analysis							1		1		1		1	2
Marketing Research		1			1						1		1	2
Data Processing		2			2									2
Econometric System							2		2					2
Marketing Demand Anal							1		1					1
Computer Science							3		3					3
Production Model											1		1	1
Farm Management											1		1	1
Macro Econometrics											1		1	1
Crop Forecasting		1			1									1
Ag Outlook										1			1	1
Total	4	10	8		22		19	2	21	1	7		8	51

* 4 of the 11 MS recipients are studying in Ph.D. programs with other financing.

Other indications that the Thai staff capabilities have increased are the:

(1) increased number of policy and program issues being directed to DAE for analysis from both within and without the MOAC, e.g., economics of fertilizer application, deep well irrigation and optimal size of irrigated areas;

(2) increased number of policy and program issues being directed to DAE Thai rather than ISU staff members for analysis from both within and without the MOAC;

(3) increased quantity of analysis being undertaken by DAE Thai staff without ISU team involvement;

(4) increased percentage of computer time being used by DAE Thai staff rather than ISU staff members--from zero percent in September 1973 to more than 85% in December 1974;

(5) increased timely output of draft legislation for Parliament--ten drafts in the past two years;

(6) increased capability of DAE staff to collect and collate improved statistical data and other information for dissemination to other RTG organizations.

Also, discussions by members of the Evaluation Team with RTG "users" of the DAE's output both within and without the MOAC suggest that much progress has been made in the development of Thai staff capabilities. The Team was particularly impressed with the quality of the DAE Thai

staff presentations of the various complex modeling efforts underway. These presentations indicated an indepth understanding of their work.

Based upon the DAE's experience to date, the Evaluation Team is optimistic that the DAE will be able to keep and maintain its professional staff. Only two professional staff members have left the DAE during the past five years. Other RTG agencies have had particular difficulty in retaining computer programmers, who are in great demand by the private sector in Thailand. This has not been a problem in DAE, perhaps because the DAE programmers are first of all agricultural economists and therefore prefer to remain in work related to their agricultural economics training and experience.

Also, steps have been taken in the RTG to upgrade the DAE to an "Office" in MOAC which when effected will provide for more higher position grades and thus result in increasing the incentive for professionals to remain with DAE. Additional incentive is provided by the RTG's new position classification personnel system that permits more flexibility and more rapid promotion of younger better trained civil servants.

b. Financial Support

Budget support by the RTG and USOM for this project appears to have been adequate to date. This has required substantial increases over the past years as indicated in the following tables:

Department of Agricultural Economics - Regular Budget

(1966-1975)

1966	฿ 2,039,000
1967	5,480,900
1968	7,052,400
1969	8,422,300
1970	8,187,680
1971	10,746,300
1972	10,549,000
1973	16,186,400
1974	16,317,400
1975	20,345,700

USOM/Thailand
Agricultural Economics Project
493-11-190-180.4
FY 1967 thru June 30, 1974

FY	U.S. Dollar Assistance					RTG Baht Assistance		
	Personnel	Partici-pants	Commodi-ties	Other	Total	Project Funds	Trust Funds	Total
1967	0	0	0	0	0	1,174,000	70,000	1,244,000
1968	14,858	13,178	509	1,236	29,781	2,550,630	205,000	2,755,630
1969	23,388	31,788	66,548	0	121,724	2,475,790	310,000	2,785,790
1970	17,591	16,665	67,081	0	101,697	2,386,620	78,000	2,464,620
1971	628	32,955	46,517	0	80,100	2,695,620	50,000	2,745,620
1972	8,747	54,420	88,677	0	151,844	4,021,811	473,772	4,495,583
1973	50,664	81,077	168,033	474	300,248	4,248,920	281,000	4,529,920
1974	233,380	144,131	14,222	0	391,633	4,444,540	773,000	5,217,540
Total	349,616	374,214	451,587	1,710	1,177,127	23,997,931	2,240,772	26,538,703
FY 1975 Estimate	525,000	269,000	90,000	0	884,000	4,969,840	764,000	5,733,840

Sources: Annual Financial Report, USOM, Bangkok, Thailand
AID Division, DTEC, Bangkok, Thailand

The Third Five Year Plan has given, and the Fourth Five Year Plan will continue to give, first priority to the agricultural sector. The Evaluation Team has been assured by knowledgeable RTG interviewees that the RTG level of assistance to the DAE will continue to increase at about the same 22.5% rate per annum true of the period since 1967. The Evaluation Team believes that this should provide an adequate level of financial support to allow the DAE to sustain the project.

c. Facilities

Facilities (offices, office equipment, calculators, vehicles, etc.) provided by the RTG and USOM in support of this project appear to have been adequate to date. With the procurement of equipment that will double the core capacity of the DAE computer this year, and implementation of plans to link this computer at a later date to a larger computer, the data processing constraint should be minimal.

It is recognized that over the next few months the existing capacity of the DAE computer will limit the use of all zone model restraints in building the national model. This should not significantly affect the quality of the model, however.

3. Role of U.S. Assistance

a. To-date

The Evaluation Team is favorably impressed with the effectiveness of the U.S. assistance effort to date in developing an analytical capability within the DAE. The major components of the U.S. assistance, namely

the ISU technical team, advanced training for DAE staff members, and commodities have greatly enhanced the institutionalization process.

The ISU team's modus operandi as an integral part of the DAE, directly responsible to the DAE Chief, has provided the RTG with a mechanism whereby highly trained technicians can bring their skills to bear on basic Thai agricultural development issues in a spirit of close cooperation.

b. Future

While the degree of institutionalization to date is substantial and commendable, the next three years will be equally important in this process. Therefore, it is imperative that both the RTG and U.S. continue their support of this effort as proposed in the following discussion of the U.S. technical assistance team and also as reflected in the recommendations section of this report.

While the Evaluation Team believes that the mix of skill specialities provided by the ISU team to date has been entirely appropriate, a few changes in the skill mix will be required during the remainder of the project. At this point the overriding requirement is for a mix of skills that will strengthen the policy analysis work of the DAE and thereby move the total effort more rapidly towards attainment of the project goal of providing a national policy framework that will result in (1) increased agricultural output and (2) an improved income distribution both within the agricultural sector and between the farm and non-farm population. The

Evaluation Team believes that the following personnel will be required on the ISU team to achieve the project purpose:

(1) Chief-of-Party: The replacement (June 30, 1975) for the present ISU Chief-of-Party should be a senior agricultural policy analyst. This person should have a thorough understanding of the modeling tools as well as highly developed communications skills and considerable experience in the analysis of national agricultural policy issues in developing countries. It is anticipated that such a person should serve in the Chief-of-Party position until June 1978.

(2) Linear Programmer: A highly skilled linear programming specialist familiar with the problems of programming individual farms as well as the development of regional and national LP models will be required until June 1978. High priority should be assigned to continuing the services of the present linear programmer as long as possible. His work is considered to be essential to the success of the project during the next two years.

(3) Macro-Economist and Applied Econometrician: The duties of the macro-economist should be to construct the econometric models necessary to link the agricultural sector (specifically the regional LP models) to the other sectors of the economy. This work is essential to the analysis of the total impact of changes in agricultural programs and policies. This position should be maintained until at least June 1976 and, with some modifications in job description, the position may be required until June 1978.

Supply and Demand Analyst: Further work on supply and demand analysis will be required for approximately a two-year period until June 1977. This work is essential both to the LP modeling and to the analysis of specific marketing and price policies. Initial emphasis will continue to be on demand analysis but with increased attention to regional demands. Later, additional work will be needed to determine the price responsiveness of regional supplies of major food and export crops. The analyst presently in this position terminates his work in February 1975 and should be encouraged to return to Thailand on short-term consultancies periodically to bring his long-term experience to bear on this important effort. A new long-term specialist for this position should be recruited as soon as possible.

(5) Agricultural Marketing Specialist: It is anticipated that there will be a continuous need to analyze various agro-industry, marketing, and transportation problems, programs and projects. The initial emphasis of this work should emphasize building an information base concerning the marketing of major food and export products and on the use of linear programming models to determine optimal location of facilities and expected interregional product shipments. Later work should emphasize marketing project analysis, the impact of institutional changes on market shares, and more general government marketing policies. An effort should be made to acquaint DAE personnel with a wide range of approaches to analyzing marketing problems and implementing marketing programs.

Rural Development Specialist: DAE's work is rapidly broadening to include a broader range of problems than those related to agricultural development, per se. Increased attention is being given to the social as well as economic aspects of rural development, to income distribution and employment problems, toward programs to assist the poorest farmers and rural workers. It seems likely that this trend will continue and that DAE will become involved in the analysis of institutional arrangements, rural industrialization as well as rural health education and related services, and other aspects of more integrated rural development activities. The DAE needs to develop the capacity to understand and analyze the special problems involved in integrated rural development policies and programs directed to the rural poor. It is recommended that a new position be added to the ISU team for a two-year period to assist in developing this capability.

(7) Short Term Specialists: In addition to the long term positions recommended above, approximately ten man-months per annum of short term consultants should be provided to address new kinds of policy issues which may arise from time to time and to assure follow-up assistance by previous long-term ISU team members.

The allocation of ISU inputs in terms of man months during the July 1, 1975 to July 1, 1978 period are summarized in the following table. The operative project proposal called for a total of 337 man-months of inputs to be provided by ISU during the period June 1973 to June 1978.

June 1975 ISU will have provided approximately 117 man-months of inpu The suggested staffing pattern would provide a total of 333 man-months of inputs if the macro-economist position was maintained during FY 78 It seems likely that actual man months will be somewhat less than the 333 suggested due to recruiting lags. Personnel requirements should be reviewed annually and appropriate adjustments made.

The Evaluation Team believes that the mix of skills suggested is, on the basis of the present situation, appropriate for attainment of the project's objectives even though the total man years of ISU inputs will be slightly less than envisioned when this project was formulated.

Proposed Annual Allocation of ISU Team Inputs by Position, 1975-78

Position	FY 76	FY 77	FY 78
1. Chief-of-Party (Policy Analyst)	12	12	12
2. Linear Programmer	12	12	12
3. Macro-Economist & Econometrician	12	12	(12)
4. Supply & Demand Analyst	12	12	--
5. Marketing Specialist	12	12	6
6. Rural Development Specialist	12	12	--
7. Short Term Technicians	8	10	12
Total	80	82	54

Adequacy of This Activity in Improving the Productivity and Incomes of the Poorer Half of the Rural Population

Special problems exist in pursuing within the modeling effort, the special interest of the Thai and U.S. governments in improving productivity and incomes of the poorer half of the rural population. The models currently being developed are designed to provide insights on proposals affecting farmers as a group, and farmers as a group are the largest single component of the "poorest" population. The models being developed can also help evaluate programs designed to assist individual zones and regions which are at an apparent economic or social welfare disadvantage with respect to the remainder of the country.

The models being constructed, however, will shed little light on policy or project effects on the poorest elements within a particular zone or region or within the farming community in general. Much greater disaggregation by farm type and farm size will be needed before this can be done. A great deal more basic research will also be required on questions such as sources of off-farm employment (known to be very significant for the poorest farmers) and the buying-selling behavior of the poorest farmers. For poor farmers with little marketable surplus, reservation demand for what they sell may well be proportionately great and the income effects of price increases or the role of expectations may be such that the quantity of the commodity sold may not respond to price changes in the manner generally expected.

To the extent, of course, that the poorer half of the rural population are concentrated geographically, the design of the models being developed poses a smaller barrier to their usefulness for analysis of the "rural poor

It can also be argued that the current distribution of agricultural income within a zone or region is relatively equitable, in comparison with income distributions found in other countries. Land in the past has not been so limiting a constraint as in other countries. Concentrations of economic power growing out of agricultural land scarcities have therefore been relatively less important in the Thai agricultural sector. This situation may change and the models being developed may be able to make useful statements about the directions of change in land values (and in the rental values of other scarce resources) under alternative policies. This, in turn, should give insights into the question of the ultimate effects of these policies on income distribution, provided that basic information is secured on the ownership distribution of these scarce resources.

A final problem or question--perhaps more theoretical than practical--concerns the consistency of the goal itself, internally and relative to other goals. Certainly it is conceivable that selective measures taken to increase the short-run productivity of the poorest segments of the rural population could result in decreased total productivity of the sector as a whole. And it is also conceivable that selective measures taken to increase the monetary income of the poorest segments of the rural

population need not necessarily be accompanied by increases in their short run productivity. Hopefully, the modeling effort when fully developed may help to resolve any such inconsistency.

(B 1, 2, 3) Agricultural Statistical Data Base

Type of Statistical Data Needed

The DAE deals with a broad range of policy issues and therefore must be able to draw on or generate a full range of agricultural statistics. For price policy questions the most important data are: (1) annual production of major grains and export crops by region, and (2) current prices (at least monthly averages) for grains and export crops in the principal market cities. The analysis of special projects, such as irrigation projects, usually requires both rural census data plus special surveys in addition to standard time series data on prices and production. Census data include information on farm size, characteristics of farm families, and types of land available. Special surveys may be required to determine the type of agricultural technology being used, the availability of marketing facilities, and the sources of off-farm income. The linear programming models being built require: (1) accurate estimates of technological (input per unit of output) coefficients; (2) data on land, labor, capital, and other production inputs per decision period; and (3) information on the costs of inputs and the price of outputs.

Accuracy of Available Statistical Data

The quality of the available data varies considerably. The retai price data for major food products sold in Bangkok appear to be reasonably reliable. Price data for areas outside of Bangkok are generally inadequate but efforts are underway to improve them. At the present time it appears that the best way to construct the regional prices required for the LP models is to use Bangkok prices and subtract marketing and transportation costs from the major regional market centers. It should be possible to crosscheck the the adequacy of this procedure during the next year through the use of independently collected regional prices.

The available data on crop production is such that there is constant debate over whose figures are correct. The DAE is taking steps to improve this situation as well as attempting to shorten the time lag between the collection and publication of data. It appears likely that substantial progress will be made during the next two to three years as the DAE moves to an area frame sample system and increased use is made of its computer facilities to cross check the accuracy of data and to speed the data tabulation process.

The macro-modeling work of the DAE will draw heavily on national account data. It appears that these data are about average in terms of quality and coverage. Considerable data adjustments will be required at times to eliminate technical errors in the data. Although the DAE has

no direct control over most of the national account data, the macro-modeling work at DAE could make a substantial contribution to pointing out ways in which the accounts could be improved, expanded, and made internally consistent.

Many of the coefficients used in the linear programming models are based on data from the annual survey of 18,000 farms and the farm record program which provides more detailed data for 450 farms. It appears that the coefficients estimated from this data are far above average compared to similar estimates in other LDC's. Nevertheless, additional cross-checking would be advisable and should be increasingly feasible as the DAE modeling efforts are linked more closely with the Ministry of Agriculture's research and extension program and the accuracy of the annual farm survey is improved.

In summary, although there are recognized weaknesses in the statistical data being used in the DAE sector analysis work, it appears that (1) the data are being improved, (2) are being used with a recognition of their weaknesses, and (3) are sufficiently reliable to provide general insights into the effects of changes in agricultural programs and policies when used with the "first generation" linear programming models being constructed. Nevertheless, it is important that the users of the information outputs obtained from the sector analysis models be fully aware of the key assumptions of the models and their limitations. This could be accomplished to some extent through the use of "short courses" to

acquaint technicians in other agencies with the basic characteristics of the linear programming and other models being developed in the DAE sector analysis program.

Improving the Statistical Data

The Agricultural Statistics Center of the DAE has expanded rapidly during the past two years and is making substantial progress on improving both the quality and timeliness of agricultural data. It has added an IBM 1130 computer which is being used to speed data tabulation as well as to cross-check the accuracy of sample observations and recording. Time did not allow a detailed analysis of the Center's staffing, data collection and publications program but a few general observations are possible.

The size of the statistical staff appears adequate to carry out the present data collection program. Staff additions will be required if the data collection program is expanded. Some additional staff would be needed if the publications series is expanded. Publication of increased amounts of regional data appears desirable and should be feasible with existing computer facilities. Efforts should be made to up-grade the ability of the present statistical staff with particular emphasis on improving the accuracy of their work both in data collection and data processing. This can be done (1) through increased use of in-house training programs, (2) through long-term training for a few key positions in the Agricultural Statistics Center, (3) through the use of foreign technicians to assist in developing improved data collection methods

concentrate on double checking the accuracy of the data collection and proc and seek ways to improve field questionnaires, work sheets, and tabulation procedures.

USOM could assist the Agricultural Statistics Center during the next two years in several ways. The short-term assistance of USDA personnel will be needed to further develop the area frame sampling procedure and to adopt it to Thai conditions. Short-term assistance in data processing and computer coding such as the assistance now being provided by a member of the ISU Team will be needed from time to time. Such assistance should concentrate on improving the accuracy of data processing, devising computer checks to identify inaccurate observations, and improving the usefulness of computer tabulated outputs. Additional short-term assistance would be helpful in improving sampling procedures and the accuracy of field data collection. This assistance could be provided by either the USDA or ISU. An alternative approach would be to try to identify a long term statistical technician to work on both improved field data collection procedures and computer processing techniques.