

Agricultural Development Planning and Administration Project in Indonesia

Executive Summary

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EXECUTIVE SUMMARY

AGRICULTURAL DEVELOPMENT PLANNING
AND ADMINISTRATION (ADPA) PROJECT

April 17, 1979 - September 30, 1984

Host Country Contract between
IOWA STATE UNIVERSITY
AMES, IOWA, USA

and

MINISTRY OF AGRICULTURE
REPUBLIC OF INDONESIA

(U.S. Grant Agreement No. 77-14)
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GLOSSARY OF ACRONYMS

AARD	- Agency for Agricultural Research and Development, MOA
ADPA	- Agricultural Development, Planning and Administration project
AETE	- Agency for Education, Training and Extension, MOA
AID	- Agency for International Development (United States), also known as USAID at the country level
AIT/T	- Asian Institute of Technology in Thailand
BAPPENAS	- National Planning Agency, GOI
BIMAS	- Agency for rice intensification programs
BFC	- Bureau of Foreign Cooperation, also known as KLN, MOA
BOA	- Bureau of Administration, MOA
BOF	- Bureau of Finance, MOA
BOM	- Bureau of Material, MOP
BOP	- Bureau of Planning, MOA
BULOG	- Bureau of Logistics, GOI
CADP	- Central for Agricultural Data Processing, MOA
CAER	- Center for Agricultural Economic Research, MOA
DG	- Directorate or Director General
GOI	- Government of Indonesia
HIS	- Honeywell Information Service
IDRC	- International Research and Development Center (Canada)
IG	- Inspector General, MOA
IPB	- Agricultural Institute (university) at Bogor
ISU	- Iowa State University
KLN	- Bureau of Foreign Cooperation, also known as BFC, MOA

KPA - Key Policy Area

MOA - Ministry of Agriculture, also referred to as the Department of Agriculture

MPS/X - Mathematical Programming System - extended

NCI/P - National Computer Institute in Philippines

SAS - Statistical Analysis System

SPSS - Statistical Package for Social Scientists

U of I - University of Indonesia

UGM - University of Gajah Mada

EXECUTIVE SUMMARY

AGRICULTURAL DEVELOPMENT PLANNING AND ADMINISTRATION PROJECT

FINAL REPORT

I. PROJECT DESCRIPTION

Purpose of the Agricultural Development Planning and Administration (ADPA) Project was to upgrade the policy, planning and programming capability of the Indonesian Ministry of Agriculture (MOA) by helping institutionalize within the MOA the ability to conduct effective agricultural policy analysis and the capability to design and evaluate appropriate developmental programs and project alternatives. For implementation purposes, the project was divided into two sub-projects: (1) improvement in the capability of the MOA in policy and project planning and implementation and (2) improvement of the data management and administrative system.

Implementation of the technical assistance and U.S. training aspects of the ADPA project was provided for through a Host Country Contract between the Indonesian Ministry of Agriculture and Iowa State University, signed June 9, 1979. The contract, as amended, provided \$1,458,474 in grant funds for contract technical assistance and \$1,079,660 in loan funds for long- and short-term training in the United States. Technical assistance functions of the contract ended on April 12, 1984, while training aspects continued through September 30, 1984.

II. PROJECT BACKGROUND

Initial conceptualization of the ADPA project occurred in 1975. Early planning was based on the premise that all agricultural policy, planning and data management functions would be centered in one location at the Bureau of Planning in the Ministry of Agriculture. When the Agency for Agricultural Research and Development (AARD) became operational, it assumed primary responsibility for long-run agricultural policy analysis at the Center for Agricultural Economics Research (CAER) and data processing services at the Center for Agricultural Data Processing (CADP). Subsequent project development planning shifted the data processing function and related technical assistance activities to the CADP of AARD, but left the agricultural policy analysis and planning function and policy technical assistance assigned to the Bureau of Planning. This program planning change separated the institutional and physical sites of the two major parts of the ADPA project. In addition, MOA assignment of the long-run agricultural policy research function to the CAER raised a number of doubts and uncertainties concerning the role of the Bureau of Planning (BOP) in agricultural policy analysis and research. With the recent changes in the administrative leadership within the Ministry, the role of the BOP in policy analysis and planning and its relationship to other agencies and departments has been under active review and revision. Further delineation and institutionalization of policy and planning roles within the Ministry, and particularly with respect to the Bureau of Planning, will be beneficial for future program development and implementation.

Initial planning for the ADPA project envisioned sending several advanced degree participants to third countries for training. However, by the time the advanced degree training was ready for implementation, in-country educational institutions were able to provide quality advanced degree training in agricultural policy and planning areas equal or superior to the training available in most third country institutions with the added advantage that training could be carried out in the Indonesian language with dissertation research more directly related to local problem issues. Given the difficulties encountered in achieving satisfactory English language skill levels for potential external participants, this local in-country training alternative proved to be a major benefit for the project. ADPA project managers recognized the increased training capabilities and benefits of in-country educational institutions and adjusted advanced degree training programs accordingly.

III. MAJOR PROJECT ACCOMPLISHMENTS

Significant accomplishments were achieved by the ADPA project. Global accomplishments are itemized below and individual components are discussed in following sections.

A. Global ADPA Project Accomplishments

Professional Resource Development:

- | | |
|---|-----|
| 1. Total number of long-term M.S. and Ph.D. degree programs in U.S., third countries and Indonesia. | 81 |
| 2. Total number of short- and mid-term non-degree programs in U.S. and third countries. | 61 |
| 3. Total number of short-term non-degree participants in Indonesia. | 765 |
| 4. Total number participant programs | 907 |

Data and Information Processing:

1. Selection, purchase and installation of data processing and data entry equipment for CADP, Pasar Minggu MOA campus. Honeywell Level 6
Texas Instruments 990/10
2. Selection, purchase and installation of scientific computational equipment for CAER, Bogor. IBM 4331
3. Selection, purchase and pending installation of administrative word processing equipment for the Office of the Secretary General, MOA, Jakarta.
Wang Word Processor
4. Completion of logical design for MOA technical and administrative data base. P. T. Masrida
5. Completion of physical design for MOA technical and administrative data base (pending). P. T. Dassad

Agricultural Policy Analysis:

1. Formation of a professional cadre of knowledgeable agricultural policy researchers to carry out policy research and serve as a forum for review of alternative agricultural policies.
18 senior professionals
2. Completion and publication of a major agricultural policy handbook. Growth and Equity in Indonesian Agricultural Development.
Edited by Mubyarto. Yayasan Agro Ekonomika Press, 1982.
258 pages.
3. Near completion of a follow-on in-depth agricultural policy analysis.
4. Integration of ADPA degree participants into the agricultural policy group as associate researchers for professional on-the-job training development.

B. Professional Resource Development

Development of the professional resource base of the MOA was carried out through long-term degree training and short-term and non-degree training in the United States, third countries and Indonesia.

Eighty-one long-term degree programs were programmed under the ADPA project. Twenty degree programs were at the Ph.D. level and the remaining sixty-one at the M.S. level. Sixty-two degree programs were scheduled in Indonesia, another 18 in the United States and one in a third country. About half of the participants were drawn from central offices and the remaining half from regional offices. By mid-1984, 27 of the M.S. degree programs had been completed. Most of the remaining M.S. degree candidates should finish their programs by the end of 1984. Only a few participants, primarily Ph.D. candidates, will be carried over into future years.

Much of the short-term, non-degree training in the United States was scheduled through regularly programmed USDA courses. Thirty-three ADPA participants completed training in these courses. Another six computer participants from the CADP attended special mid-term training programs arranged by Honeywell Information Systems in the United States.

Most of the professional computer training programs for CADP staff members were conducted through mid-term training programs in third countries. Seventeen participants were trained at the National Computer Institute in the Philippines and another five at the Asian Institute of Technology in Thailand.

In-country, short-term training was programmed in rural development planning, project evaluation, development administration, personnel

management, management skills, food and nutrition planning, English language training and computer related training activities. Of the 765 short-term, in-country participants, 501 attended courses in agricultural planning, management and related fields, and the remaining 264 attended courses in computer applications and computer language skills. More than half of the in-country participants were trained at the University of Indonesia, University of Gadjah Mada and the Agricultural Institute at Bogor. Distribution of the participants was divided fairly evenly with slightly less than half of the participants from central offices and slightly more than half from the regional and decentralized offices.

All major goals of the ADPA training component have been met or exceeded. However, there are still inadequate numbers of trained agricultural policy, planning and data processing staff. Further, those that have received training will require additional on-the-job guidance and supervision to most appropriately apply their academically acquired skills. Some attrition may also be expected as reassignments and promotions occur within the Ministry or the private sector draws trained staff, particularly computer operators and programmers, away from their originally programmed responsibilities. A continued training activity should be an important component of any future development program.

C. Data and Information Processing

Major activities in data and information processing centered on the selection and acquisition of data processing equipment and development of the logical and physical design for the MOA administrative and technical data base.

The first data processing equipment purchased under the ADPA project was a Honeywell Level 6, 16 bit, minicomputer with related peripheral equipment. This was installed in June of 1981 in a temporary location at the AARD headquarters complex in Pasar Minggu. A Texas Instruments 990/10 data entry configuration was later added at the same site. Following completion of a new building at the MOA campus in the Ragunan area, the computer equipment and CADP staff were transferred to the new location in November of 1983 where they presently occupy the third floor of the new building with excellent office space and computer housing accommodations. The Honeywell Level 6 minicomputer is scheduled for a major expansion of data storage disk drives and internal memory before the close of fiscal year 1984.

It is anticipated that the MOA administrative and technical data base will eventually be loaded and maintained on the Honeywell minicomputer at the MOA campus. In support of the data base activity, two major consulting contracts were awarded. The first consulting contract was awarded to P. T. Masrida for development of the logical design for the data base. This logical design of the data base was completed in late spring of 1982. A related consulting contract to provide the physical design of the data base was awarded to P. T. Dassad. The physical design activity is nearing completion and should be finished before the end of the 1984 fiscal year. Following completion of the physical design of the data base, attempts will be made to load some or all of the data base with appropriate testing of data entry and retrieval programs and procedures.

With the expansion of agricultural data collection, research computations, economic modeling and analysis at the CAER, additional and separate scientific computational facilities were determined to be needed for research-oriented data tabulations, computations and analysis. An IBM 4331, 32 bit, mainframe computer and appropriate software was acquired to meet CAER and related MOA research needs. This equipment was scheduled for installation in early summer of 1984 and should be fully operational by the fall of 1984. The IBM 43XX series is an updated version of the IBM 370 computer series and has a wide selection of software available for scientific use including SASS, full-sized SPSS and MPS-X programs.

To update and modernize administrative operations within the Secretary General's office, an office management and word processing system was recommended to facilitate administrative operations. Subsequently, a Wang system was determined to most closely meet present and future needs of the MOA. Scheduled for delivery in the summer of 1984, the Wang installation should be fully operational by the end of fiscal year 1984.

A considerable amount of data and information processing equipment was acquired under the ADPA project. What remains to be done is the effective utilization of this equipment to best serve the needs of the Ministry in data base management, data analysis and administrative management operations.

D. Agricultural Policy Analysis

Two major agricultural policy studies on growth and equity in Indonesian agricultural development were initiated under the ADPA project.

The first basebook agricultural policy study was completed in 1982 and published in time for distribution at the XVIIIth International Conference of Agricultural Economists held in Jakarta from August 24 to September 2 of 1982. A second more in-depth policy analysis study was nearing completion in late spring of 1984. The final workshop for this second policy study was scheduled for the first week of May, 1984, with final editing and publication pending subject to a review of the component parts and summary policy strategy sections of the study. Contract technical assistance activities ended in April of 1984, so ISU short- and long-term consultants did not participate in the final workshop review and evaluation.

More than a dozen senior Indonesian agricultural policy researchers participated in development of the first agricultural policy basebook. The Indonesian key researchers received professional support from a select group of ISU policy consultants who collaborated in the research design and analysis as well as the intermediate and final editing process. The basebook study was divided into six key policy areas (KPAs) ranging in scope from agricultural and non-agricultural linkages to poverty, equity and rural development issues. Final manuscripts were completed in early 1982, edited by Mubyarto with assistance from ISU consultants, and published in final form in the summer of 1982, Growth and Equity in Indonesian Agricultural Development, edited by Mubyarto, Yaysan Agro Ekonomika Press, 1982, 258 pages. The growth and equity basebook study also was presented at the XVIIIth International Conference of Agricultural

Economists. Reaction to the basebook was uniformly complimentary as evidenced by the following unsolicited comments:

1. Don Hedley, "...five years ago a book like this would have been nearly impossible."
2. H. W. Arndt, "...most authoritative, comprehensive account of Indonesian agricultural development at present available."

A second more in-depth policy analysis study was initiated following completion of the first basebook study. Additional policy researchers were added and the original six key policy areas were expanded to include a seventh area on agricultural policy synthesis, evaluation and recommendations. Advanced ADPA degree participants were included in the research study group as associate researchers to incorporate relevant aspects of their dissertation research and provide them with valuable experience in on-going policy research. Several economic models were developed for specific policy analysis topics. These models also provide a basis for continuing and expanded policy research in the future. The last policy workshop in which ISU policy consultants participated was in January of 1984. At that time, excellent progress was being made in four of the key policy areas with completion of manuscript preparations, some progress had been made in two KPAs, but work on the last section on synthesis and policy conclusions was lagging seriously behind. Technical assistance to the ADPA project ended on April 12, 1984, and therefore the contractor's policy consultants were unable to participate in the final May 1984 policy workshop. If all key policy areas were covered

sufficiently in the final May presentations, it would be advisable to proceed with the editing and publishing of the complete version of the policy analysis study, even though some areas might be stronger than others. If, on the other hand, there were significant deficiencies in one or more areas, and particularly the synthesis section, it might be necessary to allow independent publication of finished section manuscripts and postpone final publication of the complete policy study until such time as the deficient areas are brought up to a reasonable level.

One of the most significant accomplishments of the ADPA project has been the formation of a professional cadre of agricultural policy researchers under the auspices of the growth and equity policy research studies. Eighteen of the most knowledgeable and highly respected Indonesian agricultural policy specialists were brought together to share and integrate their research experiences and to serve as a forum for the review of alternative agriculture policies. Most of these policy analysts have been together since inception of the ADPA policy analysis research effort in early 1981 and have actively participated in the growth and equity workshops as well as other agricultural policy reviews. Several have recently assumed high level positions as administrators or consultants where they can utilize their research experiences with the growth and equity studies to make significant contributions to Indonesian agricultural policy decision making in the future. ADPA advanced degree participants joined the growth and equity research group for the second study and benefited greatly from their interactions with the senior policy researchers.

The professional research experience and interactions gained by the group of high level Indonesian policy analysts is a very positive foundation that merits consideration for continuation and expansion of policy research efforts in future program development.

IV. PROJECT IMPLEMENTATION

A limited number of unanticipated factors and issues arose during the life of the ADPA project which influenced the timing and the focus of the project. These factors and issues included English language skills of proposed third country and United States participants, delays in availability of computer software, uncertainty concerning the future role of the Bureau of Planning in agricultural policy analysis and administrative confusion in interpretation of Host Country Contract provisions.

English language skills are a requirement for third country and U.S. participant training. While English language training was provided in-country, difficulties were encountered in achieving acceptable language levels for several proposed participants. As a result, some participants had to be reprogrammed for in-country training. Others found their options were restricted to universities that would accept lower language proficiency levels or grant waivers contingent on taking additional English language training along with degree courses. Because of English language difficulties, the number of potential candidates for third country and U.S. training was constrained and delays were experienced by some participants who found it necessary to take additional language training as part of their degree training programs.

Software availability and development for the Honeywell Level 6 computer was a major technical problem for use of computer facilities by policy and planning researchers. Statistical and modeling software packages were not available during initial years of the CADP computer center operations. Because of the special characteristics of the Honeywell Level 6 operating system and the ways in which program languages, especially FORTRAN, are implemented, attempts at converting public domain software packages to use on the Honeywell computer were only partially successful. Recent availability of a condensed version of a statistical package for social scientists has partially resolved this problem. When the IBM 4331 scientific computer and its related statistical and modeling software packages become operational at Bogor, an alternative data analysis and processing installation will be available for policy and planning researchers, which should help to resolve this problem area.

Assignment of the long-run agricultural policy analysis function to the Center for Agricultural Economics Research of AARD created a number of doubts and uncertainties concerning the remaining role and responsibility of the Bureau of Planning in agricultural policy analysis. A more clearly defined policy role with assigned institutional responsibilities and structure would have greatly facilitated implementation of the policy analysis function of the ADPA project. Recent changes in administrative leadership and related clarifications of institutional roles and responsibilities for MOA agricultural policy analysis should provide a stronger base for future program design and implementation.

The working relationship between the Ministry of Agriculture and Iowa State University was specified in a host country contract between the two institutions. Terms and conditions of the contract were separate and specific to the clauses and provisions contained in the contract document. Operational and administrative relationships between the MOA and ISU were excellent throughout the life of the project. However, confusion did arise within certain USAID administrative, finance and project review offices concerning the interpretation and applicability of some contract provisions. The confusion was partially resolved with the arrival of more experienced USAID administrative, contract and finance officers about two-thirds of the way through the life of the contract. On the whole, the host country contract functioned remarkably well as a vehicle for provision of technical assistance services to the Ministry of Agriculture.

V. RECOMMENDATIONS

Much was accomplished during the five-year life of the original ADPA project. A major professional resource development program was conducted. Large quantities of data and administrative processing equipment were acquired. Two major agricultural policy studies on growth and equity issues in Indonesian agricultural development were implemented. In addition, a cadre of highly qualified professional experts on Indonesian agricultural policy and development problems was assembled to serve as a forum for the review and recommendation of alternative agriculture policies. Several members of this agricultural policy cadre have recently assumed high level administrative positions within the Ministry of

Agriculture where they are in key positions to implement future developments in agricultural planning and policy.

Although much was accomplished during ADPA, these achievements are not sufficient for the long-run needs of the Ministry. The training program was broadly focused and those who were trained will require on-the-job guidance to most effectively apply their newly acquired skills. While large quantities of data and administrative equipment were acquired, the application utilization of this equipment needs to be further developed and expanded. Further, the initial ADPA project was narrowly focused on only one element in the policy and planning process, the Bureau of Planning. More attention needs to be devoted to the broader interactions in policy and planning formulation involving both multiple agencies and different governmental levels. In short, although much was accomplished during ADPA, more remains to be done by building on the base already established.

In view of the above, it is recommended that a five-year, more sharply focused, continuation of the policy and planning activities be planned and programmed with sufficient financial support provided by an external donor. An external funding level of approximately \$10 million would seem appropriate with distribution of these funds destined as about one-third for technical assistance, one-third for training and the remaining one-third for commodities, special studies and related activities.

A. Training

Training activities of the follow-on development planning project should be more need specific to fill training areas overlooked by the ADPA project and to anticipate possible attrition of staff already trained. This implies the need for a manpower study and projection of staff needs and related qualifications for the mid- to long-term future. Appropriate ways also need to be designed so that newly acquired skills of returning participants can be utilized most effectively.

Long-term degree training might most appropriately be directed at the M.S. level with only selected individuals chosen for Ph.D. training based on past superior performances. At least two ADPA participants achieved Cum Laude or superior performance ratings in their M.S. programs and could be candidates for future Ph.D. training.

Short-term training for the future will need to be more goal specific. Indonesian universities and institutes have provided excellent training in the past, but curricula and staff need to be reviewed in order that training programs provide more direct relation to on-the-job needs. The successful on-site training program developed by BULOG and the Stanford Food Research Institute provides a model that might be adapted to MOA needs. Computer training for staff will need to be continued to provide for possible attrition and expanded needs. Training in applications of existing software should be emphasized for Ministry-wide users of data processing facilities.

Specialized English language training will also need to be provided for potential third country and U.S. participants in order to more

adequately meet proficiency levels required by selected educational institutions. Potential participants would benefit from full-time language training in-country and/or from such special training programs in English language and academic review of basic core courses as offered by the Economic Institute at Boulder, Colorado.

B. Policy Analysis, Planning and Special Activities

The two growth and equity policy studies implemented under the ADPA project provided a great deal of background information concerning the agricultural sector of the Indonesian economy. In the process of implementing these studies, additional areas for future in-depth analysis were identified. Skilled researchers with management capabilities and dedication were also identified. Based on these research experiences, a nationwide agricultural policy agenda now needs to be developed with the appropriate institutional framework and related responsibilities specified. Once the agenda and framework are in place, funds will need to be provided in order to carry out more in-depth research on the priority issues identified. Appropriate funding needs to be made available for carrying out these kinds of special studies in a future project.

Policy decision makers require many different types of information for arriving at final decisions. An area that merits further development is the action analysis type of research that results in situation reports and outlook appraisals of immediate use to policy decision makers. Action analysis research tracks current trends and happenings in the agricultural sector. It uses the findings of other longer-run research analysis to develop models and analytical frameworks that can respond quickly to "what

if" policy questions. The demand/supply model developed by Teken and Meyers for the ADPA project is an excellent example of a policy model that can quickly respond to "what if" questions of policy makers. Professional technical assistance could be very effectively utilized in developing this type of action analysis capability within the Ministry.

C. Integrated Planning

While ADPA policy and planning technical assistance activities were more narrowly focused at the Bureau of Planning, long- and short-term training was broadly based with participants coming from many different directorates and spatial levels within the Ministry. Half of all degree participants came from the province level with South Sulawesi, West Java and Riau provinces all sending substantial numbers of participants. These participants provide an excellent resource base from which a more integrated approach to agricultural planning might be developed. Rather than start with a nationwide, integrated planning program, it seems more appropriate to limit initial steps to one or two provinces over an experimental and developmental period of five years. Selection of one province with a trained resource base and another with fewer trained staff resources would provide a basis for comparative analysis of integrated planning developmental efforts. Both technical assistance and special study funds would be needed to support this activity.

D. Agricultural Data Base

A major responsibility of the Center for Agricultural Data Processing is the design and implementation of the National Agricultural Data Base. Once installed and operational, this data base could provide extremely

valuable services to the policy, planning and administrative functions of the entire Ministry of Agriculture. Two major determinations need to be made before attempts are made to load the data base. The first evaluation and determination is whether or not the Honeywell Level 6 minicomputer at CADP, or some upgraded version of this equipment, has the capacity to fully implement a rapid response data base system as per discussions by Suart and Rowland in their October 1983, consultation. The second determination involves how the data base will be loaded -- as a whole, by individual components or some combination of the two approaches. The summary report of a data base seminar chaired by Mike Morfitt on February 22, 1984, should provide some additional insight for making this decision. Loading of the data base will require additional technical assistance and some special project funding support.

E. Long-Term Policy Analysis

The Center for Agricultural Economics Research currently is surveying farm households nationwide from which data on income, employment and farm production will be collected on a periodic basis. In addition, it also has several other policy oriented modeling exercises in process and under development. The recent acquisition of an IBM 4431 mainframe computer will help to resolve computational needs, but may not completely resolve all data entry needs. An experienced professional with training and experience in economics, statistics and computer applications could provide valuable services to research efforts of the CAER. Some funding for purchases of equipment and services not covered by other sources would

also be beneficial for increasing the flexibility of the CAER in carrying out its policy research mission.

F. Technical Assistance

In order to provide sufficient professional support for future agricultural planning activities, a critical mass of at least four long-term consultants will be required. Two of these consultants could appropriately be assigned to policy and planning tasks and attached to the Bureau of Planning and the Center for Agriculture Economics Research. They should have sufficient flexibility to interact and assist with the functions of other agricultural policy and planning units within and without the Ministry as well as with selected regional offices. In addition to responsibilities for assisting in long-run and action analysis policy and planning activities, they could also play an important role in identification and placement of participants as well as in the design and implementation of short-term and on-the-job training programs. They could also play an important role in identifying and specifying terms of reference for special research studies and in organizing inter-agency research and policy discussions through policy and planning seminars, workshops and other types of formal and informal interactions. Professionals with strong backgrounds and demonstrated skills in agricultural economics analysis and analytical development skills will be required to fulfill the multiple tasks of these two policy planner consultants. Sufficient funding for short-term consultants should also be provided to complement the activities of long-term consultants and to

perform special tasks concerned with short-term training, special policy and planning studies, project management and other related areas.

Technical assistance will also be necessary for further agricultural data base management and computer application activities at the Center for Agricultural Data Processing and the Center for Agricultural Economics Research. Because most computer equipment has already been purchased and installed, emphasis should be placed on optimizing the use of current installations with professional assistance provided for implementing the data base, processing of agricultural data and expanding the use of most appropriate computer application programs. Assistance in planning computer training programs for both staff and users should also be provided by these consultants. Professionals with strong backgrounds in computer applications, statistical analysis and econometrics would be most desirable for the long-term positions. Short-term consulting services will also be required for special data base implementation tasks, survey design, data entry and processing and statistical analysis.