AGRICULTURAL PLANNING AND STATISTICS
SUDAN

(Project 650-0048)

MID-TERM EVALUATION

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I. INTRODUCTION TO THE EVALUATION

A. Purpose and Scope

The Agricultural Planning and Statistics (APS) Project was developed to assist the Government of Sudan (GOS), and specifically the Planning and Agricultural Economics Administration (PAEA) of the Ministry of Agriculture and Natural Resources (MANR), to improve and strengthen its policy analysis and planning capabilities for the agricultural sector. Assistance provided by the project was designed to: (1) improve and strengthen the capability of the PAEA to identify, rank, and analyze critical macroeconomic, trade, and marketing problems and issues; (2) develop a reliable agricultural data base and reporting system to generate timely agricultural statistics; and (3) strengthen and improve the capability of the MANR to identify, appraise, and plan agricultural investment projects and programs designed to overcome current and future constraints on agricultural development in Sudan. In order to achieve the objectives of the project, USAID has financed technical assistance (long-term and short-term advisors and consultants), microcomputers and associated software, training, studies, and other commodities using both dollar funding and local currency.

This was the project's first external evaluation. Long-term technical assistance personnel include a macroeconomic policy analyst, an agricultural trade and marketing analyst, an agricultural planner, a production economist, and an agricultural statistician. It has been partially staffed for 2 1/2 years, but had been fully staffed for only 1 1/2 years at the time of the evaluation. The project activities completion date (PACD) is April 30, 1987, less than two years from the date of the evaluation.

The objectives of the evaluation were: (1) to identify the strengths and weaknesses of the project, (2) to assess its overall effectiveness, and (3) to recommend changes for improvement. The evaluation team gathered its information from persons in Washington and Khartoum. Extensive use was made of project documentation.

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Our interviews with the project advisors, the Project Director, Sudanese counterparts, other informants, and USAID staff, were conducted in a spirit of full and frank discussion of issues. We are cognizant of the difficulties in arriving at factual and fair conclusions about a project that is as complex and diverse as this one. We are grateful for the courteous and professional reception extended to us by all participants and have tried to reciprocate through careful conclusions and considered recommendations.

B. Evaluation Procedures

The team gathered data and information from relevant sources both in Washington, D.C., and Khartoum. Upon arrival in-country, the three-person evaluation team worked in close collaboration with the USAID Project Officer and the Project Professional Coordinator. Interviews were held with the long-term technical advisors, host country Project Director, host country counterparts, and other individuals familiar with the planning process in the Sudan. A list of persons interviewed is included as Appendix C.

At the suggestion of the Project Director, written comments were solicited from host country counterparts and senior staff of the PAEA. A copy of the questionnaire distributed is included as Appendix F. Comments were received from four respondents.

The team held a series of debriefings prior to leaving the country. Mission staff was debriefed, as were the Project Director, PAEA division chiefs and staff, and the individual long-term technical advisors. A written summary of our recommendations was reviewed at each of the debriefings. A draft report was left with the Mission prior to departure. The final report was prepared following receipt of comments from the Mission and GOS.

C. Organization of the Report

Our overall findings and recommendations are summarized in Part II below. Subsequently, Part III contains a more detailed evaluation of the main components of the project and a discussion of important issues that we identified. Supporting materials are included in the appendices.

II. OVERALL FINDINGS AND RECOMMENDATIONS OF THE EVALUATION

A. Need for the Project and Project Extension

We find that the need to strengthen capabilities for agricultural planning and policy analysis in the GOS is as strong now as it was when this project was initiated. As the food crisis subsides continuing long-term issues of investment planning, pricing of agricultural inputs and outputs, service delivery to support traditional smallholders, and allocation of land and water resources, will rise in importance. This project has contributed to improving the analytical capacity of the Planning and Agricultural Economics Administration of the Ministry of Agriculture. However, progress has not been as rapid as planned, primarily due to a slow start in implementation and the scarcity of human and budgetary resources in the recipient agency. In particular, long-term academic training for PAEA staff has been delayed for a variety of reasons. Overall, erosion of manpower in the PAEA has occured as some of the most qualified staff have left for better jobs out of the country.

The fundamental assumptions underlying the project are:

1) That the GOS will institutionalize formulation of policies affecting agriculture so that analysis based on reliable and timely data will contribute to improved policy decision-making, and

2) That the PAEA can recruit and retain qualified staff and function as a key source of policy - relevant information and advice within the GOS.

Both of these assumptions can be questioned. Progress in the future is no more likely to proceed on a smooth upward trend line than it has in the past. The MANR and GOS should be encouraged and expected to extend their efforts to develop appropriate institutional arrangements to increase the utilization of analytical information showing consequences of alternative policies for policy decision-making.

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Thus far, progress under the project has been largely on the "supply side"--improving the capacity of the PAEA to generate policy-relevant information and analysis. Nothing guarantees that this knowledge will be reflected in better policy decisions by the GOS. A stronger commitment from the GOS is needed on the "demand" side. Within the MANR, this would involve enhancing the role of the PAEA in formulating policy options and investment alternatives. Recurrent policy decisions need to be identified and specific responsibilities for assessing current policies, identifying alternatives, and analyzing impacts of alternatives on producers and consumers, assigned to the PAEA. Outside the MANR, the PAEA should seek and be given a more explicit role in inter-ministerial policy decision processes and investment project planning.

If the GOS confirms its commitment to enhancing the role of the PAEA, both internally in the MANR and externally in the broader national policy arena, and in spite of the risks involved, we find that the need is so great and the probability of progress sufficiently high to make the following overall recommendations:

Recommendation 1: The project should be immediately extended through the period for which the present LOP funding will suffice, approximately April 1988.

Recommendation 2: Timely steps should be initiated during 1986-87 to formulate a further extension of this project or a new project that will provide continuing support at least through the end of FY 91 (September 1991). While final approval of a new or extended project can wait until 1988, and further evaluation of this project, plans to provide continuity of effort should be formulated.

Recommendation 3: In collaboration with the PAEA, and MAHR, every acceptable means should be used to improve incentives and working conditions in the organization including better work planning, improved facilities, support for field work, (e.g., overtime and per diem, vehicles), and access to long and short-term training.

Given an adequate renewed commitment by the GOS, we strongly recommend that the full set of project activities be continued through the end of the current project and into the new or extended

project. In particular, phasing out long-term technical assistance prematurely will result in a rapid deterioration of existing capacity and and loss of momentum toward improved capacity. It is likely that support will be needed for ten years or more to fully accomplish the objectives of the project.

B. Long-Term Technical Assistance

This has been the key factor in the success that has been achieved so far. With the exception of the first marketing and trade advisor, who was released from his assignment, and the first statistics advisor, who was largely ineffective in improving data collection, we find that the work of the long-term advisors has been fully adequate to outstanding. The project and the GOS are fortunate to have the technical assistance team that is presently in place. The demand for additional long-term technical assistance exceeds available funding. We have discussed needs with a number of officials in the PAEA and MANR and arrived at the following recommendations:

Recommendation 4: The following long-term technical assistance should be provided in the final phase of the project.

1) Macroeconomic Policy Analyst and Professional Coordinator, attached to Director General, PAEA.

*2) Management Specialist, attached to the Director General, PAEA.

3) Sectoral Planner, attached to the Department of Project Planning, PAEA.

4) Production Economist, attached to the Production Economics Section, Dept. of Agricultural Economics, PAEA, but also responsible for work on livestock production economics with the Animal Resource Economics Department.

5) Marketing and Trade Economist, attached to the Marketing Section, Department of Agricultural Economics, PAEA, but also responsible for work on livestock marketing and trade in connection with the Animal Resource Economics Department.

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6) Statistical Advisor, attached to the Statistics Division, Department of Agricultural Economics, but responsible for improving all basic data collection activities in the PAEA including crop and livestock production and marketing.

*7) Computer and Data Processing Specialist, responsible for upgrading the computer center in PAEA to handle the large-scale data collection activities now underway and further training of staff in computer utilization.

The rationale for this recommendation is given in the main body of the report. If funds are not available for 6 U.S. advisors, we would give priority to filling position 7 and delaying recruitment of the sectoral planner until new funding is available.

C. Project Focus

Policy and planning issues encountered in PAEA run across both the irrigated and rainfed sub-sectors. Data collection efforts, policy studies, and comparative advantage studies will suffer if assistance is restricted to work on the rainfed sub-sector.

Recommendation 5: USAID assistance should support the policy analysis and planning process of the PAEA with no distinction between irrigated and rainfed sub-sectors.

D. Long-Term Training

Long-term degree training has lagged more than any other project component although it is the most essential element for institution building. We recommend the following:

Recommendation 6: MS and Ph.D. candidates should be screened and processed as soon as possible. Every effort should be made to place some candidates for remedial work as early as January 1986 with a larger number to begin in June 1986. Selection of trainees

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*These should be local-hire paid by local currency counterpart funds. However, if a qualified computer specialist cannot be recruited locally, position 7 should be shifted to the dollar budget and a person recruited in the U.S. with the understanding that within two years a Sudanese will be trained to replace the U.S. specialist.

should be based primarily on academic potential and expected professional contribution to the PAEA. MS degrees in agricultural economics should not be highly specialized because we do not feel long-term training slots should be allocated strictly by section or department. However, we do recommend that all MS programs should be research-oriented and involve a thesis requirement or other significant research training.

Recommendation 7: Careful placement and close monitoring of academic participant trainees is needed. It would be helpful to have a U.S. university administer the long-term training program. If time is sufficient, this could possibly be arranged through BIFAD or a RFP to qualified institutions. If the established AID system is used, provision should be made for the required supervision and coordination of training.

Recommendation 8: Immediate steps should be taken to re-open the proposal to strengthen MS training in the Department of Rural Economy, University of Khartoum. This assistance should involve improved facilities, visiting professors, fellowships, and research support. Priority should be given to the physical facilities while the other components are being planned. This assistance will not only provide for a larger number of locally trained staff for the PAEA in the future but should also be linked to the long-term research needs of the PAEA. (Further discussion of these recommendations is provided in the issues section of the report.)

E. Short-Term Training

We find the short-term courses that have been given locally have been appropriate and generally well received. We especially note the courses to be given in September - October on livestock economics and economic theory by local instructors as examples of useful and cost-effective in-service courses. Courses should be operational and skill oriented, but we also recognize the need to increase the basic understanding of economic principles and mathematics.

Recommendation 9: We recommend that additional emphasis be given to short-term training courses organized and taught by the long-term advisors and local instructors. Possibilities include:

- Micro and macroeconomic theory;
- Methodology for analyzing pricing and market intervention policies;
- Mathematics for economists and statisticians;
- Agricultural survey statistics and methods;
- Micro-computer training; and
- Project identification and preparation.

We further recommend that training continue to be provided during working hours and individuals be permitted to use work time for training.

Recommendation 10: An overall training plan for the PAEA should be prepared to establish the priority of external short-term training needs and appropriateness of proposed courses. We recommend that individuals be funded for such courses based on the priorities set by the training plan.

F. Project Planning and Reporting

We find that the current system of separate monthly reports by each long-term advisor is too formal and fragmented. Furthermore, the approach of individual annual work plans for each advisor does not integrate activities around the operational objectives of the project.

Recommendation 11: We recommend that a consolidated quarterly report be prepared by the professional coordinator that identifies progress, constraints, and solutions for all major activities organized around the four major operational objectives of the project, which might be specified as:

- Improving the data and information base for agricultural planning and policy analysis, especially for rainfed agriculture.
- Improving the institutional organization and management of the PAEA and its component departments and divisions.
- Analyzing policy issues and planning sectoral investment programs and projects.
- Training technical staff.

The reports should review each project activity classified by the objective to which it contributes most directly.

Recommendation 12: The annual project work plans should also be integrated following a format such as the one presented above. An end-of-year internal self-evaluation should summarize achievements, identify constraints, propose solutions, and assess the extent to which the objectives are being realized.

G. USAID Administrative Support

Administrative matters are consuming much time of the USAID Project Officer, Professional Coordinator, and long-term advisors. Moreover, there are times when lack of secretarial support is constraining the productivity of the advisors.

Recommendation 13: USAID should establish a project support unit (PSU) staffed with administrative and secretarial personnel. This staff should handle administrative problems concerning personnel, housing, equipment, and supplies. The unit should also provide back-up secretarial support to the project advisors when it is unavailable in the PAEA.

H. Sampling Frame for Data Collection

Project documentation and the PASA Scope of Work called for introduction of an area sampling (ASF) for data collection. After reviewing base materials, i.e., maps, landsat and aerial photography, and assessing the length of time required to complete an ASF, we conclude that:

Recommendation 14: The village list frame should be used to begin the process of scientific data collection. Data should begin to flow and all tasks of a modern survey system should be carried out - frame design, sample selection, data collection, computer entry, edit and summary, and survey resource management. Surveys should be regularly repeated each year and the resulting data processed and disseminated on a timely basis.

Recommendation 15: As soon as materials for ASF construction become available, a pilot effort should be carried out to construct an ASF. Completion of an ASF for Sudan will require a time frame of five to

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ten years. It should be undertaken only if this project is extended beyond its present termination date and adequate financial and technical assistance is provided.

III. PROJECT ACTIVITIES AND ISSUES: FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

A. Project Design and Redesign

1. Project Goal

According to the project PP, the broad sector objective to which this project contributes is "to improve the level of living in the traditional agricultural/livestock sector". This goal is consistent with the USAID strategy that concentrates on rainfed agriculture in the Sudan.

Measures of goal achievement specified in the logical framework for the project are:

a. Increased rural income,

b. Increased marketing of crops and livestocks,

c. Increased consumption and exports and decreased imports, and

d. Improved quality of diets.

These are all long-run indicators. Even under normal circumstances there would be little likelihood of verifying changes in these indicators directly attributable to the project within the short period this project has been in implementation. Under the conditions of economic stress, food scarcity, and political instability that have prevailed during the implementation period, there is no possibility of doing so.

The main assumption made in the PP for achieving the goal is that "government policies will not discriminate against the agricultural/livestock sector generally, and specifically with respect to services to rural areas and to products produced by the traditional sector". This seems to us to be less of an assumption pertaining to goal achievement than a description of the linkage of the project purposes (see below) to the long-term

project goal. Perhaps the most crucial unstated assumption is that the GOS is politically willing and able to institutionalize the process of policy reform, so that implementation mechanisms are available, or can be created, to carry out policy changes in a consistent and coherent manner. It must be understood that policy changes -- even those that favor long-term efficiency and growth--also create short-term losses to some groups in an economy. Thus, in the process of policy reform there is no way to avoid the necessity for policy makers to make difficult decisions that must be sustained and sequenced over time.

2. Project Purpose

The project purpose is to "improve policy definition and planning for agricultural development in the traditional sub-sector of agriculture". The sub-purposes are:

a. To develop methods of agricultural sector policy analysis.

b. To develop the capability to identify, design and implement project procedures to carry out agricultural development program.

c. To develop a reliable and statistically sound system for generating agricultural statistics.

The project purpose and sub-purposes provided the focus for this evaluation. We assessed to what extent the purposes are being achieved and recommended actions we believe will help promote a higher level of achievement.

The assumptions for achieving the project purpose included the key assumption that the GOS would make staff available for training and for planning, analysis, and data collection. This assumption implies that salaries and working conditions would be such that staff could be attracted and retained. The extent to which this assumption has not been correct is a good indication of one of the key constraints on the long-term success of this project.

3. Project Redesign

After the approval of the PP and the nomination of long-term resident staff by the USDA, USAID initiated a PP supplement that made several significant changes in the project.

- An increased LOP funding from U.S $4.9 to U.S. $7.3 million.
- An increase in long-term technical assistance with the addition of a production economist.
- An increase in long-term training through assistance to the Department of Rural Economy, University of Khartoum, to improve in-country MS-level graduate training.
- An increase in funding for short-term training, commodities, and other foreign-currency project costs.

Long-term technical assistance was subsequently obtained under a USDA PASA and a contract with Checchi and Company.

Each of the five long-term advisors was assigned to a Department/Division in the PAEA. In the subsequent section of the report, we review each of the components of long-term assistance to the PAEA in which technical assistance and training have been used to strengthen its capabilities to gather data, analyze policy issues, and prepare investment plans and projects.

4. Project Outputs and Inputs

Project outputs were defined in terms of analysts with specified levels of long-term and short-term training and the Sudanese capability to undertake and manage project development and data collection. Outputs were to be measured in terms of formal and in-service training, projects prepared, policy analysis documents produced, and the existence of an operational computerized data base for the agricultural sector.

Inputs provided by the project include:

- Long-term technical assistance

- Short-term technical assistance
- Long-term external training
- Short-term external training
- In-service short-term training
- On-the-job training
- Commodities, such as computers and vehicles

Resources to provide these inputs come from U.S. dollar funding for foreign exchange costs and local currency counterpart funds.

In the following sections we review the main components of the project, identify and discuss a number of issues, and present our detailed recommendations on the project.

B. Major Institution - Building Activities in the PAEA

1. Macro-Economist, Sectoral Planning Division, Department of Project Planning, PAEA

This position is filled by Dr. William Bateson, who also serves as Professional Coordinator for the overall project. Dr. Bateson is a highly qualified and experienced economist. In this section we are concerned with his institution-building role within the Sectoral Planning Division of the Department of Project Planning (see PAEA organizational chart in Appendix G).

Dr. Bateson has prepared or co-authored a number of excellent analytical papers. These include a study of agricultural development in the Northern Region, a paper on impacts of gas-oil pricing on agriculture, and a series of analyses of crop pricing policies, especially for wheat. These papers reflect an admirable blend of theory and empirical analysis. They are oriented to important issues on the Sudanese and USAID policy agendas. They have been well received by Sudanese policy makers and donor agencies.

Recently, Dr. Bateson has initiated a unique data-collection activity in Southern Kordofan. This survey will collect detailed production and consumption data from a total of 240 households located in 12 villages in the Kadugli area. The survey is a joint activity among the Sectoral Planning, Food and Nutrition Planning, Marketing, Production Economics, and Statistics Sections of the PAEA.

The survey was designed to maximize variation among the sampled villages with respect to price and infrastructural variables. It will involve visits to sampled households on a bi-weekly basis over the period of a year. It is expected to produce data suitable for econometric analysis using the household production - consumption modelling approach. Dr. Bateson has obtained consultant services from Professors Evenson and Strauss of Yale University, both well known for their work in this area.

This is a very promising activity. Dr. Bateson is literally making heroic efforts to overcome logistical problems and exercise quality control on data collection and processing (coding and data entry). The activity will produce a group of trained and experienced enumerators who are also capable of coding and data entry.

The team endorses the concept and implementation of this activity. At the same time we have several concerns and suggestions. The data collection and analysis plan, which is well documented, appears to be ahead of the Sudanese capability to participate. Thus, it is not clear where the capacity to continue this type of data collection will be institutionalized, although the documentation suggests that the survey will be moved to other geographic areas in the future. Additional Sudanese participation both in the survey design and analysis of the data should be sought.

We have some concern that the Yale consultants have moved the survey design and data collection instruments too strongly toward a specialized econometric model. A survey that is as time- and resource-intensive as this one must perforce be multi-purpose. The long list of possible outputs

are almost all oriented to the expected econometric analysis, which for the most part can take place only after the end of the data collection and processing. What is the relevance of the survey to GOS concern, with development of the traditional agriculture sub-sector and the USAID western rainfed agricultural strategy? Can baseline data be obtained on the initial round, scheduled for September 1985, that can provide for analysis of internal and external constraints on smallholder production in the area? Have plans been made for producing intermediate outputs based on early survey rounds that will provide useful knowledge to the GOS and donor agencies? What specific policy issues will be addressed in the data analysis phase? While we are aware that attention to these questions will compete with time for field work, we recommend that they be addressed before field work actually begins. We see a high potential for this activity but recommend more emphasis on earlier and intermediate results to demonstrate its value and policy relevance.

We would also like to see Dr. Bateson increase his efforts toward institution building. We are aware that he has had a succession of counterparts in sectoral planning and we see evidence of collaboration with Sudanese in his policy papers. We also observed that he is enthusiastic and energetic in working with Sudanese analysts in an "on-the-job" training context. But we are not aware that he has really focused on the requirements for "building" the capacity of the Sectoral Planning Division. What are its objectives? Is there a work plan for the Division? What are the main constraints faced by this Division? How can the APS Project help in removing these constraints?

Related to this point, we suggest that Dr. Bateson pay more attention to training and staff development for policy analysis. We are not aware that he has organized any short-term courses. Yet, his work on Northern Region agricultural development, wheat pricing policies, and international competitiveness could all be easily used as the basis for training courses. The purpose would be to train Sudanese staff in the methodologies and institionalize the capability

for further application of the techniques. His proposal for a domestic resource cost analysis of comparative advantage which would then be continued by Sudanese staff in the future, is a good example. However, we are uncertain that this proposal is being implemented according to the established timetable.

2. Production Economist, Agricultural Production Section, Department of Agricultural Economics

The agricultural production economist position was added to the project by the PP amendment in 1983. Consequently, this position was not filled until Dr. Surjit Sidhu arrived at post 16 months ago.

Dr. Sidhu has made good progress in training individuals in the Agricultural Production Section (APS) in undertaking farm surveys. Beginning in April 1984, plans were developed to survey the rainfed mechanized sector using state-of-the-art production economics techniques. This work has required considerable time as this unit had not previously undertaken the kind of production economics analysis as introduced by Dr. Sidhu. A survey instrument was developed, village lists checked, a sample selected, staff (counterpart and enumerators) trained, data collected from 435 farms, data coded and listed, and summary tables developed. The data is presently being entered into a computer for analysis.

The objective of the study is to better understand the issues and production problems in the mechanized rainfed sector, with attention to the risks associated with various technologies involved in the production process. A significant amount of work has been undertaken, but little documentation has been produced. Although tables have been developed laying the basis for analytical work, no written plans exist detailing how the analysis is to be undertaken, how the data will feed into micro-economic analysis studies, or how this analysis will be disseminated to others who could use it. Will the analysis begin by developing profit functions? At what stage will supply curves be developed? Will analysis focus on the effects of changes on input prices, exchange rates, or risks of technology changes? The agricultural production advisor should work closely with the APS staff in establishing priorities and include these in short and long-term work plans.

The advisor has worked well in overcoming constraints on implementing farm-level surveys. Local public transportation is being used to supplement that provided by PAEA. It was noted that due to insufficient transport for data collection efforts, the sample had to be adjusted to interview farmers closer to a bus route. This may have been the only solution to the problem at the time, but questions are raised on the ability to infer the sample to the population using such sampling methods. Once a sample has been selected, could plans be developed prior to any enumeration which effectively uses both public and private transportation? If the vehicle constraint is serious enough to prevent the collection of "good data" a request should be made for use of project vehicles to assist in data collection efforts.

A number of survey instruments have been developed for the first mechanized rainfed survey, for the traditional rainfed sector, and for the second mechanized rainfed survey. Has enough experience been gained to identify the basic data which will be required on a continuing basis for analysis in the Agricultural Production Section? Collaboration with the Statistics Section has been ongoing, both in sampling work and in data collection. Statistical staff have been used for enumeration. Information on area, yields, and production are the priority areas for data collection by the statistics unit. To the extent that recurrent data are needed for production cost analysis, it would be more efficient to "piggyback" the collection of these data on the regular surveys of the Statistics Division. Special surveys of a "one-shot" nature should be limited to specific purposes. The latter are likely to continue to be the responsibility of the sponsoring office, although the technical skills and experience of the Statistics Division should be used to the fullest extent possible.

Work in collaboration with the macro-economist has produced policy studies that have contributed to informed policy making discussion and policy changes. The gas-oil pricing policy effort was instrumental in a change in gas-oil price, albeit temporary. These and other policy studies are good pieces of work that should be used as training tools for economists in the PAEA.

There has been a good deal of on-the-job training given by the advisor. The counterpart has been involved with developing the first draft of survey instruments and in planning data table formats. Dr. Sidhu has also worked with two individuals in guiding their analysis of processed data. Two training courses on data collection and surveys were held prior to data collection efforts. This training is commended. The data sets becoming available from the farm surveys will provide a good basis for future training sessions. Plans should include seminars and workshops on analyzing production data and developing microeconomic studies of production costs and returns.

One issue which needs to be addressed is the delay in outputs. Two reasons for this exist. Typists have not been available, and material has not been prepared in final form. The study of structural change of agricultural production in Sudan is composed of four individual studies. Some work has already been completed, but not typed and released. Lack of a typist has been a serious constraint to producing output. Provisions with the USAID Management Office are being made to assist the project with administrative tasks. This facility should be used in cases such as this where efforts over a number of months have failed to produce results due to typing constraints.

It is important that analysis already completed be written up and distributed to potential users. A regular PAEA publication series to disseminate research highlights and preliminary findings would be one such method. (See issues section).

Dr. Sidhu has made a valuable contribution to the development of capabilities in the Agricultural Production Section in undertaking farm surveys. Since the work involved introduction of new methods of analysis, there is a long process ahead to fully develop the capabilities of the staff to design and undertake data collection, as well as do the analysis of the data once processed. We recommend that this position be extended and Dr. Sidhu be asked to remain as advisor to the APS.

3. Marketing Economist, Marketing Section, Department of Agricultural Economics, PAEA

The first marketing and trade advisor arrived in Sudan in 1983. Due to problems in adjustment and attitude, his tour was terminated. The incumbent, Dr. M.E. Sarhan, began work in Khartoum in late March, 1984. Thus, it was not until April 1984 that this component of the project really got underway.

Our review shows that Dr. Sarhan has done an exemplary job of institution building. He has actively assisted the Section in terms of organization, staff, and programs. He has involved Sudanese staff in every phase of every activity. We feel that his first annual report is an excellent example of a comprehensive report covering goals, progress, constraints, and possible solutions.

With his assistance, collection of price and market information has been drastically improved. Prices, movement and stocks are being collected and disseminated for sorghum, sesame, groundnuts, gum arabic, and livestock. A short-wave radio network is being established to both receive and disseminate market information from and to major markets. Future plans are to include more commodities and more markets and different points in the marketing chain. Dr. Sarhan has also provided much-needed assistance to the Livestock Resource Economics Department of the PAEA.

Another very significant activity for the APS Project is the new Situation and Outlook Report. The goal of this publication is a regular monthly publication of both production and marketing information. While progress in bringing this publication into being was slower than Dr. Sarhan had hoped, the release of the first "end-of-season" issue covering the 1984/85 crop harvest has been achieved.

The real test of this activity will be the future regular and timely release of S/O reports based on primary information generated through the market information field network. Expectations have now been created, including a crop early-warning dimension. The latter is of great interest in a

drought-prone country emerging from a period of food scarcity. We urge that the highest priority be accorded this activity by the advisor so that it can be successfully institutionalized as a regular activity of the DAE.

We also wish to comment favorably on the 1985/86 workplan for the Marketing Section, presented jointly by Dr. Sarhan and Mr. Abdel Aziz M. Farah, his counterpart. This plan more closely approaches an overall workplan for the section than that prepared by any other long-term advisor. We feel this is exactly what the workplan should be, and should also show how project resources will be used to support that plan.

We recommend that every effort should be made to retain Dr. Sarhan for the length of the project. We have two suggestions that might be useful to him. One is that he be especially diligent in keeping Sudanese in leadership roles and restricting his activities to advisory, training, and support functions. This will hasten the day that he "works himself out of a job", which is the goal of long-term technical assistance for this project.

Our second suggestion reflects a concern that the workplan of the Marketing Section for 1985/86 seems overly ambitious to us. In particular, we question the wisdom of initiating a national food consumption survey as proposed in the plan. We feel that the PAEA and the APS Project are involved in enough major data collection and analysis activities to fully utilize all available resources for the next year and beyond. We urge that this activity be deferred. If time and resources are in fact available in the coming year, a critical review of available information on food consumption patterns in Sudan could be undertaken. This could be extended to prepare a much more specific list of questions to be answered and a detailed proposal for collecting the data and performing the analysis necessary to answer those questions.

4. Agricultural Planning Advisor, Project Preparation Section (PPS), Department of Project Planning, PAEA

This component of the project has been staffed since July 1982 by an agricultural economist, Mr. Raymond Fox. As Mr. Fox will be departing shortly, the following will be a brief review of his activities, but will concentrate on the type of activities that should follow his departure.

Among other activities, the scope of work called for the advisor to assist the Ministry of Agriculture "in the design and implementation of a process of orderly identification, preparation and appraisal of agricultural projects and programs". The advisor has concentrated his efforts in project identification: preparation and review of several hundred one-page project profiles, and development of "pre-feasibility studies", or preliminary project proposals. The approximately twenty pre-feasibility studies produced were brief descriptions of project ideas, five to twenty pages long. Most included limited benefit-cost analysis. Only a few of these products were available for review as file copies did not exist. The ones reviewed were of varied levels of sophistication and analysis. As will be discussed below, the usefulness of developing these project profiles and pre-feasibility studies is open to some question.

An agricultural project analysis handbook was developed to serve as a guide on agricultural project preparation for the staff of the PPS as well as regional offices. The handbook is a 30 page document which describes benefit-cost analysis and the distinction between economic and financial analysis. Although elementary, the handbook is useful in introducing these concepts to central and regional staff.

A consumption survey of 600 households was undertaken a couple years ago. Some data had been entered into a micro-computer, but after preliminary review of summary data it was decided to drop the project. It was determined that the data was of poor quality, and useful analysis could not be undertaken.

With regards to training, three short-term courses were held on project preparation and analysis. These courses were arranged by the agricultural planner, who participated in the field trip instruction, but were primarily taught by instructors provided by OID USDA. All staff of the PPS have benefited from enrollment in the courses, as well as individuals in various other PAEA sections and staff members from regional agricultural ministries. Two of the courses were beginning project analysis while the third was intermediate project analysis. The third course did not effectively communicate the course material due to a number of serious problems (poor facilities, insufficient progress through the course syllabus in a previous introductory course, inappropriate teaching orientation and material, and problems with the second instructor).

Future long-term technical assistance to the Planning Department should shift from project identification to; (1) investment program planning, (2) project monitoring and evaluation, and (3) development of a system to provide current data on planning parameters. Considering that at present and in the foreseeable future, the Ministry of Agriculture does not, and will probably not, fund any new agricultural projects (all funding is directed toward existing projects) the development of long lists of project proposals is a waste of time, energy, and resources. Furthermore, most outside donors develop their own projects for funding. Similarly, preparing lists of projects for regions and areas seems to have little relation to the allocation of investment funds within the GOS.

A more important task of the Planning Department is to ensure that ongoing projects use resources efficiently. For this reason, efforts should be made to strengthen the Monitoring and Evaluation Section.

Another important task, which falls naturally to the Planning Department, is the establishment of a system to provide information on planning parameters for sectoral studies and project preparation. The PAEA may not have the comparative advantage in developing projects, but it can certainly develop a good data base to be

used by others, including the Ministry of Finance and outside donors. A good information system, providing current financial and economic prices most frequently used in the agricultural sector, is one place to start. The system could then be developed to provide a range of planning parameters such as input/output coefficients, subsidies, shadow prices, demand and supply elasticities on a regional and national basis. Regional parameters were developed for Darfur during the summer of 1984, but the activity did not continue. This item is noted in the 1985/86 plan of work for the Planning Department and should be given high priority.

A good data system providing current data, and knowledge of the success and failures in the project portfolio (and the reasons why), will provide a more solid base from which sectoral planning for the agricultural sector can be undertaken. Overall sectoral planning, in collaboration with the Planning Wing of the Ministry of Finance and Economic Planning, is another area that needs strengthening. It should be included in the terms of reference for the new advisor in agricultural sector planning. It is an area in which the PAEA needs to establish its competence and play a more major role in the inter-ministerial process.

5. Agricultural Statistics Advisor

a. Technical Assistance

In May 1982, USDA signed a PASA with USAID that, among other things, requested services from USDA to support and strengthen the statistics program in three areas:

1) To assist the Statistics Division of the Department of Agricultural Economics to collect data to support regional planning and project monitoring and to process, manage, store, and disseminate reports in a timely manner.

2) To design, test, and implement an area sampling frame (ASF) on a province by province basis, eventually to cover the entire country.

3) To interact with the policy analysis component to determine the amount, type, and format of statistics required, as well as to design and conduct non-probabilistic special surveys in critical areas.

The first long-term statistics advisor for the Statistics Division was sent to Sudan in 1982 and his first activity was to try to implement an area sampling frame (ASF) in an area along the White Nile about 150 kilometers from Khartoum. This area has irrigated, mechanized, and traditional agriculture. The only available aerial photography, dating from 1962, was ordered. It was obvious that so much had changed in 20 years and that the photography was useless for construction of an ASF because the boundaries found in those photographs were no longer present on the ground.

After that pilot effort, those persons involved felt that ASF methodology would not work in Sudan unless new materials were obtained. The report on the White Nile area pilot ASF study, however, did not make this conclusion clear. The Director of Statistics in the Department of Agricultural Economics indicated that he understands that ASF methodology cannot be implemented with current materials.

The long-term advisor never worked on frame development after this brief pilot study but began to work on the computer installation. In June 1982 USAID and USDA signed an additional agreement to bring computer hardware and software to the PAEA. This activity, which was only a small part of the total work specified in the PASA, clearly absorbed 95% of the time of the long-term advisor (judging from the monthly reports). (Recommendations about the computer center are provided in a later section).

It is unfortunate that work with the sampling frame was not further pursued because without a frame no statistically sound data can be collected. In fact, no data has been collected from the traditional sector except by subjective methods such as eye guesses. This type of estimate is not acceptable to the Ministry because they need to establish policy and imports and need

hard quantitative data. We did not find evidence that the problem of the sampling frame was ever acknowledged even though both the Sudanese and USDA personnel recognized the fact that fulfilling the terms of the PASA (construction of an ASF) could not be done with the present materials. The fact is that the first statistical advisor was not effective in regard to data collection. The computer center was important to establish. We give him high marks for that but it absorbed too much of his time.

We feel that someone in USDA/SRS should have been "on top" of the situation to guide Mr. Erwin. If a senior statistician had been overseeing the project on a continuing basis he would have been able to redirect work and enable the advisor to be more effective in his major responsibility for data collection.

In 1984, the third year of the project, the second statistical advisor, Mr. Ed Lippert, came to Sudan. He has developed a plan to begin data collection in a systematic way. The plan calls for an area and livestock survey to be run this fall -- two years late but finally started -- using the village council list as the sampling frame.

A second pilot study was conducted during November, 1984, to further investigate the feasibility of constructing an ASF in the traditional rainfed sector. As the earlier study has shown, current aerial photography was needed. Work was carried out in two sites: a traditional rainfed area at Tel Geifil near El Obeid (North Kordofan) and a mechanized rainfed area near Habila (South Kordofan). These two areas were flown and ground truths established. The results showed that satisfactory segment boundaries could be established. However, given the relatively small area covered and the cost/time involved in this pilot ASF in the traditional sector, the decision to develop an alternative sampling frame for traditional area was confirmed.

The questionnaire for the first survey, which is included as Appendix H, is devoted almost entirely to crop area and production data but with several questions on livestock. It is presently being programmed for data entry.

The evaluation team endorses this survey and plan as a way to start the task of probability sampling and data collection. We further feel that the PAEA must see to it that the survey is on schedule and nothing is allowed to interfere with the successful implementation of this important effort. The Division of Statistics needs to complete the survey to demonstrate its capability. The PAEA, the Ministry of Agriculture and Natural Resources, and USAID should expect that this survey will be carried out in November and December so that crop production data is available for analysis and policy formulation. Further, the Division must understand that this survey is only the beginning of a statistical series. In the future, the survey should be run twice a year - the first survey run in August to pick up area planted and the second run after harvest to pick up area harvested and production.

After the first survey, the data must be summarized and the results released to the public. Then the Division needs to give the effort a complete review and adjust the procedures and prepare for the next survey round in August 1986 to obtain planted area. Once the Division has prepared for the second crop survey, then the Director and staff will need to organize and manage their resources in light of the mandate to collect more types of data.

A partially completed spread sheet was left that could be used to tie together data collection and users of the data. This paper should not distract attention from the basic crop area and production surveys. However, as a future management tool, the spread sheet could be used to schedule data collection activities, release dates for publications, questionnaires and manuals, and computer entry sections of the Agricultural Economics Department. We recommend that Mr. Lippert be kept on as the Statistical Advisor as long as possible. He has a lot to accomplish and the project is running out of time. He is extremely important to the project. A new advisor would likely cause delays in the current survey activities.

Livestock statistics are now the responsibility of the Livestock Economics Department of the PAEA. They have their own statistics group, which ran a survey in the field during April and May, 1985. The Livestock staff had to go to the Agricultural Economics Department for help in developing a frame and collecting the data. Nearly the entire livestock unit helped in the data collection effort. They are taking their data to Khartoum University to be summarized and analyzed. There is apparently very little statistical expertise in the Livestock Department so it would seem appropriate to assign the task of data collection and analysis to the Division of Statistics in the Agricultural Economics Deapartment. If there is statistical expertise in the Livestock Department, then it could probably be better utilized in the other larger Division of Statistics. As it is now, the statistical expertise is fragmented and weakened and the scarce resources poorly utilized. In addition, when one survey is going on in the field, it is often very efficient to "piggyback" questions about other items. The largest expense in Sudan is transportation while the added expense of asking a few extra questions during interviews will be minimal.

There is still the difficult problem of estimating the amount of cattle associated with the nomadic population as well as the problem of under-reporting because cattle are taxed. Some people feel that the village council sheikhs know the number of animals and the whereabouts of the families who are associated with their village. Further, some feel that most nomadic families are associated with just one village. We find it hard to believe that the problem could be so simple that the village council list would provide a complete sampling frame for livestock. In any case, scarce resources can be more efficiently utilized if they are not fragmented; therefore the data collection efforts should be combined.

b. Training and Institutional Development

1) Long-Term Training

So far the project has sent three persons to the U.S. Census Bureau, International Statistics Program Center (ISPC), in Suitland, Maryland for long-term technical

training. One person went to the agricultural statistics program for 16 months (this program includes 4 months at George Washington University and offers a Masters Degree.) He now heads up the sampling frame unit. The second person was trained at the ISPC computer program and learned to run mainframe computers. He currently supervises the computer center. The third person, trained in survey methods, has just returned to Sudan and is involved in the development of the area and production surveys. The first and third programs were useful because they provided practical training but the second program, computer science, was nearly useless because the Ministry has microcomputers not mainframe computers. No microcomputer training was provided. A few skills are transferrable but not enough to justify the years of training. Computer training must be provided at other institutions where microcomputer maintenance, programming, and management are taught.

Two more persons are in the process of being sent to the ISPC, one for the Masters program which includes the 12 month sampling course and the second for the sampling course only.

One major constraint on sending graduate students for academic training is that the Division of Statistics does not have personnel with adequate math background to be trained in the field of statistics at most U.S. universities. A degree in statistics requires mathematical measure theory, advanced calculus, and theory of linear algebra and complex variables. These are mostly graduate level courses that require a background of many undergraduate courses. Many of the professional persons working in the Division of Statistics have degrees in general agriculture or agricultural economics. In 1981, there were three professionals with mathematical backgrounds, but now there are none. We have recommended elsewhere in this evaluation report that remedial math be offered for economists and statisticians.

2) Statistical Staff and Facilities

According to Hassan El Sheikh, Director of the Division of Statistics, the number of enumerators, supervisors and professionals five years ago was 20 percent larger than now. The Division has deteriorated substantially with respect to personnel both in number and quality. We raise this as a major issue - we heard it over and over in all departments and divisions of the PAEA.

The Division of Statistics in the Department of Agricultural Economics has a staff of about 40 persons. This includes interviewers, supervisors, and the professionals. This is less than the number of persons required to collect data in most individual states in the U.S. during the survey periods. There are enough personnel to collect data for essentially one state in the U.S. provided the data collection can take six weeks rather than the two weeks required in the U.S. This limitation of personnel means that data for one inference region can be made. This is, data can be collected for about the equivalent of one state (about 250 to 300 segments) in the six week period. These data may be collected for a province, a district within a province or perhaps a 5 or 6 province area, with the understanding that lower level estimates cannot be as reliable because of sample size.

Presently there are three subdivisions in the Division of Statistics: the sampling section with 10 graduates, the publication section with eight graduates, and the sampling frame section with six graduates. About 30 enumerators and supervisors are available for interviewing during survey periods (some of the persons are counted twice).

The Mission Director, Dr. William R. Brown, expressed to us the fact that Sudan is the size of the United States east of the Mississippi yet has roads about equivalent to Rhode Island. Obviously, getting to rural areas is difficult, expensive, and

time consuming. The travel situation is a serious constraint no matter what data collection system is used. Although there are vast areas of desert where no data will be collected, there remain huge areas where agricultural activities are present, implying that data will need to be collected from all agricultural areas of the country on a sample basis. The traditional agricultural areas may shift from one year to the next depending on the rainfall pattern. The shifting agriculture creates a special difficulty for efficient stratification design.

In order to collect data in a timely fashion for one inference area, about 15 teams of interviewers will need to be in the field at the same time for about six weeks. About 11 vehicles (six of which can be obtained from the pool) and drivers, and at least three supervisors, are needed to support the data collection effort for the survey. If other activities are going on during this survey period, then additional resources will be needed. Presently, the department has 10 vehicles, most of which are worn out. Three vehicles are provided to the car pool by the APS project: one is in El Obeid, one issued to the advisor, and one is in the motor pool. Before that, six cars were provided five years ago. The average life of a vehicle in the Sudan when used in rough terrain will be about four years. As soon as the cars are used in the surveys, one can expect that the cars will break down. The Division needs five new vehicles to carry out its mandate of data collection in the agricultural areas.

The computer center of PAEA, maintained and operated at the Division of Statistics consists of the following configuration of hardware:

- Two Northstar Horizon microcomputers with two terminals each.
- Each of the above with two double sided, double density hard disks.

- Two 20 megabyte Winchester Hard Disks partitioned so that each terminal unit has access to 10 megabytes of hard disk.

- Two IBM compatible Compaq Computers with 512 K RAM, one with a 10 megabyte hard disk.

- Letter quality printer, matrix printer, and power conditioners.

The Northstar configuration was state-of-the-art five years ago. Presently, the equipment is old, difficult to maintain, and without the capacity to service all the needs of the PAEA. However, it does have the capacity to enter, store and summarize some of the data currently being collected by the PAEA. It has the capacity to provide terminals for word processing and table organization and storage.

Basic crop and livestock data can easily be entered at the four terminals attached to the two Northstars; however, complicated data from socio-economic surveys cannot be entered. Two groups from within the PAEA could not enter their data because of the complexity of the data and because the questionnaire designers were unwilling to modify the questionnaire to conform to restrictions of the software. There are five persons trained to use the word-processing software and the same five can enter data from questionnaires.

As noted earlier, data from two PAEA surveys have been sent to the University. This may turn out to be expensive, time consuming, and may not result in the processing service that is needed. The PAEA loses control when data processing is done elsewhere.

The Compact Computers have the capacity to run fairly large data sets and further they can run rather sophisticated regression packages and econometric programs that are available. Large data sets can be analyzed by subdividing the one set into several smaller sets.

The center equipment is in the process of being integrated so that data can be passed between the Northstar and Compaq computers. Newer equipment with a larger capacity may be needed to handle some of the data that are anticipated to be collected in the near future. We did not undertake a sufficiently detailed appraisal to make a specific recommendation on upgrading the computer center.

In addition to the above equipment in the center, there is a trend to have individual stand alone computers placed with many of the technical advisors. We encourage the proliferation of these stand alone computers in the Ministry to the full extent that training can be supported and use can be made of them. This increased use of computers is consistent with project objectives and should be considered as a necessary resource to apply modern econometric models and quantitative methods.

There is an immediate need for a computer expert to maintain, train, organize, and manage the center (even the present center) if the statistical advisor is to get the survey work going. This task of computer maintenance and on-the-job training is currently requiring 60 to 80% of the statistical advisor's time and energy. The evaluation team would like to see a computer expert hired locally. We realize that a competent computer expert is not easy to find and we feel that the chances of finding someone locally are limited. But it is important to make this effort. However, this position is so important that our recommendation, assuming that a competent local person cannot be hired within two months, is to hire a person in the U.S. Do not run the risk of being unable to process the important data currently being collected or delaying the Statistics Division in running surveys of basic crop acreage and production data.

C. Other Project Issues and Recommendations

1. Concentration on the Planning and Agricultural Economics Administration, Ministry of Agriculture

The APS Project was designed to improve the data collection and analytical capabilities of the PAEA as a means of strengthening the role of the MANR in agricultural planning and policy formulation. Obviously, the MANR does not act alone in formulating agricultural policies but must interact with other ministries and agencies. We see no reason to question the basic strategy of the project since much remain to be done to increase the effectiveness of the MANR as a major force in policies affecting agriculture. Yet, the project must also be aware of the need to strengthen the linkage of PAEA to decision-making processes that not only move upward through its own ministry but also outward to other key policy-making institutions and agencies.

The PAEA does not yet have the capacity or the status to fulfill its information generation, planning, and policy analysis roles. Unfulfilled demands both within and outside the MANR are evident. Yet, we see definite progress and movement in the right direction. It is beginning to establish its role more clearly and assert its responsibilities in relation to other ministries. The leadership shown by the Marketing Section in establishing a continuing collection of data on and analysis of marketing margins, rather than deferring to a one-time study of margins purposed by the Ministry of Finance and Economic Planning, is one example. The provision of analytical studies as inputs for price-policy decisions is another example where the PAEA is becoming more "visible".

It should also be recognized that the PAEA must necessarily focus on immediate and short-term policy issues and is unlikely to be able to undertake the more basic research on relevant agricultural development topics that are essential for formulation of long-term strategies and policies for the sector. The University of Khartoum is the most likely location for that type of research. We believe that linkage and funding should be provided to the Department of Rural

Economy (DRE) to carry out an agreed research agenda. This work would form part of a larger package of assistance to the DRE to strengthen its Master's Degree graduate training, as described later in this section of the report.

2. Project Focus

The project is assisting the PAEA to develop its capabilities in agricultural planning and policy analysis. Policy and planning issues encountered in PAEA and GOS run across both the irrigated and rainfed sub-sectors. Data collection efforts, policy studies, and comparative advantage studies will suffer if assistance is artificially restricted to work only on the rainfed sub-sector. Effective institution building requires that assistance not be limited to work on the rainfed sub-sector. However, this recommendation is not inconsistent with the USAID strategy that concentrates on the rainfed sub-sector as its priority for assistance.

3. Project Workplans and Reports

Project documentation in USAID files is adequate but could be more complete and better organized. Our main concern, however, is with the concept and nature of the workplans and reports.

Workplans are developed individually by each long-term advisor and submitted to the Director-General, PAEA. Some reflect a concern with the institutional development of the division involved; others are a collection of individual activities. There is no attempt to integrate them into an overall set of activities oriented to the priority needs and constraints of the PAEA and its departments and divisions. Similarly, individual monthly reports are submitted to the Project Director and USAID Project Officer.

We believe that the professional coordinator should lead the technical assistance team in coordinating and integrating the various elements of the workplans for each division into an overall project workplan that addresses the major operational goals of the project. These goals might be identified as:

- Improved data and information base for agricultural planning and policy formulation, especially for the traditional agriculture sub-sector.

- Improved institutional organization and management of the PAEA and its departments and divisions.

- Analysis of policy issues and preparation of sectoral investment program and projects.

- Training of technical staff.

If this format is adopted it could also be used for quarterly implementation reports that are consolidated into one overall report by the professional coordinator. The annual workplan and the quarterly reports should be used as the basis for an end-of-year self-evaluation led by the professional coordinator.

4. Administrative Support and Management

Here we see two major needs. There is obvious difficulty in arranging for disbursements of funds and solving local procurement and logistical problems within the PAEA. Much time of the professional coordinator and USAID project officer is absorbed on administrative matters, and frustrations are created for the advisors and their counterparts. We suggest that a talented management specialist be recruited locally using counterpart funds. This person should work in the office of the DG. He/she should be able to alleviate the administrative burden and improve the management of project activities within the PAEA. Particular attention should be paid to budgeting procedures so that approved budgets are readily available to the departments to carry out agreed activities.

It is equally true that a good deal of time is spent on the USAID/project interface. This involves such matters as housing, personal status, and external procurement. Moreover, there are times when secretarial support for project activities is required that exceeds the capacity of the PAEA. We suggest that USAID take definite steps to establish a Project Support Unit (PSU)

supported by counterpart funds. This unit would be staffed with administrative and secretarial personnel and be responsible for facilitating the work of the long-term advisors. We understand this issue has already been discussed and accepted in principle. Its implmentation seems to require that a trust fund be established to provide for use of local currency for this purpose. We urge that the necessary steps be taken so that specific support resources are clearly available.

The administrative complexity of the project leads to much confusion over budgets and allocation of funds. Some of our informants believed that activities approved in the annual workplans still needed specific expenditures to be approved by USAID. This seem to result sometimes in requests being denied to a department director after he thought an activity was approved. Since knowledge of budget amounts are not widely known, some request for commodities and other support apparently are approved while others are rejected due to "insufficient funds". Some of the long-term advisors seemed not to know for how long their positions are funded and what level of support is available for short-term technical assistance and in-country courses. With the number of organizations and procedures involved, it will not be possible to avoid all of these problems. We feel they can and should be minimized. Whatever the merits of the specific complaints we heard, the importance of the workplans containing adequate budgeting for resources is clear.

The split location of the PAEA adds to the administrative and logistical complexity of the organization. Obviously this problem can only be solved completely by placing all parts of the organization in the same physical location. A new building would accomplish that physical integration as well as upgrade the facilities and work environment. We were not able to ascertain if this approach is feasible and we hesitate to make any recommenda- tion that might unnecessarily impede the planned (and needed) expansion of facilities at the present DAE site.

Lack of vehicles was identified as a constraint by many of our informants. Vehicle maintenance and fuel supply are involved as well as the number of vehicles. We suggest that this area should be a priority for the management specialist to work out improved procedures for procuring, scheduling, and maintaining vehicles.

We feel that the USAID Project Officer is aware of many of the issues discussed in this report and is already working on many of them. It would be better if some of the limited time she has available for the project could be used on substantive issues rather than on administrative problems and details.

5. Source, Management, and Backstopping of Technical Assistance

This project has the unusual feature that two sources of technical assistance and U.S. procurement are used: a USDA PASA and a contract with Checchi and Company. Other than the agricultural statistics component, the logic of the separation of the components by sources is not clear. The need to coordinate the overall set of project activities led to the appointment of one of the long-term advisors as "professional coordinator". The terms of reference for this role were apparently not established with adequate specificity.

We believe the leadership role of the professional coordinator should be strengthened. We have offered several recommendations to do that. However, we do not intend that he become a full-time manager with no involvement in policy analysis. We believe the policy analysis function is also critical and should be maintained. What needs to be reduced is the amount of time he is spending on administrative and logistical problems.

The recommendation to place the macroeconomic policy analyst and professional coordinator at the DG-level is for two purposes:

- To emphasize that analysis of policy issues draws on data and analysis that is done in various departments/sections.

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- To emphasize the need for coordinating all the activities of the project around the operational objectives of the project.

Generally, satisfactory procurement support and short-term technical assistance has been provided by both contractors. USDA has been especially responsive to requests for assistance with the microcomputers. But neither source has provided much in the way of continuing support of top quality professionals to guide the overall development of the project. We see little evidence of U.S.-based scientific leadership by the contracting organizations. Nor do we see a continuing flow of intellectual support to assist in maximizing the success of the project and guiding it to achieve its long-term institution-building objectives.

6. Institution Building and Counterparts

Institution building requires that the capabilities of a component part of an institution are increased, not just those of an individual. Generally, technical advisors should interact with more than one assigned counterpart. A good example of this is the interactions of the agricultural production economist. His attentions are focused on developing the abilities of his assigned counterpart, but he is also working directly with two other individuals in guiding their analysis of summarized data, as well as training the unit's staff on the implementation in farm surveys. The marketing advisor, as we have already noted, has worked to improve the overall program of the Section as well as assisted the Livestock Resource Economics Department.

We believe that too much emphasis has been placed in this project on one-to-one counterpart assignments for the long-term advisors. Our recommendations imply that they--and the project as a whole--should be more concerned with overall development of the departments and sections with which they are working, and that the project should focus on the evolution of the PAEA as a source of data and analysis for policy decision making.

Nevertheless, we do not feel it would be appropriate to try to create counterpart relationships at higher policy levels. For long-run success, policy advice needs to flow from Sudanese staff to Sudanese decision-makers. The central task we see for this project is to improve the capabilities of the PAEA staff and strengthen the linkages of the organization to key decision makers within the policy formulation processes of the GOS.

7. Livestock Economics and Statistics

The PAEA contains a Department of Animal Resource Economics (DARE) as one of its major subdivisions. In turn, this commodity-oriented department has responsibilities for livestock production and marketing economics and statistics. These functions overlap with the same functions involving crops in the Department of Agricultural Economics. Staff members of DARE are generally poorly trained to carry out their responsibilities. Also, there is considerable confusion about DARE's role in relation to the planning section in the Animal Resource Administration of the MANR. The history and implications of this complex organizational arrangement are described in the short-term consultant's report prepared under the APS Project, "Evaluation of the Animal Resource Economics Administration".

The team received a strong plea from the Director and staff of the DARE for additional support from the project, especially a long-term advisor. They were very appreciative of the efforts of Dr. Sarhan to assist them and described several important activities he has helped them organize. The need is obviously great. However, we opt for recommending a sharing of advisors in production economics, marketing, and statistics with the DARE rather than bringing in one full-time advisor for that Department. One basis for this recommendation is our doubts that the group can fully utilize the services of a full-time advisor. Another is that the proposed arrangement will give this Department access to specialized assistance appropriate for their mandate to cover all aspects of livestock economics and statistics. In time, the PAEA may choose to

integrate its work in livestock with its crop departments. In our opinion that would be a more effective use of the scarce technical economic and statistical resources that are now fragmented across commodity lines.

The proposed arrangement will work only if it is incorporated into the job description of the advisors involved. We are unable to specify what percentage of time of each is appropriate. We do believe that the percentage should be explicit and involve that amount of physical presence in the DARE. The danger in this arrangement is that the additional work for the advisors will be added on top of assignments that already exceed full-time. We do not intend that to happen; everyone involved must recognize that the advisors will have <u>less</u> time in their present assignments.

8. Staff Morale and Motivation in the PAEA

Our attention was directed numerous times to problems of low morale and lack of motivation among the Sudanese staff. Salaries are low and the GOS functions with inadequate physical facilities and financial resources. Promotions are infrequent and apparently based on seniority.

We have few recommendations in this area. We are sure that some short-term expedients, such as topping-off salaries, create even more insoluble problems later. When we found dedicated and productive staff, it was usually those who were learning new skills and participating in worthwhile work on relevant policy topics. We encourage the leadership of the PAEA and the long-term advisors to try constantly to stress the importance of the work that is being done, the usefulness of the skills being transferred, and the utility of the results for policy decision-making.

We are fully aware that an evaluation team in the country for three weeks cannot solve a problem that is endemic in the environment. We can only urge all participants in the project to pursue every possible opportunity for its amelioration.

9. Conflicts in Objectives and Ambivalence Toward the Project Objectives

The long-term goal of the project to create a greater analytical capability within the GOS is clear. Yet, we learned that in some instances USAID has requested specific analysis from the project staff with little concern for Sudanese participation. While we are pleased that the Mission has been able to utilize some of the projects outputs in its policy dialogue with the GOS, we feel that an excess emphasis on immediate outputs can get in the way of the longer-term institution-building objectives of the project. We would like to see the advisors told explicitly that teaching the Sudanese "how to do it" is more important than "doing it themselves". We believe there is an inevitable trade-off between immediate outputs and institutionalization. While donor and GOS pressures may sometimes force the advisors to produce outputs with little involvement of local staff, we stress the need to involve them as much as possible and upgrade their analytical skills and experience as rapidly as possible if the project is to achieve its long-run goals.

Outside the sponsoring Agriculture Office, we found some ambivalence within USAID about the project, ranging from lack of familiarity to feelings of futility in face of the financial crisis and demoralization of the GOS. The project is clearly related to the Mission's policy dialogue with the GOS. It has contributed directly to that dialogue in the past. It should continue to contribute, and increasingly from "inside" the GOS's own policy formulation processes. Nevertheless, the long-run risk cannot be denied. We found that an UNDP/World Bank planning assistance project with the Planning Wing of the Ministry of Finance and Economic Planning was drawing to a close after eleven years and the recipient ministry is believed to be analytical weaker now than when the project was started. However, within the MANR and the other ministries, we found explicit unfilled demands for data generation, policy analysis, and planning that the PAEA should--and increasingly can--undertake.

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10. Long-Term Training

Long-term training has lagged more than any other project component. This is a weakness of the project, and the source of much disappointment for all concerned.

The PP amendment to the project in 1983 provided for the development of facilities at the University of Khartoum's Department of Rural Economy (DRE), as well as the provision of two U.S. visiting professors. Unfortunately, after much progress towards developing a program to increase the University's capability to train graduate-level economists, the plan was dropped and the decision made to arrange graduate training directly with American universities.

The reasons cited for dropping the support to DRE were problems with the agreement--on the form, provisions and conditions of the proposed assistance--and slowness in developing acceptable construction plans. By the time the decision was made to revert back to the original approach, two years of the project had elapsed.

Subsequent problems were encountered in sending individuals for long-term training in the United States. To date, only six individuals have completed long-term training. Another ten are in the process of leaving or are in training. (See Table I for a list of long term training activities.)

The Project Officer recognizes the problems (the selection process, English language, capabilities to fulfill entrance requirements of American Universities, various testing deadlines) and has worked hard to relieve these constraints. A number of individuals have been enrolled in English language courses, selection criteria have been established, efforts to arrange special testing made, and preparing students with remedial work is being considered. A new mission order sets minimum standards for training nomination (TOEFL score of 500, GPA of 2.75, GRE test results, and a minimum number of years from retirement eligibility) which should relieve the Project Director from pressure from staff members requesting training on the basis of seniority alone.

TABLE I

SUMMARY OF PROJECT TRAINING ACTIVITIES

1. Long-Term External Training

	No. of Individuals		
	Completed Training	In-Process	Degree Program
Statistics	2	2	2
Computer Training	2	-	-
Planning	2	5	-
Agricultural Economics*	-	3	3
TOTAL	6	10	5

2. Short-Term External Courses** 8

3. In-Country Courses

	No. Of Individuals Trained
Project Analysis (2)	46
Advanced Project Analysis	25
Use and Maintenance of Project Hardware and Software	6
Data Collection and Survey	36
Economic Forecasting	26
TOTAL	139

* Two at University of Arizona and one at Michigan State University

** Topics of external courses/workshops/seminars were: fertilizer sector analysis, remote sensing, food and finance agricultural policy, and M.Sc. preparation.

1/7X

Efforts should be made to place individuals in U.S. universities starting in January 1986, with a larger number to follow in June and September 1986. Selection for training should be based primarily on academic potential and expected professional contribution to the PAEA. MS degrees in agricultural economics should not be highly specialized so we feel long-term training slots should not be allocated strictly by department or division.

Master degree programs should prepare individuals as much as possible to undertake economic research when they return to PAEA. Skills in problem definition, research design, and seeing the process to completion are needed. These skills are best developed in a thesis program. Thus, programs selected should contain a thesis requirement.

We recommend that the vast majority of the participant training take place in the U.S. We believe the highest quality programs are offered by U.S. institutions. Third-country training should be limited to special cases.

To further strengthen the training program, careful placement to match the interests and capabilities of the trainees with the academic programs is needed. In addition, close monitoring of progress and seminar/workshop activities to encourage relevant research by the trainees and coordinate their research activities is desirable. If possible, a U.S. university should be selected to implement the academic training program. Either BIFAD as an RFP to interested institutions might be used to select an institution. If time limitations dictate the use of the established AID system, specific training objectives should be provided in the training PIO/P's along with detailed background information on the trainees. More monitoring and networking among the trainees and between the trainees and the PAEA should be provided than is usually the case.

In the long run, the Sudanese will need to produce their own qualified individuals to staff planning and research agencies in the private and public sectors. In working towards this objective, the

facilities and staff of the Department of Rura Economy at the University of Khartoum should b strengthened. The facilities should be upgraded including construction of a new building an expansion of computer facilities and librar holdings. Due to the lack of sufficient classroo space for existing classes, the building componen should receive priority while other elements ar being planned.

The evaluation team explored the project's relation to the DRE with the Dean of the Faculty of Agriculture, staff of the DRE, the previous USAID project officer, and the Ford Foundation Representative. The University is very interested in re-opening negotiations for involvement with this project, and we are optimistic that previous constraints can be overcome. To avoid a repetition of the previous situation, we suggest that an agreement with the University Administration and the Dean of the Faculty of Agriculture on the need for the assistance and the major components of the assistance should be reached as a first step.

Research funds should be included at the University to support student and faculty research. It is important to provide an attractive environment at the University to slow the departure of faculty to more attractive positions abroad. For this reason research funding should be used for faculty research as well as supporting graduate students. The research should be oriented to the needs of the PAEA by means of a research agenda developed jointly by the two institutions.

We understand that USAID may consider developing a broad project to strengthen the University. Some mission staff apparently feel the assistance proposed here might better be part of such a separate project for the University. We reached no conclusion on the structure of the Mission's project portfolio. However, we do stress that the involvement of the University in the project is not just a peripheral issue. The University has a key role to play in terms of training planners and analysts and performing basic, long-term research. Both are critical to sustaining improved planning and policy analysis capabilities

in the GOS. Thus, the University is an integral component of the overall agricultural planning system in the country and deserves treatment as a full partner in this project.

We are also aware that some of the funds allocated earlier to the University have been reprogrammed to support construction of a new building for the PAEA. Since budgetary resources are both limited and--to a degree--fungible, some competition for funds is inevitable. However, we do not recommend dropping the proposed construction and shifting those same funds back to the University. We are basing our recommendations for assistance to the DRE on new funding. If additional local currency is available, plans could be developed for the needed facilities for the DRE. By the time this construction is complete, other assistance (visiting professors, micro computers, reference materials) could be implemented through new dollar funding provided under project extension.

11. Short-Term Training

A number of short-term training courses have been offered, including project analysis, use and maintenance of computer hardware and software, data collection and surveys, and economic forecasting. These courses have trained approximately 140 individuals, and have met identified needs. Most have been well received.

It has been demonstrated that the most successful courses have been those for which significant preparation was made and which included the personal attention of a technical advisor. Preparation of in-country short-term courses should continue to include country visits by external instructors. These are beneficial in determining course content and familiarizing the instructors with Sudanese conditions for instructional purposes.

Long-term technical advisors are encouraged to present seminars and organize workshops and courses centered around their work. This is an effective way to train a large number of staff and institutionalize the capability among a number of individuals.

Courses should be operational and skill oriented. To this end, some courses in project identification and preparation and micro-computer related training should continue. Other courses such as mathematics for economists and statisticians, and methodology for analyzing pricing and market intervention policies, would be helpful.

As many locally trained agricultural economists are better trained in agronomy than economics, the need to increase their understanding of agricultural economics and the application of these concepts to policy issues is necessary. To this end, training in economic theory and mathematics is needed. A continuing in-service training program during working hours could help address these deficiencies.

Short-term external training is often viewed as a benefit to be awarded to staff members. However, this training is too expensive to serve as a fringe benefit. All training should be aimed at meeting identified knowledge and skill gaps in the PAEA. An overall training plan should establish training priorities and identify topical areas for which training is needed. Short-term external training should be funded according to the priorities of the training plan and the appropriateness of available courses.

12. Publications Series

We are aware of the new "Situation and Outlook" report series that has been initiated. Also, the Statistics Section has its annual yearbook and periodic reports on current statistics. We also see a need for a formal publication series, such as "studies in agricultural economics", that would be prepared and published by the PAEA for general readership in the public and private sectors. Whatever forms taken, the goal of early and systematic dissemination of research results should be emphasized for all of the analytical efforts undertaken by the project.

APPENDIX A

EVALUATION SCOPE OF WORK AND TEAM TERMS OF REFERENCE

Background

The Agricultural Planning and Statistics (APS) Project was developed to assist the Government of Sudan, and specifically the Planning and Agricultural Economics Administration (PAEA) in the MinAg, in improving and strengthening its policy analysis and planning capability for the Agricultural sector. The project's three components are designed to: (1) improve and strengthen the capability of the Ministry of Agriculture to identify, rank and analyze critical macro-economic, trade and marketing problems and issues; (2) develop a reliable agricultural data base and reporting system to generate timely agricultural statistics; (3) strengthen and improve the capability of the Ministry of Agriculture to identify, appraise and plan agricultural projects and programs designed to overcome current and future constraints to agricultural development in the Sudan. In order to achieve the purposes of the project, AID has financed technical assistance (long-term and short-term advisors and consultants), microcomputers and associated software, training, studies and commodities.

Scope of Work

This is the project's first external evaluation. It has been partially staffed for two and one-half years, but will have been fully staffed for only one and one-half years at the time of this evaluation (8/85). The project activities completion date, PACD is April 30, 1987, less than two years from the proposed date of this evaluation. TA personnel include a macroeconomic policy analyst, an agricultural trade and marketing analyst, an agricultural planner, a production economist and an agricultural statistician.

The evaluation team should verify and assess the following:

1. Whether the assumptions made in the project design are still valid and whether the project design and target outputs remain appropriate to changing conditions and the human resources which are committed.

2. Since project outputs have lagged behind the original schedule, (attributed largely to delays in staffing) evaluators should review the delays in outputs identifying any other constraints (including host country logistical support capabilities) which may need to be addressed.

S2X

3. The impact of delays and recommend corrections and adjustments, including possible extension of the PACD, to ensure that the project can successfully realize its objectives.

4. Special attention should be given to the effectiveness of the TA personnel in institution building and direct TA outputs with recommendations for improvement, as appropriate (the coordination of personnel and their mix of skills should be evaluated along with the PAEA's absorbtive capacity and the morale of personnel).

5. The training plan/program should be reviewed and its appropriateness to the project objectives evaluated.

6. Whether the level and identification of inputs (TA, training, commodities, etc.) are appropriate to support the project objectives and anticipated outputs and whether consideration should be given to provision of inputs beyond April 1987.

7. Review the reports, analysis and plans produced to date as well as those scheduled for the future under the project in order to evaluate the linkage between project outputs and policy formulation and evaluation and recommend ways of strengthening the relationship.

Four and one-half weeks of field work (essentially in Khartoum) should provide adequate time for team members to review project documents, evaluate project design, verify assumptions, interview relevant personnel, identify constraints to implementation, make recommendations for any mid-course adjustments indicated, provide guidance for a contemplated project extension and draft the report and present it to the Mission prior to departure from Sudan.

Personnel

1. Team Leader, responsible for drafting the report, should have considerable experience working with LDC-specific problems associated with data collection, analysis and reporting, policy analysis and agricultural planning. Experience in working with similar projects is essential.

2. Agricultural policy analyst should have experience assisting LDC's in strengthening host country technical and institutional capacity to provide timely and appropriate analysis of policy alternatives and policy recommendations. This individual must be of sufficient professional stature to demand the respect of all involved.

3. Agricultural Statistician/Remote Sensing Specialist

a. Prior to Departure from U.S.

Contact Al Warren of USGS. It is anticipated that Thematic Mapper Imagery (24 color composite prints at 1:250,000 and color positive transparency at 1:1,000,000) taken Oct.-Dec. '84 and covering much of W. Sudan will be available to Warren prior to shipment to Khartoum. Two Sudanese cartographers from MinAg Soil Conservation Service and the Nascent National Remote Sensing Center will be working with Warren in May/June on TM techniques. Above products should be directly useable by project in Khartoum without specialized equipment. Additional special services are available through regional remote sensing facility, Nairobi.

b. In Khartoum

1. Review project documentation and USDA's scope of work (as per the PASA) and evaluate the work of project statisticians in assisting the MinAg to develop a reliable agricultural data base and reporting system to allow timely agricultural planning. Collaborate with the rest of the evaluation team (being contracted under an IQC) in responding to the scope of work specified in a cable for W. Weinstein, AID/W, AFR/PD (attached).

2. Project documentation and USDA PASA specifically call for the introduction of area frame sampling technology. Consultant's principal task will be to evaluate the appropriateness of that technology, the potential of existing materials (imagery, air photos, maps and related documentation), identify possible institutional constraints to the introduction of area frame sampling into the work program of the Agriculture Planning and Statistics Project and Ministry of Agriculture. Area and other forms of stratification, cluster selection, and estimating procedures should be considered. The primary focus will be on the relatively physically homogeneous dryland agricultural areas of western Sudan (smallholder and mechanized schemes). It should be noted that crop yield and area statistics on dryland agricultural production, especially from the traditional sector, are considered unreliable. The principal crops of interest are sorghum (dura), millet, groundnuts and sesame. Cotton, livestock numbers and range conditions present another set of issues which must also be addressed.

3. Participate in field trip with project and advisory staff to assess ground truth quality of existing materials.

4. As appropriate, conduct seminar(s) for GOS and project staff.

5. Prepare and present a draft report summarizing findings and recommendations for USAID and the project before leaving Sudan. Submit one copy of final report, after written comments are provided, to the evaluation team leader for inclusion in the final evaluation report, and forward 30 copies to USAID within one month of departure..

APPENDIX B

POSITION DESCRIPTIONS FOR THE LONG-TERM ADVISORS

1. Macro-Economic Policy Analyst

This agricultural policy advisor shall be an employee of the U.S. contractor who will assist the GOS in strengthening its capacity to carry out priority policy analysis and formulation. This individual reports programmatically to the Director General of the PAEA. He/she also reports through normal corporate channels of the contractor to insure contractual obligations are met. This position is to commence as soon as possible after a contract is finalized and last for a period of 48 months.

The macro-economic policy analyst will assist the MinAg in the design and conduct of macro-economic studies of key policy issues. The analytical work of this advisor will focus upon agricultural budget planning of the MinAg, prices and subsidies of agricultural inputs and commodities, aggregate supply and demand of agricultural commodities and policy issues revolving around public and private investment in the agricultural sector.

The advisor will:

a. Provide on-the-job training to the MinAg and other staff in the design and conduct of key macro-economic studies.

b. In collaboration with MinAg colleagues and policy makers, identify major macro-policy issues, data needs and analytical studies to be undertaken; draw up short- and long-term work plans to design, conduct and report upon such policy studies.

c. Be thoroughly familiar with the public budget planning process with particular emphasis on allocation of capital and recurrent funds between and among (a) crops and livestock, (b) irrigated and rainfed agriculture, (c) basic agricultural services (research, extension, crop protection, veterinary services, etc.), (d) planning and administration, and (e) special projects and programs; identify and measure economic tradeoffs and opportunity costs involved in the budgeting process.

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d. Be able on the basis of economic analysis and policy studies to advise policy makers on development opportunities, investment alternatives and priorities, and policy trade-offs for the agricultural budgeting and planning process.

e. Undertake analytical studies on the direct effects and distributional impacts of current and alternative agricultural prices and subsidies.

f. Maintain systematic time series data on the supply and demand of agricultural commodities and develop projects under current and alternative agricultural policies.

g. Maintain close working relationships with Ministry policy makers in order to predict and respond ex ante to macro-economic policy needs.

h. Identify and schedule in collaboration with the project Director short-term technical support and training needs and maintain overall training plans for GOS counterparts.

2. Agricultural Trade and Marketing Analyst

This agricultural policy advisor shall be an employee of the U.S. contractor who will assist the GOS in strengthening its capacity to carry out priority policy analysis and formulation. This individual reports programmatically to the Director General of the PAEA. He/she also reports through normal corporate channels of the contractor to insure contractual obligations are met. The position is to commence as soon as possible after a contract is finalized and extend for a period of 48 months.

The agricultural trade and marketing advisor will generally be responsible for assisting the design and conduct of analytical work in this policy sub-sector. The analytical work of this advisor will focus upon domestic marketing of agricultural commodities, exports of crop and livestock products, food imports, domestic milling capacities, and crop storage (both on-farm and terminal market facilities).

The advisor will:

a. Provide on-the-job training to the MinAg and other staff in the design and conduct of analytical studies in the agricultural trade and marketing area.

b. In collaboration with MinAg colleagues identify major policy issues and data and analytical needs in the area of agricultural trade and marketing.

c. In collaboration with MinAg colleagues, prioritize needed policy studies and draw up short- and long-term work plans to design, conduct and report upon such policy studies.

d. Collect and maintain systematic time series data in the area of agricultural trade and marketing for purposes of monitoring and evaluation of existing trade and marketing policies and arrangements.

e. Maintain close working relationship with MinAg policy makers in order to predict and respond ex ante to policy formulation and planning needs.

f. Identify and schedule in collaboration with the Project Director short-term technical support and training needs and maintain overall training plans for GOS counterparts.

3. Production Economist

The Production Economist will assist the PAEA to develop its analytical capacity in the area of microeconomics with a focus on production economics. The analyst will establish a procedure for collecting farm-level data to estimate costs of production and financial returns for the principle crops produced in major crop production areas within the rainfed sector. He/she will be equally concerned with generating appropriate data for supply response studies which will be conducted for key commodities being produced in the rainfed sector (e.g., sorghum, groundnuts, sesame and wheat in the northern region). The production economist will, from a mircoeconomic perspective, assist the PAEA with on-going studies which focus on agricultural price policy, farm-level production constraints, and means to overcome production constraints in order to increase marketable surpluses and export trade.

The Production Economist will:

a. Provide on-the-job training to PAEA staff in analytical production economics and microeconomics studies.

b. In collaboration with PAEA colleagues and decision makers identify major micro-economic policy issues, data needs and analytical studies to be undertaken; draw up in collaboration with the PAEA, short and intermediate-term workplans to design, conduct and report upon such economic studies.

c. Be able, on the basis of micro-economic studies, to advise policy-makers on farm-level investment alternatives, micro-economic trade-offs and development opportunities.

d. Design appropriate data collection procedures to establish cross-sectional and time series data bases for micro-economic analysis.

e. Develop and maintain close relationships with other team members.

- Agricultural Statistical Advisor

The agricultural statistician will provide assistance and support to the MinAg in establishing a central data facility and in collaboration with the Project Director and other project advisors will:

a. Identify short- and long-term data needs, and

b. Design and implement short- and long-term procedures for meeting those needs.

The advisor will:

- Provide on-the-job training: (1) to conduct area sample frames, (2) in the design, collection and analysis of statistical data and (3) for data reporting.

- Identify, in collaboration with other project advisors and MinAg colleagues, short- and long-term data needs and facilities to establish a central agricultural statistics data management and reporting system.

- Develop and maintain time series data on selected agricultural statistics (including crop and livestock production estimates, input and commodity prices, distribution and use of agricultural inputs, meteorological data) required for policy analysis and agricultural planning.

- Collaborative with other components of the project in (1) the design and conduct of special surveys, and (2) data analysis and reporting.

- Identify and schedule in collaboration with the Project Director, short-term technical support and training needs and maintain overall training plans for GOS counterparts.

5. Agricultural Planning Advisor

The agricultural planning advisor will be primarily responsible for assisting the MinAg in the design and implementation of a process for orderly identification, preparation and appraisal of agricultural projects and programs. This advisor will also assist with establishing the important linkages between the policy analysis and agricultural statistics components of the project, and assuring that the statistical and agro-economic data generated are consistent with the form and scope required for policy analysis and agricultural planning.

The advisor will:

- Provide on-the-job training to MinAg staff to identify project needs and scope, undertake project appraisals and plan for project implementation;

- In collaboration with other project advisors and MinAg colleagues, identify short- and long-term agro-economic data needs and determine priorities and procedures for the design, collection, analysis and reporting of such data;

- In consultation with other project advisors and MinAg colleagues, assist with the design, conduct, analysis and reporting of special short-term surveys required for policy and planning purposes;

- Identify and schedule in collaboration with the Project Director, short-term technical support and training needs and maintain overall training plans for GOS counterparts.

APPENDIX C

PERSONS INTERVIEWED DURING THE EVALUATION

Interviews were held with the following persons or groups in Khartoum:

USAID

Elizabeth S.F. Martella	USAID Project Officer
William Bateson	Professional Coordinator and Macroeconomic Policy Advisor
Ed Lippert	Agricultural Statistics Advisor
M.E. Sarhan	Marketing and Trade Advisor
Sirjit Sidu	Production Economics Advisor
Ray Fox	Project Planning Advisor
Robert Brown	USAID Director
Fred Winch	Mission Senior Economist
Carlos Pascual	Program Officer
Robert Bourquein	USAID Controller
Edna Koenig	Author, APS Training Plan
John Bierke	Evaluation Officer

Government of Sudan

Saddig Abdin Mohammed	Minister of Agriculture and Natural Resources
Mr. Dash	Permanent Underscretary, MANR
Abdel Moneim El Sheikh	Project Director: PAEA Director General
Zen Omen Sharif	Soil Survey Unit, USGS TDY
Abdel Zazigg	D.G. Project Planning Dept., PAEA
Hassan Sid Ahmed	D.G. Agricultural Economics Dept., PAEA
Farhalla Riad	D.G., Livestock Economist
El Zubeir Abdel Rashman Yousif	Livestock Economist
Kamal Mirghani Mohammed	Livestock Economist
Abdel Latif Mohammed Sayed	Livestock Economist
El Iman El Khidir	Dean, Faculty of Agriculture, U.K.
Farah Hassan Adam	Head, Dept. of Rural Economy, U.K.
Ahmed Hmeida	Professor, Rural Economy, U.K.
Gaafar Bashir Mohammed	Professor, Rural Economy, U.K.
Babiker Idris Babiker	Professor, Rural Economy, U.K.
Abdiem Mohamed Ali	Professor, Rural Economy, U.K.
Kamil Ibrahim Hassan	Professor, Rural Economy, U.K.
Hassan El Sheikh	Director of Statistics, PAEA
Sayed Mohammed Ahmed Hamiel	D.G., Min. of Commerce, Industry and Supply

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Mohamed A. Mohammed	Director, National Remote Sensing Center

Other

Charles Bailey	Ford Foundation Representative
Survey and Engineering Company, Khartoum	
Arab Organization of Agricultural Development	
John Strauss	Yale University and Consultant to APS Project

Washington, D.C. Area

Ron Jones	USDA Backstop
Pierre Sales	Checchi, Vice-President
Warren Weinstein	USAID/Washington
Timm Harris	USAID/Washington
Boyd Whittle	USAID/Washington
Al Warren	USGS
Don Moore	USGS
Zen Omar Shariff	USGS

APPENDIX D

PP LOGICAL FRAMEWORK

NARRATIVE SUMMARY

Program or Sector Goal: The broader objective to which this project contributes:

To improve the level of living in the traditional agricultural/livestock sector.

Project Purpose:

To improve policy definition and planning for agricultural development in the traditional sector of agriculture.

Sub-Purposes:

1. To develop the capability for improved methods of agricultural sector policy analysis.

2. To develop the capability to identify design and implement project procedures to carry out agricultural development programs.

3. To develop a reliable and statistically sound system for generating agricultural statistics.

Outputs:

1. Planning and policy analyst with specific training and Sudan experience in economic and policy analysis related to agricultural problems.

2. Sudanese capability to initiate and manage the preparation, evaluation, and implementation of an orderly project development process.

3. Sudanese capability to operate, maintain, update and expand agricultural statistics in a timely manner.

Inputs:

1. AID Contribution:

(a) Training	(a) $330,000
Long-Term Part	72PM for 4 part for U.S. MS degrees

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	Short-Term Part	24PM for 4 part for training in computers, Landsat and computer positions
	In-Country	120PM for 120 individuals
(b)	Technical assistance	(b) $2,484,000
	Long-Term	192PM for 4 individuals
	Short-Term	76PM
(c)	Commodities	(c) $ 380,000
	Vehicles, computer, Landsat products, maps and office equipment	
(d)	Other Costs	(d) $1,706,000

GOS Contribution

Support for U.S. technicians	508,000
Support of In-country training	100,000
Office equipment and supplies	200,000
In-country travel	300,000
Special surveys and material	500,000
Local hire	500,000
ABM vehicles	200,000
Contingency and inflation	450,000
In-xind contribution	500,000

OBJECTIVELY VERIFIABLE INDICATORS

Measures of Goal Achievement:

1. Increased rural income
2. Increased marketing of crops and livestock
3. Increased consumption and exports and decreased imports
4. Improved quality of diets

Conditions that will Indicate Purpose Has Been Achieved: End of Project Status:

1. Sudanese capability to manage and sustain a sound policy analysis process, to prioritize problem areas and policy issues, to conduct effective policy analysis, and to provide information to decision-makers in a timely manner.

2. Sudanese capability to initiate, manage, and sustain the preparation, evaluation and implementation of project measures to achieve development in the traditional agricultural sector.

3. (a) A statistically sound area sample frame will be in place in two provinces.

   (b) Statistical information will have been gathered, tested, and published for two years.

   (c) Sudanese capability to operate, maintain and expand the system to produce agricultural statistics on a regular basis.

Magnitude of Outputs:

1. (a) Two professionals with 18 months each of formal training.

   (b) 40-60 professionals with four weeks seminar-training in analytical methods.

   (c) 6-8 policy analysis documents.

2. (a) One professional with 18 months of formal training

   (b) 20-40 professionals with four weeks of seminar-type training.

   (c) 6-8 professionally-prepared and evaluated projects.

3. (a) One professional with 18 months of formal training in agricultural statistics.

   (b) 40-60 professionals with two months of short-term training in statistics.

   (c) An operational computer-based data management system.

   (d) An operational sample frame for two provinces.

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MEANS OF VERIFICATION

1. Surveys of agricultural production and extension of area sample frame to include socio-economic factors.

2. Market records and surveys.

3. Retail trade and household consumption surveys.

4. Policy papers analyzing critical problem areas and policy issues with effective analysis of trade-offs, impacts, and recommendations for program solutions.

5. (a) Project papers prepared in an orderly fashion with adequate analysis and design criteria for implementation.

   (b) Trained Sudanese.

6. (a) The operating area frame in two provinces.

   (b) The statistics gathered and published.

   (c) Trained Sudanese.

Annual evaluations, contractors' reports.

IMPORTANT ASSUMPTIONS

Assumptions for Achieving Goal Targets:

Government policies will not discriminate against the agricultural/livestock sector generally and specifically with respect to services to rural areas and to products produced by the traditional sector.

Assumptions For Achieving Purpose:

The data and information used is thoroughly researched, as accurate and verifiable as possible, and is used by MAFNR.

The MAFNR is sufficiently committed to the project to make people available for training and for planning, analysis, and policy implementation.

The MAFNR is sufficiently committed to the project to make appropriate staff available for training and project implementation.

The area sample frame methodology will be found to be applicable to Sudanese conditions and/or suitable modifications are designed.

Assumptions for Achieving Outputs:

Availability of suitable GOS counterparts.

Timely provision of U.S. technical assistance.

Availability of GOS counterpart funding.

APPENDIX E

PROJECT IMPLEMENTATION SCHEDULE

FY 1981	Project design
6/81	Project authorized for $4.9 million
12/81	Initial condition precedent to disbursement satisfied
2/82	Two of four long-term advisor job descriptions revised to place more emphasis on policy analysis (macro-economist policy analyst and agricultural trade and marketing analyst)
5/82	USDA/OICD contracted to provide project statistician and agricultural planner
5/82	RFP issued for two long-term policy advisors and associated support
6/82-7/82	Statistician and agricultural planner arrived at post
1/83	Contract signed with Checchi and Co.
2/83	Macro-economist arrived at post
5/83	Marketing and trade analyst arrived at post for a period of two months. (Individual released from position.)
6/83	Project amended increasing LOP funding from $4.9 million to $7.3 million. PACD extended to April 30, 1987
4/84	Production economist arrived at post
5/84	Second marketing advisor arrived at post

APPENDIX F

QUESTIONNAIRE FOR PAEA DIRECTORS AND SENIOR STAFF

We are here to evaluate the Agricultural Planning and Statistics Project and make recommendations on further project activities. We would like your comments on the following questions for the activities with which you are involved.

Dr. Sheikh has suggested that each department and section head complete this questionnaire. Please use as much space as you require to answer these questions.

AID Evaluation Team: Lehman Fletcher
Bonni van Blarcom
William Wigton

1. Please say what you consider to be the major objectives of the project. Specifically, what did you <u>expect</u> the project to <u>achieve</u> for you?

2. What do you think the project <u>has achieved</u>? What has been the impact of the project? For example, has the project influenced any changes in policy, process, or capabilities in your section?

3. How useful do you feel each of the following components of the project have been for you:

   a. Long-term technical assistance
   b. Short-term technical assistance
   c. On-the-job and in-service training
   d. In-country short-term training
   e. External short-term training
   f. External long-term training

4. What problems and constraints can you identify that have influenced project implementation? What do you think can be done to work at removing these constraints?

5. If the project continues as it is until the scheduled completion date of April 1987, will it succeed in creating sufficient capability in your unit to accomplish your responsibilities at the desired level? If not, why not?

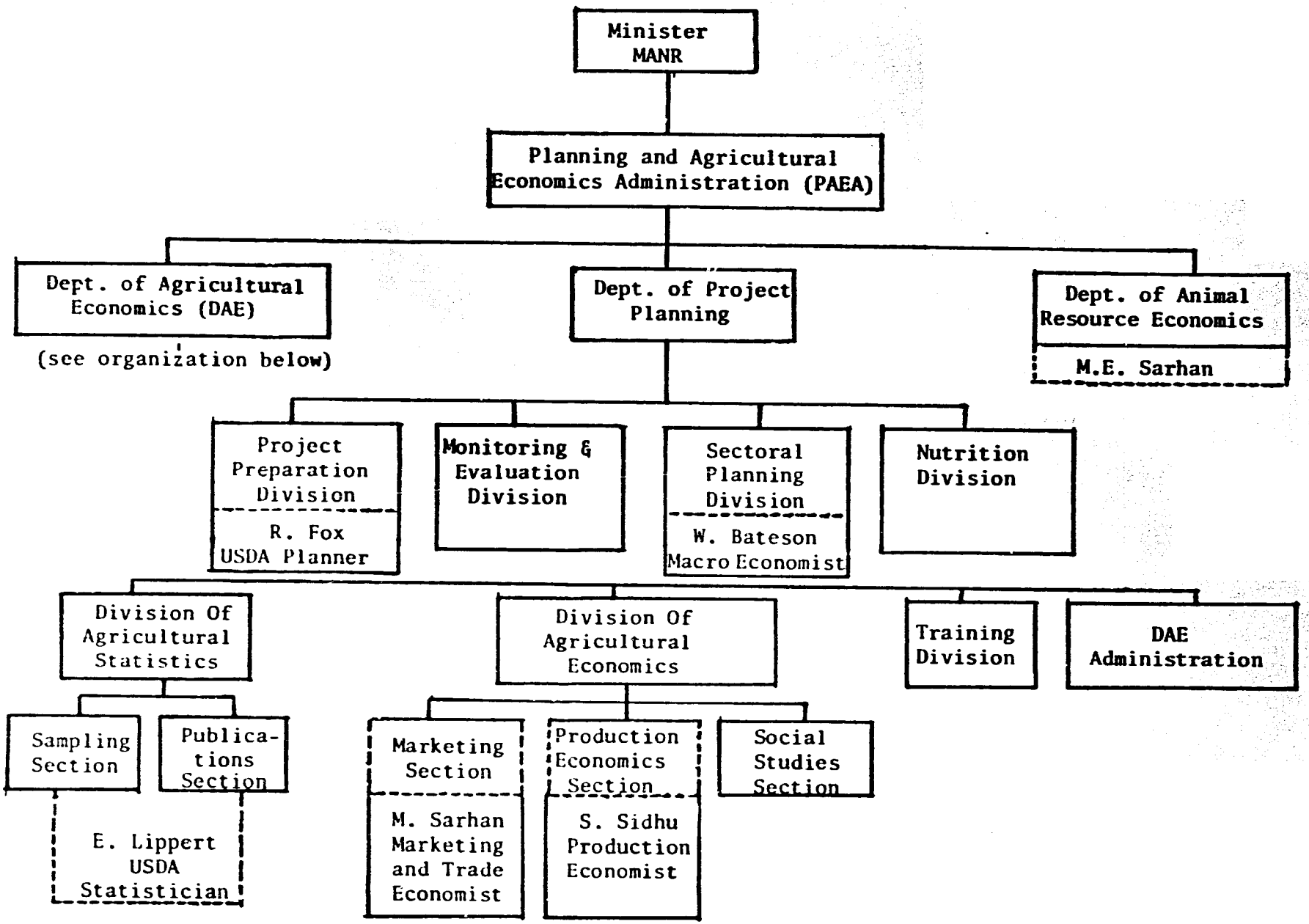
6. If the project were to be extended, what do you think should be the priorities in the area of technical assistance and training? Are there any materials or facilities you think the project should provide?

Thank you for your ideas.

Please return your comments to Elizabeth Martella, AID Project Officer by Wednesday, August 14, 1985. (Dr. William Bateson can help get comments to Ms. Martella.)

APPENDIX G

ORGANIZATION OF THE PAEA



organization of DAE

APPENDIX B

ACREAGE, PRODUCTION and LIVESTOCK SURVEY
DEPARTMENT OF AGRICULTURAL ECONOMICS
AGRICULTURAL STATISTICS DIVISION

ACREAGE, PRODUCTION and LIVESTOCK SURVEY Nov. 1985

QUESTIONNAIRE

Code

Province .....(____)
District .....(____)
Rural Council .....(____)
Village Council _____(____)
Village _____

1. HEAD OF FAMILY

a. Name of head of family:

_____ Replic./Family...(____

2. Does any one else in this family operate any land or own livestock?
( ) NO-- Continue interview.
( ) YES-- Enter name(s) of family member _____

[ENUM. Combine all crop area, production, crop uses and livestock numbers of all family members into this questionnaire.]

3. TOTAL LAND OPERATED

a. How many feddans do you now OPERATE? (Include land owned, rented from others, and worked for others for a share of the crop.) FEDDANS (920) ____.__

1) How many of these feddans are located INSIDE your village council boundries? (921) ____.__

2) How many of these feddans are located OUTSIDE your village council boundries? (922) ____.__

[ENUM. The sum of 1) and 2) must equal 3a, if not, ask questions inorder to indentify the incorrect number and make changes.]

b. How many feddans did you operate LAST season? (930) ____.__

X
72

4. CROP AREA AND PRODUCTION, CURRENT SEASON

For each crop you planted this season, I would like to know the area planted, harvested, and production. Include area of crops that was planted but not harvested, and area where more than one crop was harvested from the same feddan.

Name of Crop	Area Planted (Feddans)	Area Harvested (Feddans)	Total Production: No. Units	Total Production: Unit Name	Total Production: Total (Kg.)
a. Sorghum....(110)	____.__	____.__	_____	_____	_____
b. Sesame.....(125)	____.__	____.__	_____	_____	_____
c. Groundnuts.(120)	____.__	____.__	_____	_____	_____
d. Millet.....(105)	____.__	____.__	_____	_____	_____
e. Karkada....(143)	____.__	____.__	_____	_____	_____
f. Cotton.....(100)	____.__	____.__	_____	_____	_____
g. Watermelon Seed.....(144)	____.__	____.__	_____	_____	_____
h. Other_____( )	____.__	____.__	_____	_____	_____
i. Other_____( )	____.__	____.__	_____	_____	_____
j. Total Crops(199)	____.__	____.__	XXXXX	XXXXXXXX	XXXXXXXX

5. CROP AREA AND PRODUCTION, LAST SEASON

I would now like to know the area planted, harvested, and total production of your crops last season (1984/85).

Name of Crop	Area Planted (Feddans)	Area Harvested (Feddans)	Total Production: No. Units	Total Production: Unit Name	Total Production: Total (Kg.)
a. Sorghum....(210)	____.__	____.__	_____	_____	_____
b. Sesame.....(225)	____.__	____.__	_____	_____	_____
c. Groundnuts.(220)	____.__	____.__	_____	_____	_____
d. Millet.....(205)	____.__	____.__	_____	_____	_____
e. Karkada....(243)	____.__	____.__	_____	_____	_____
f. Cotton.....(200)	____.__	____.__	_____	_____	_____
g. Watermelon Seed.....(244)	____.__	____.__	_____	_____	_____
h. Other_____( )	____.__	____.__	_____	_____	_____
j. Total Crops(299)	____.__	____.__	XXXXX	XXXXXXXX	XXXXXXXX

6. USE OF CROPS PRODUCED

The following questions are to determine how you plan to dispose of the crops you produced on your land this season.

Name of Crop	Uses of Crops Produced: Unit Name	Home Uses (Unit)	Taxes (Unit)	For Sale (Unit)	Other Uses (Unit)
a. Sorghum....(710)					
b. Sesame.....(725)					
c. Groundnuts.(720)					
d. Millet.....(705)					
e. Karkada....(743)					
f. Cotton.....(700)					
g. Watermelon Seed.....(744)					
h. Other_____( )					
i. Other_____( )					

[ENUM: The total of all uses for each crop must equal reported production this year, Section 3.]

6. LIVESTOCK OWNED

I would like to ask about the number of livestock you now own and and the number you owned this same time last year. Include animals that may be grazing in areas located some distance from your village.

Type of Livestock	Number Owned Now (Head)	No. Owned This Time Last Year (Head)
a. Cattle.....(620)		
b. Sheep.....(650)		
c. Goats.....(630)		
d. Other _____..(___)		
d. Other _____..(___)		

This concludes the interview, thank you for your cooperation.

M4X

TIME TABLE

	EST. TIME	DATE
A. PRE-SURVE.		
1. Develop VC list sampling frame	2 weeks	by Sept. 14
2. Select village council sample	1 week	by Sept. 21
3. Secure VC Census maps (2 sets)	3 weeks	by Oct. 15
4. Questionnaire & listing form		
a. Develop	2 weeks	by Sept. 14
b. Translate	2 weeks	by Sept. 21
c. Type (Arabic)	2 weeks	by Sept. 28
d. Print	2 weeks	by Oct. 2
5. Enumerator manual		
a. Develop	4 weeks	by Sept. 30
b. Translate	3 weeks	by Oct. 5
c. Type (Arabic)	3 weeks	by Oct. 12
d. Print	2 weeks	by Oct. 19
6. Field operations		
a. Vehicles (6)		by Oct. 1
b. Fuel Supply		by Oct. 15
c. Supplies & equipment		by Oct. 15
d. Enumeration teams (6 @ 4 enum. per team)		by Oct. 1
7. Enumerator training school	2 weeks	Oct. 26-Nov.7
a. School location		by Oct. 1
b. Supplies & equipment		by Oct. 15
c. Instructors		by Oct. 12
B. SURVEY PROPER		
1. Data collection (Questn. Completed)		
a. Begin		by Nov. 17
b. 25% complete (360)	2 weeks	by Dec. 3
c. 50% complete (720)	1 week	by Dec. 11
d. 75% complete (1080)	1 week	by Dec. 19
e. 100% complete (1440)	1 week	by Dec. 28
2. Data entry and edit		
a. Manual data edit	4 weeks	Dec. 3-Jan. 2
b. Computer data entry (SUDS)	4 weeks	Dec. 5-Jan. 6
C. POST-SURVEY		
1. Data summary		
a. Design & test "SUDS"	3 weeks	by Oct. 19
b. Summary printout	2 weeks	by Jan. 11
2. Survey report		
a. Develop table format	3 weeks	by Oct. 19
b. Write and type report	2 weeks	Jan. 11-25
c. Print report	1 week	by Feb. 1

APPENDIX I

ADDITIONAL REPORT OF THE AGRICULTURAL STATISTICIAN/REMOTE SENSING EXPERT

I. Review of Documents and Meetings Prior to Trip

Prior to the trip to Sudan, I obtained PASA agreements from Checchi Vice-President Pierre Sales and met with Dr. William Bateson, Project Coordinator, while he was on home leave. From discussions with Dr. Bateson and Mr. Sales, and project documents that were provided, I became familiar with the Scope of Work that USDA had signed to improve crop area and production estimates.

I contacted USGS in Reston, Virginia, where two Sudanese remote sensing experts were completing their final few days of work using Thematic Mapper (TM) Landsat data to produce several map products - a soils associations map based on Landsat photo-interpretations, and a map showing roads on the TM imagery. I met Mr. Zen Omer Sharif, soils scientist from the Ministry of Agriculture and Natural Resources (MANR) at Wad Madani; Mr. Al Warren, USGS cartographer; and Dr. Don Moore, Application Scientist from EROS Data Center. Both Mr. Sharif and Dr. Moore were familiar with soils in western Sudan. Dr. Moore had developed soils maps when he was associated with the Remote Sensing Institute (RSI) at South Dakota State University. Mr. Zen Sharif arrived in Khartoum the same week that I did so I was glad that I had met him in the U.S.

II. Scope of Work Review

Project documentation and USDA's Scope of Work in the PASA call for the introduction of the area sampling frame (ASF) methodology. ASF provides the best survey methodology to obtain information about the rural and agricultural sector. It has served the U.S. well since it was started in 1956 and completed in 1965. In intensive agricultural areas, it is rather simple in theory to implement and the statistical properties of the estimators are superior to estimators generated from other sampling frames. Other countries have started to adapt the methodology to conditions in their country. ASF's are being used in the Dominican Republic, Tunisia, Morocco, Ecuador and Thailand. There are good case studies that show ASF methodology can be employed outside the U.S.

In addition, when ASF methodology is used, advanced technologies can be integrated. Digital satellite data to improve area estimates, objective yield surveys, and multiframe estimators are simple in concept when an ASF is used as a base. When the Agriculture Planning and Statistics project paper was written, naturally the ASF methodology was contemplated. The idea was to provide Sudan with the latest technology.

III. Discussion of Area Sampling Frame Construction

In order to construct an ASF, one needs to be able to subdivide the total land into small blocks of land using natural boundaries. The natural boundaries used must be roads, rivers, and railroads or permanent field boundaries. If good boundaries are available, then an ASF can be constructed but the set-up time is substantial. For example, an area the size of Kansas can be completed in about six person years of work with experienced personnel.

The authors of the project paper were familiar with the ASF but not with conditions in Sudan. They knew that ASF methodology had been implemented in other countries so it was recommended for Sudan. Unfortunately, Sudanese conditions are difficult and the institutional constraints are great. The idea of completing an ASF in Sudan was ambitious under the best of circumstances. In Sudan, where land areas are huge even if the desert areas are left out, there are still vast areas of potential for agriculture. Unfortunately, the road system is equivalent to what is found in Rhode Island. Roads are not dense enough. Further, maps are not complete and aerial photography is obsolete to the point where boundaries located in the aerial photographs are not found on the ground.

The White Nile area at El Gafil is an example of an agricultural area with irrigated, mechanized, and traditional agriculture. The traditional and mechanized areas have changed drastically since the time of the last aerial photography to the point where only a few land marks can be recognized. The existing photography was useless as material for an ASF construction. There are census maps that show roads and villages of most areas. These maps show no physical features.

In addition to need for materials ASF construction requires a large investment in set-up time. After materials become available, then the Sudanese will require

six months of training to get them to point where they can construct an ASF and an additional six person years to construct the ASF for a province the size of North Kordofan. It is unrealistic to expect more than six persons to be made available to construct an ASF in the Division of Statistics, PAEA, and therefore it is unrealistic to have real ASF completion before the end of the project.

RECOMMENDATION 1

Do not have ASF construction started before materials are available. Materials include Landsat base maps with roads and villages overlayed.

RECOMMENDATION 2

Start a new effort to complete Landsat base maps with roads. This can be done at the Sudan National Remote Sensing Center. Do not distract personnel at the Division of Statistics from their current upcoming survey. All skills they are learning will transfer directly to the ASF design.

IV. Stratification

Usual procedures for ASF construction start by dividing the total area of interest into homogeneous agricultural land areas. Satellite images are often used because usually one can differentiate between intensive cropland areas and loss intensive cropland, nonfarm areas, and rangeland. In Sudan, the TM images were taken from October to December 1984 during a drought and after harvest. It is difficult to tell cropland in the image but soils associations can be separated. Soils with rainfall maps will create reasonable stratification.

In order to construct an ASF for Sudan, soils will be used since crops are planted on clay soils to conserve moisture. The stratification will be general.

Roads, rivers and other permanent features must be used for all strata boundaries. The next step is to subdivide strata into primary sampling units (PSU). Again, roads will be used as boundaries where possible. Select PSU's for further subdivision using the usual procedures to obtain final land sampling unit clusters. The last step will be to subdivide these selected areas into final sampling units. The work that was done by the Survey and Engineering Company demonstrated that this can be done. Photography can be taken from an aircraft with a hand held camera to be used to subdivide PSU's or alternatively field staff on the ground can subdivide the areas.

The final step is to select sampling units to be enumerated on the ground. These areas are called the segments.

V. Institutional Constraints

Institutional constraints in the Division of Statistics are severe. No scientific survey have been conducted in the traditional sector that I am aware of. The Division of Statistics does not have facilities, materials, or trained personnel with skills that are needed to run scientific surveys. There are a few top level persons who understand the concepts. Their ability to collect data is limited because of the lack of good roads and because the motor pool cars are old and worn out. ASF construction is costly and not appropriate in Sudan until a better institution is built to use, collect, and analyze the data and until better materials are available.

RECOMMENDATION 3

The Division of Statistics must develop a village list and begin data collection and analysis.

VI. Overall Recommendations For Estimating Crops Livestock and Rangeland Conditions

To recommend procedures to estimate each crop separately would be repetitious because in many cases, the crops are planted in the same sector in adjoining fields. Further, most crops are grown in the irrigated, mechanized and traditional sectors. Cotton and wheat are exceptions since they are only grown in the irrigated sector. Data must be collected from all agricultural areas and from all sectors. Survey methods must be institutionalized. The irrigated sector is to be set up as one or more stratum. List sampling is presently used but often there is no data available because either the managers do not report or the data never arrive at the Division of Statistics.

Data collection and analysis in the irrigated sector must be improved and institutionalized so that crop estimation is accurate and timely. A more extensive version of the basic crop area and production questionnaire can be used in the traditional sector survey. Send interviewers to the schemes to collect data because each scheme contributes much to the total production. Crop area should be collected after planting and production data soon after harvest. The Division of Statistics should not wait for scheme management to mail data on planted areas of each crop.

Data collection and analysis for the public mechanized sector should be carried out using the same procedures as is used in the irrigated sector. The conditions are the same in both the irrigated sector for sampling and the mechanized sector is important.

Since most crops are grown in all three sectors and since accurate estimates are needed for total production, then all sectors must be surveyed. In fact each sector should be inventoried with accuracy in proportion to each sector's contribution to the total.

I did not study the agricultural statistics in the irrigated and mechanized sectors. They need work but not as much as the traditional sector. The reporting is haphazard, irregular, and slow - it may not be accurate either.

The mechanized sector must be handled carefully because this sector will continue to have a high percentage of total production in the future. It will need to be picked up by the same survey used in the traditional sector. The problem will be to survey every field that is mechanized and also not in the public sector. Doing this may be tricky. The Division of Statistics will need help developing good procedures to collect data from these sectors.

VII. Livestock Inventories and Range Conditions

In my scope of work, livestock and range conditions were listed for review. Livestock estimates are difficult for two reasons. The first is that there is no sampling frame for the nomadic pastoral people. This sector will need special attention. Livestock associated with the traditional sector must be picked up on the traditional crop survey.

Livestock from the nomadic sector can be estimated using an ASF concept. The following steps should be tested.

1. Stratify the nomadic areas using the AVHRR satellite images.

2. Divide the strata into fairly large blocks on land - perhaps 10 miles by 10 miles. No natural boundaries are available but it does not matter in this case. A simple grid can be used.

3. Select a sample of these areas to be enumerated.

80

4. Collect the desired data using a light aircraft.

5. Since no boundaries are available on the ground, navigational boundaries can be used to subdivide the provincial land. This means that the light aircraft must have a reasonable navigational system.

Segments are enumerated by flying over the correct areas and counting or photographing and then counting the herds. A hand held 35mm camera can be used. Resolution is such that cattle, sheep, and goats can be counted. It is difficult to distinguish between sheep and goats.

This method of counting livestock is superior to selecting flightlines and counting between certain angles out the windows. Biases are quite large using flight lines and this enumeration procedure.

The second problem encountered during livestock surveys from interviewer methods is that livestock are taxed which means that cattle are always underreported when picked up from questionnaires. There is little that can be done about this fact. Serious biases always result because livestock herders are cautious when reporting numbers to government workers.

Range land conditions can be surveyed using AVHRR data and taking notes about the range land conditions from the areas when data is collected from the light aircraft. Range land conditions are important to anticipate feed conditions of the pastoral nomads.

FIELD TRIPS

White Nile, El Gafil

South Kordafan, Kadugli