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Morocco: Planning, Economics and Statistics for Agriculture
Project (608-0182)

Second Mid-Term Evaluation

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10. Abstract (optional - 250 word limit)

This report is the 2nd mid-term evaluation of the Morocco Planning, Economics and Statistics Project, occurring in the 7th of its 10 years. The evaluation team consisted of an agricultural economist who focussed on the economics and planning components and a statistician who evaluated the statistics component. The report qualitatively analyses the project in a full and detailed discussion, in order to assess the progress that has been made, to give a prognosis for the near future, and to evaluate the impact in achieving the purpose level goals. The report concludes that the project has made considerable progress in building institutional capability in statistics, economic analysis, and to a lesser extent, in planning. It further notes that the project has achieved a high level of success in meeting its output level goals.

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**MOROCCO: PLANNING, ECONOMICS AND
STATISTICS FOR AGRICULTURE PROJECT
(608-0182)**

SECOND MID-TERM EVALUATION

JUNE 1990

PROJECT DOCUMENT NO. 209

**Conducted Under Contract with Abt Associates Inc.
and the Agricultural Policy Analysis Project, Phase II (APAP II)**

**Team Members: Michael Cullen, Economist
William H. Wigton, Statistician**

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We thank the technical assistance team for their thorough and helpful discussions at the beginning of our visit. These persons involved were Mr. Will Sherman, Team Leader, Dr. Michael Bertelsen, Planning Advisor, and Dr. Wally Tyner who was visiting on a TDY.

We thank the USAID mission, particularly Fenton Sands in the Agriculture office for giving generously his time and providing the team with useful documents and detailed information about the project.

INSTITUTIONAL ACRONYMS

DAE	Division of Economic Affairs
DP	Planning Division
ERS	Economic Research Service
ESA	European Space Agency
DPAE	Directorate of Planning and Economic Affairs
EEC	European Economic Community
GOM	Government of Morocco
IFAD	International Fund for Agricultural Development
MARA	Ministry of Agriculture and Agrarian Reform
NASS	National Agricultural Statistics Service (USDA)
OICD	Office of International Cooperation and Development
PD	Planning Division
SEEMP	Service of Economic Studies, Markets and Prices
SIP	Production Incentives Service
SP	Monitoring and Evaluation Service
SPL	Planning Service
SSD	Statistics, and Documentation Service
USDA	United States Department of Agriculture
USAID	United States Agency for International Development

TECHNICAL ACRONYMS

ASF	Area Sampling Frame
CV	Coefficient of Variation
EMR	Electromagnetic Radiation
FPED	Farm Production Expenditure Data
GE	Generalized Edit
ISPF	A computer program utilized in data base management
MSS	Multispectral Scanner
OY	Objective Yields
PACD	Project Assistance Completion Date
RBV	Return Beam Vidicon
SAS	Statistical Analysis System
SPOT	Systeme Polyvalent pour l'Observation de la Terre
TM	Thematic Mapper

EXECUTIVE SUMMARY

The Planning, Economics and Statistics Project (608-0182) has nearly completed seven of its ten years and the long-term resident technical advisers have recently left Morocco. The USAID/Rabat mission requested this second mid-term evaluation because the project is at a convenient point, a point of transition where most activities will be completely in the hands of Directorate of Planning and Economic Affairs (DPAE) staff, and plans for the future need to be assessed to determine the prospects for continued progress in the project. The main purpose of this evaluation is to determine what progress has been made, particularly since the previous mid-term evaluation in late 1987, to assess plans for the coming three to five years and evaluate the impact of the project on improving policy analysis and decision making within the Ministry of Agriculture and Agrarian Reform (MARA).

The evaluation team consisted of an agricultural economist who served as team leader and concentrated on the economics and planning component of the project, and a statistician who evaluated the statistics component. It must be stated from the outset that since this was a second mid-term evaluation, not an end of project evaluation, the thrust of the analysis is qualitative rather than strictly quantitative with a full and detailed discussion of every facet of the project. It is intended to give in general terms a notion of progress made to date, a prognosis for the near future and evaluate the impact in achieving the purpose level goals.

The conclusion of the evaluation team is that the project has made considerable progress in building institutional capability in statistics, economic analysis, and to a lesser extent, in planning. (The planning component was added in 1988 and was relatively less developed.) Nearly all of the output level goals specified in the original project paper or in the amended project document from 1988 have been met.

The statistics component has been the responsibility of the Service of Statistics and Documentation (SSD), a branch of the Division of Economic Affairs (DAE). An aerial frame sampling system is in place covering all the nation's agricultural land, specified surveys are undertaken regularly and results published, an aerial photo lab is operating, and computerization is under way for field offices. Data provided by SSD are of critical importance for GOM decision makers and SSD will likely continue to receive necessary support. Its operations are largely self-sustaining and though some tasks need modification to reduce recurrent costs, these changes can be accomplished without any appreciable loss in capability. SSD has served as a model program in Area Sampling Frame for FAO in Francophone countries.

The economics component has likewise made considerable progress as has planning, though to a more limited extent. Two resident technical advisers carried out training in computer use, economic theory, data base management, econometrics, and research methodology, and as a result staff in Service of Economic Studies, Markets and Prices (SEEMP) have produced

economic analysis of reasonably good quality, both in collaboration with outside economists and with Dr. Tyner, one of the advisers. One of the main purpose level goals of the project was to improve policy analysis capability within the GOM, and by all accounts, the project has had a marked impact on policy discussion and decision making within MARA. Results from DPAE studies have been useful in negotiations on the Agricultural Structural Adjustment Loan II that was recently agreed on and various other results will be helpful in the GATT negotiations now underway. The project has affected the manner in which policy questions are formulated in that discussions now almost always include or revolve around economic impacts of policy choices as indicated by DPAE research. Policy decision making has been enhanced by the project and such change comes at a critical time when Morocco must make vast economic reforms and plan its strategies to maintain the effectiveness of its agricultural sector. The institutional capability has been put in place to provide the necessary analysis for policy making, just as the project intended.

Despite the success of the project to establish the capacity within DPAE to collect data and provide valuable economic analysis, there are areas that remain problematic. Nearly all the deficiencies and foreseeable problems for the project's continued existence relate to management within DPAE. Many of the discussions the team held with staff members at all levels in DPAE ultimately reflected some shortcoming in management. There are several areas that seem most pressing. For the Division of Economic Affairs (DAE), the conflicting needs of answering short-term information requests from a diversity of sources on an endless array of subjects, versus the mandate to conduct medium or long-term research, is a critical one. There is no clear statement of priorities within the DAE on this, and consequently resources are routinely shifted on an ad hoc basis to meet the immediate requests. Though within the MARA, DPAE has responsibilities of a general nature, there is no clearly stated list of priorities, and subsequently, planning for DPAE is almost non-existent. Though tasks are specified for each service within DPAE, no precise allocation of personnel is made, nor of time needed, performance criteria, or of budgetary resources. The organization lacks cohesiveness which finds expression in the fact that publications and information are not routinely distributed within DPAE or to the outside, interactions between staff members are limited, training and other perquisites have been allocated in a subjective fashion, recognition for work is not always given, and morale and motivation periodically ebb because staff members do not feel their needs are sufficiently looked after by management. Top level managers are often absorbed in other tasks within MARA, or even away from the DPAE building frequently, further contributing to the impression that priorities are not fully looked after. Such a lack of institutional cohesiveness also puts in jeopardy re-absorbing the two dozen staff members who will be returning from long-term training in the U.S. with Masters's or PhD. degrees. The fact that managers engage in outside work using DPAE resources, further removing them from their appointed responsibilities, also reduces the effectiveness of the institution.

Obviously some of the management problems are as much a function of the Moroccan system of government as they are of the individuals in the top management positions. However, what is at risk if some of these issues are not resolved is that much of the institutional capacity that has been put

in place by the project could be eroded if not properly husbanded. There are many well trained, motivated bright young staff members in DPAE who will eventually become irrevocably frustrated and dissatisfied, and will perhaps leave the service if their needs are not sufficiently met. Much has been accomplished by the project but the proper means must be found to improve the management so that DPAE can continue to provide information and analysis that will enhance policy decisions in the future.

SUMMARY OF RECOMMENDATIONS

General Recommendations

1. Definition of DPAE's priorities: DPAE should clearly define its purpose and allocate resources accordingly. Though its currently stated purpose is to carry out economic analysis for policy use, it devotes much of its efforts to responding to short-term information requests. It must make clear what its priorities are, whether it wants to continue to fulfill both functions or give priority to one over the other.
2. Planning and Management of DPAE: Management of DPAE needs to be improved. There need to be precise plans of activities, staff allocations, performance criteria established, time necessary to complete specified work, and budgets elaborated so managers and staff know what resources are at their disposal. Managers need to be more responsive to staff needs. Some management training would be helpful, though that is not the only solution. Managers must be made to see the importance of changing their attitudes and patterns of management and be encouraged to interact more regularly with staff.
3. Efforts to retain returning staff from U.S.: Retention of returning staff from U.S. training should be a high priority. This assumes that planning can more precisely be accomplished so these returning staff members will have job descriptions, workplans, proper resources and know where they fit in.
4. Resolution of status of outstanding candidates for training: Several candidates for training have not had definitive answers about their training. Their cases need to be cleared up because they are top candidates and will play a role in the research in SEEMP that is coming up for the next years.
5. Research results and publications: DPAE research and publications need to be more quickly published and disseminated throughout the MARA and outside.
6. Training and professional development of cadres: DPAE staff need a system to ensure that skill upgrading becomes a routine part of the DPAE activities. In addition, the DPAE professional staff need professional outlets (associations meetings, forums to present research) a means by which they can interact with other professionals, obtain advice and reactions on their own research. Such a system could be a center of economic research (as proposed by Michael Bertelsen) in collaboration with university researchers and those in the private sector.
7. Technical assistance: Technical assistance should be programmed for stays of at least a month to give assistance to researchers and at the same time teach short courses as needed. Presumably some of the professors who supervise Moroccan students could accommodate to this. Such assistance should be in econometric methods and research techniques. If possible courses suitable for planning staff in finance and project analysis could be offered.

8. Managing students research studying in the U.S.: More thought needs to be given to whether students will return to Morocco to do their dissertation research or to have them quickly finish their studies by doing a topic in the U.S. The supervision and liaison between universities in the U.S. and DPAE is weak except for Purdue. Here there is of course a natural link but not all the students have been sent there. Some kind of coordination needs to be thought through.

9. USAID Project Involvement: USAID management of the project has been steady and quite supportive, though usually dealing with large issues and matters having to do with top management. It has necessarily been at a distance because the resident technical advisers were involved with more particular issues. Now that long-term technical advisers have left, it is even more critical that USAID management be more closely involved, not on a day to day basis, but with enough of a presence to demonstrate keen interest to encourage cadres and make it clear to management that they must improve their methods. It is recommended that the project manager try to interact with researchers and managers in monthly meetings and seminars to know the research program better and be personally supportive of staff efforts. Routine involvement may help give top managers the message that they need to be more involved with operations.

10. Current Project Administrator: Madame Cathy Raissouni needs to be supported as best she can from the USAID side because as the de facto Project Administrator, her skills and resources are stretched very thin. She has become the factotum for the entire project and demands on her are very great. There needs to be requisite compensation for her vast efforts in keeping the administrative side of the project functioning. Matters are in very capable hands but she is overloaded and demands will only increase on her resources. Her exact relationship within DPAE needs to be clearly defined as to whether she answers directly to the head of DAE or the head of projects. Priority needs to be given to installing an international phone line for communication by FAX and phone with USDA, the technical assistance provider for the project.

SSD Recommendations

Area Sampling Frame and Related Activities

1. Sample size reduction: The size of the sample should be reduced to half the current number of segments, if possible. The three major cereals will still have CV's of less than 5 percent errors. SSD will need to study CV's of items on a crop by crop basis at the province level and at the national level for minor crops.

2. Increase enumerator training: Enumerators' training schools should be of greater length than the current three days, and should provide more complete training. During data collection, enumerators need to be more closely supervised.

3. Re-evaluate the use of satellite imagery: The use of satellite imagery should be re-evaluated for stratification of areas where aerial photography would otherwise be required. There will be three major benefits: a) stratification will be improved because color images are better for land

use identification, b) costs will be reduced because it is less expensive to purchase satellite imagery than it is to require new aerial photography, c) the ASF can be completed in less time because one or two images can replace 1500 aerial photos. (The photo lab is still required because aerial photos will be needed for segment enlargements.)

4. Development of Questionnaires: SSD currently conducts a large number of routine surveys which are done well. However, when they are requested to undertake new surveys, new questionnaires should be designed, but this is not always done. Instead, a collection of extant questionnaires are combined for these new surveys. This procedure is inadequate for providing the necessary information. It is recommended that more training and technical assistance be provided to improve questionnaire development and design.

Data Processing

1. Sharing Cost of IBM Minicomputer: SSD should solicit other data users for the IBM 4361 minicomputer who can share the recurrent costs of its operation. These other users could be other offices within MARA, in other government offices or even in the private sector. This will allow SSD to save funds earmarked for maintenance of the IBM minicomputer. They should also make every effort to purchase two IBM 586 microcomputers or two 486 microcomputers and off load as much onto the microcomputers as possible.

2. Computerization of Regional Offices: SSD should continue to computerize regional offices to the extent possible. In two months a total of seven regional offices will be computerized, with over 20 remaining without computers. Currently, no funds are yet devoted to continuing the computerization of these offices, but it should be more closely considered as data can be collected more effectively and processed faster in the field.

Other Project Related Recommendations

Other Data Users: SSD should cultivate a constituency of data users outside of MARA and particularly in the private sector. SSD's usefulness can be enhanced by having a wide spectrum of users who request and routinely make use of their data.

Management Improvements

1. SSD's Status within DPAE: It is recommended that DPAE consider making SSD a division. SSD is a large agglomeration of over 100 highly trained specialists and it presently interacts with other Ministries and institutions within MARA as if it were a Division.

2. Distribution of Perquisites: Perquisites need to be distributed in a more objective manner. Currently, they are distributed according to subjective and unspecified criteria and act as a disincentive to some staff members. More thought needs to be given to distributing in a more constructive manner.

1.0 PROJECT DESCRIPTION

1.1 Background

Morocco's economy is heavily dependent on its agricultural sector to provide its food needs and to earn foreign exchange from exports. Much donor assistance is devoted to the agriculture sector and USAID's program is no exception. USAID's efforts have been dedicated to boosting small farm production, improving irrigated agriculture, training for agricultural technicians and veterinarians, and provides emergency food aid when needed. Besides the need for technical assistance in agricultural production and food aid, USAID discerned a need for accurate, reliable and timely information about Morocco's agriculture sector to help formulate and implement viable agricultural policies.

In 1979, A.I.D./Washington's Science and Technology Bureau (AID/S&T) provided funds to USDA to use satellite and aerial photography to develop information systems in 10 countries on four continents. Morocco was one of the first countries that signed a memorandum of understanding which utilized funds from this project, called Remote Sensing for Agriculture. The agency that was to provide the technical assistance was the National Agricultural Statistics Agency (NASS) formerly the Statistical Reporting Service (SRS).

Initial training was provided in Washington during 1980 on the construction of an area sampling frame (ASF). Technical assistance was also provided in Morocco and an ASF was first constructed in Kenitra Province. After procedures were revised, the ASF was established of the country, though progress was slow. In 1983, USAID/Rabat began a ten-year project to further develop data collection capabilities, project planning and evaluation and economic policy analysis.

1.2 Project Objectives

The Planning, Economics and Statistics for Agriculture Project (608-0182) is a ten effort, that had a budget of over \$20 million Dollars (\$12.6 million from USAID and \$10 million from the GOM from P.L. 480 generated funds.) The project goal was "to make available current information and sound analysis that will enable GOM officials to make policy decision that will lead to increased agricultural production." The project purpose was "to improve the GOM's ability to collect data and publish timely agricultural statistics, undertake economic policy analyses, and plan, monitor and evaluate agricultural projects."

The project has been implemented by USDA through the provision of technical assistance in statistics, ASF construction methods, data processing, computer systems training, project monitoring, planning and evaluation of projects and economic and financial analysis as well as in-country training.

Six DPAE staff were to receive Ph.D.'s and 24 staff will receive M.S. degrees in agricultural economics and statistics in the U.S. at various

universities. In addition, there was non-degree training in project evaluation, remote sensing, photo-lab operation, management and policy analysis. There has been and presently is in-country training in computer programming, computer equipment maintenance and repair, economics and management.

1.3 Project Outputs

The stated outputs of the project were to be:

- a. Development an ASF for agricultural surveys;
- b. Creation of a functioning program of current, regularly scheduled agricultural statistics based on the use of the ASF;
- c. Expansion of the data processing capability of DPAE;
- d. Completion of an aerial photography laboratory and aerial photographs taken of the primary crop production area of Morocco;
- e. Strengthened capacity of DPAE to carry out objective yield analysis;
- f. Procurement and use of satellite data for improving crop area and land-use estimates and for ASF maintenance;
- g. Increased policy analysis capacity;
- h. Strengthened DPAE planning and capability;
- i. Increased monitoring and evaluation capacity;
- j. Development of a computerized data bank for DPAE; and,
- k. Development of a Documentation Center for DPAE.

2.0 PURPOSE OF THE EVALUATION

2.1 Introduction

This is the second of three evaluations. The first evaluation took place in 1987 and concluded that "Project 0182 has made excellent progress toward supplying required inputs producing desired outputs and achieving the project's goal and purpose level objectives". This is the second mid-term evaluation and has a limited objective to assess the progress made in achieving the project goal, purpose and output levels. This evaluation will focus on the remaining three years of the project and DPAE's role in MARA, now and in the future.

The evaluation will be from the outset a practical, qualitative one that is intended to satisfy specific objectives. It has been proposed at this time because the project is at a convenient point where the resident advisers have recently left and plans for the final three years of the project have now been formulated but not finalized. This exercise can serve to assess the progress made since the last evaluation two and a half years ago, to discover areas of potential problems and make recommendations about current operation of the project and plans for the future. It is not intended to be the equivalent of a full-scale mid-term evaluation nor as all-encompassing as a final end of project evaluation. It will give a more general, extensive view of the project rather than an intensive treatment of all the project's activities. It will not give a detailed breakdown of all the project's inputs and outputs nor of the budgets and precise elaboration of every facet of the project and its workings, but rather summarize activities and present analysis of general trends, prospects for continued performance and make recommendations on particular points.

This description of the evaluation is a revision of the original scope of work which was too broad and detailed for the amount of time allocated to the task. An effort has been made to cover the major critical points that will help USAID personnel and DPAE assess progress and better plan for the future.

2.2 The Project and Progress to Date

The overall purpose of the project is "to improve the GOM's ability to collect data and publish timely agricultural statistics, undertake economic policy analyses, and plan, monitor and evaluate agricultural projects". The evaluation will assess the progress made in satisfying this purpose by looking precisely at the specific project outputs listed in the previous section.

The evaluation will assess whether or not these outputs have been delivered and the quality of their operations.

2.3 Plans for the Final Three Years

The second area of concentration will be plans for the next three

years, how appropriate they are in meeting the overall purpose of the project and DPAE's priorities, what activities are scheduled and how training is integrated into plans for the future.

Constraints to carrying out these plans will be addressed and other necessary issues having to do with management and operations of DPAE.

2.4 Policy Issues

2.4.1 Research Agenda

The third area of concentration will be policy issues which are addressed by the research now underway and planned for the next three years in the DAE. An elaboration of what is planned, how it fits in with other economic problems facing Morocco, what other areas of research could be addressed that fit USAID's specific needs and goals and others that may be less urgent but no less useful for future economic policy making.

2.4.2 Impact of Policy Analysis

The impact of the research which DPAE has undertaken will be discussed to judge whether one of the main purpose level goals of the project has been satisfied by the training and research.

2.5 Other Issues

Other issues which will receive coverage but less attention in this evaluation have to do with:

1. Training component and the impact this has had on DPAE's performance and how returning staff members from degree programs in the US will be re-integrated into DPAE
2. Management performance and obstacles to achieving necessary goals of DPAE's operations
3. USAID and USDA performance in managing the project and handling technical assistance
4. Finding other users for SSD data, more widely in the GOM and in the private sector

2.6 Recommendations

The evaluation will provide recommendations with regard to the most pressing areas which need attention in the team's view. It will briefly comment on the status of the recommendations made in the last evaluation.

3.0 STATISTICS

This section deals with the statistics component of the project, covering the outputs expected, progress in putting them in place, plans for the future and issues related to sustaining the project.

3.1 Development of Area Sampling Frame (ASF)

Definition: An area sampling frame is the division of land into provinces and administrative areas and within these, into land use categories. These land use categories are then broken down into land units of certain measured sizes and become the sampling units for selection. (See the more formal definition in the Glossary.)

The ASF is virtually complete for all areas in Morocco. The ASF can be maintained and sustained by the current staff in SSD. Project 0182, with the construction of the ASF, has made permanent changes in the quality of agricultural statistics in Morocco. DPAE has the mandated responsibility to provide official agricultural statistics for the MARA and this function has not changed over the past 10 years, in fact it has grown stronger. DPAE and MARA are committed to continuing this activity.

There are two main reasons for using the ASF technology: a.) the ASF is constructed to reduce nonsampling errors associated with sample selection and data collection, and b.) the ASF is easy to maintain and sustain once the frame is constructed.

3.1.1 Types of Data from the ASF

The ASF is designed to collect basic agricultural statistics of farms and farm households. Specifically, the ASF can be utilized to generate estimates of: a) crops (both hectares and yields), b) livestock, and c) socio-economic data such as farm production expenditures that include agricultural labor and technology. It is accepted that if one needs data collected on farm production and related activities, the ASF can be used. This is dealt with more fully in the section on comprehensiveness.

3.2 Creation of a Functioning Program of Current, Regularly Scheduled Agricultural Statistics Based on the Use of the ASF

ASF There are five regularly scheduled agricultural surveys that use the ASF. The following schedule is a summary of those surveys:

Survey	Time of Data collection	Time of Data summary
Crop hectares planted to crops	Feb to Mar	Sept to Oct
Objective Yields	May to Sept	Sept to Oct
Livestock Production	Sept to Oct	Mar to April
Prices Received by Farmers	Feb to Mar	August
Olive Survey	October	April

In addition to the surveys that are regularly scheduled, DPAE undertakes two or three additional surveys a year that are special purpose. DPAE's responsibility to produce better agricultural statistics and its commitment within the DPAE and MARA remains strong. A discussion of the statistical issues of these statements follow. Technical assistance (TA) is not required from project 0182 except as listed on the TA spread sheet. USAID needs to monitor this activity but basically it is on track. Publications from these surveys are not timely by American standards but are timely when compared to African and European standards. Certainly the quality of estimates have improved decisively since the ASF implementation. Data users are requesting that the quality of data be improved either by making it more timely or to improve accuracy.

3.2.1 Timeliness

Timeliness has to do with time from data collection to publication. Three activities are involved, data collection, data summary and publication.

3.2.1.1 Data Collection

It takes longer to collect data in Morocco than it does in the U.S. In the U.S. data are collected in 12 days. Each U.S. enumerator is supposed to collect data for 12 segments for an average of one per day. Each enumerator has his own car and can travel to locate the persons to be interviewed.

In Morocco, data are collected in February and March (a 45 day period). A team of two enumerators is assigned nine to thirty segments. They travel to a segment, meet with the village chief who typically sets up a group meeting the following day with the farmers who live or farm inside the segment boundaries. The group interview requires most of the next day. But there is a bottleneck that results from a shortage of cars and fuel, but not staff. Consequently, teams rotate between the office and the field, teams remain behind while others go to the field to conduct the surveys. To make matters worse, in some field offices, four-wheel drive vehicles are required (especially when it rains) and there may be only one for an entire office.

Thus, in most field offices, during survey periods when data collection is under way, usually half of the teams are in the office waiting for transportation. A forced rotation is not necessarily bad if the teams are properly managed to edit and summarize questionnaires collected the previous day. By the time the data collection period ends, the data should be corrected for unclear entries and nearly summarized by hand. The best time to edit and correct data entry errors is just after the data were collected in the field.

3.2.1.2 Data Summary

The second task required to develop a publication is computer data

entry, editing, summary and analysis. A manual data summary is completed in the provincial offices and then data are sent to Rabat. In three regional offices, two microcomputers are available for computer data entry which was very efficient. The office manager indicated that the data entry personnel could enter 80 questionnaires per hour, or 500 per day. Meknes field office was able to enter data in the computer for its segments in one week. A large province has less than 5000 questionnaires so it is less than a one-week job and again much of this work can be completed during the survey period using the enumerators who are not in the field. In field offices with computer equipment, data are transferred to Rabat on a floppy disk. This works well.

Obviously, these steps would be accomplished faster if all provincial offices had computers, but current plans call for only six regional centers to have microcomputers. These six centers will enter data for near-by provinces. Some new field office computers arrived in early June 1990 for the six offices, but many others will not have them. A solution to better and faster data summarization is to computerize the field offices. Field office personnel are much better at correcting data errors and more efficient at data entry than central office staff. The recommendation is to computerize regional offices as quickly as possible.

3.2.1.3 Publication

Data are summarized and publications assembled and printed in Rabat. Project 0182 purchased printing equipment. This equipment which has allows SSD to print very quickly high quality professional looking statistical publications. Sometimes distribution of the publications is delayed, but this seems to be improving.

3.2.1.4 Sample Size

The national survey utilizes 4200 segments. This number of segments seems excessive because it requires extensive survey resources for per diem, vehicles and fuel for data collection and requires a time consuming data summary and analysis process. There is a tendency to increase the sample to reduce the sampling errors beyond a point where the survey is managed well. Sample size is a function of survey resources and end-user data requirements of accuracy, timeliness and summary levels. More is presented in the section on survey schedule.

3.2.2 Comprehensiveness

There is a demand for more comprehensive data to be collected and published. New requests are coming into the SSD and there are two particular requests that SSD will need to respond to quickly. In particular, there is a demand for what DPAE staff call the cost of production data and what is referred to in this document as farm production expenditure data (FPED). Users need this data and are requesting that FPED data be collected. The data collected in this survey are not useful because they were poorly collected by "Piggy Backing" questionnaires on an

OY survey. These data are of poor quality because the data were not farm level, not segment level and not national level nor were they collected using open segment data collection methods. The problem was more in the survey procedures and not because of the ASF.

The ASF permits the selection of a representative sample of parcels of land and associated farm households. It is optimized for crops, however, livestock and farm production expenditure data (FPED) for cost of production studies should be collected from the ASF.

Recommendation: The evaluation team recommends that a new national level survey be run using open segment data collection methods with a subsample of replications in each strata in the country to collect FPED for cost of production studies. People are requesting this data so it is needed. Further, The evaluation team assumes that within a province the variation will be small therefore one replication within each strata is sufficient to provide adequate data. SSD knows how to do this and does not need outside assistance to draw the sample. They could use training and outside assistance to develop a questionnaire and analyze data.

Other data which are being requested are "Levels of Farming Technology" data. This survey will help USAID and MARA establish a benchmark and track progress in technology transfer in the Settat project area. To date, not much has been done on this survey. A series of activities need to be completed so this survey can be run. A questionnaire needs to be designed that will be specific to project objectives concerning levels of farm technology. Three groups need to be involved in this activity: USAID, INRA and MARA/DPAE. Questionnaire design will require TA from an expert in farming technology and the questionnaires will need to be pre-tested in four segments in each of three provinces. The questionnaire will need modification based on results of the pre-test, and a sample size needs to be determined. An enumerator data collection manual needs to be written that will support data collection, then the month of survey established, costs estimated and funds obtained. Enumerators need to be trained and supervisors supported with cars and funds for per diem. If the survey is to be implemented so that the results are useful, these steps need to be taken.

3.2.3 Accuracy

Accuracy is a function of sampling errors and nonsampling errors. The coefficients of variation (CV's) are a measure of sampling errors and relate inversely to the square root of the sample size (n). As the sample size increases the CV's decrease but the sample must go up by a factor of four for the CV to decrease by a factor of two.

The national level CV's for hard wheat, soft wheat and barley were computed for the first time for this evaluation and are all about 3 percent. These CV's are excellent and further, it is one of the first countries where the CV's are useful measures of the survey errors. (Usually nonsampling errors predominate.) If the sample decreases from 4200 to 2100 segments, in theory, the CV's will increase by a factor of the square root of 2 or 1.414. Thus the CV's will be $3 * 1.414$ or 4.2

percent. Certainly CV's of 4.2 percent are good enough and there are several other benefits of reduction of the sample size. Survey and data summary resources will be reduced by half and nonsampling errors will also be reduced.

Nonsampling errors are also controlled by the survey design but in a more qualitative way. Survey theory assumes that a.) a representative sample is selected from a population and b.) data can be collected perfectly from the sample. The first consideration is one reason for constructing an area sampling frame. In most countries, but not Morocco, the sampling frame is not complete and therefore a major source of nonsampling errors.

In the 1987 Mid-Term Evaluation, nonsampling errors were not specifically identified. It is assumed that those errors were associated with data collection and data summary. The evaluators were worried that the interviewers did not ask the questions correctly or the farmers did not provide accurate or truthful answers. At the time of the last evaluation, group interviews were conducted in the surveys. The survey team went to the village on one day and discussed the survey with the village chief and returned the next day to conduct a group interview with all farmers who lived on or farmed land inside the segment.

Procedures have changed. The group interview is conducted at the segment and the enumerators are able to point to a specific field and discuss the hectares and obtain other information that is required to complete the questionnaires. There has been discussion about the group interview process itself which may lead to an "averaging of ideas". It is possible that there are response errors associated with this type of interview but for the most part, Moroccan farmers try to be helpful and provide information in good faith. Nonsampling errors have been reduced from the time of the last evaluation but reducing nonsampling errors is a never ending process.

Other types of nonsampling errors are generated when data are not entered on the questionnaire or into the computer correctly or data are not summarized and expanded properly. Nonsampling errors are best controlled when the sample size is small enough so that all activities of the survey can be managed and supervised properly.

Sample sizes are established to estimate the most important items at the lowest level of aggregation. In Morocco, the lowest level of aggregation is areas within provinces. For example, there were three agricultural project areas in Kenitra and each project area required a sample that was adequate to provide reasonable estimates for that area. Kenitra has 300 segments because of these small areas. There are nine project areas in Morocco. The MARA management knows that these project monitoring systems require resources. If the data are worth the resources, then that is a management decision. Segments in these project areas should be reduced quickly when the projects are no longer using the data.

The Bureau Chief of the Computer Center summarized last year's data using only 2100 segments. The results show that the national level estimates for the three major crops have CV's of less than 4 percent.

These computer printouts need to be studied carefully to observe the CV's for the individual crops in each province and in each stratum of each province but they show what the theory indicates. A subsample of about half the segments will provide excellent estimates at the national level.

Recommendation: The evaluation team recommends that the sample be reduced to about half its present size. The sample design for the Morocco ASF is stratified, replicated random sampling. Sample reduction can be done by selecting replications to be eliminated from the survey. The SSD staff know how to do this without outside technical assistance.

The Director of SSD indicates that he will meet with his staff and review province level estimates and national estimates of each crop and item. He has agreed to reduce the sample sequentially over the next several years. He is exercising caution and wants his staff to be involved in the decision of how to reduce the sample.

3.3 Expansion of Data Processing Capability

The data processing capability of the DPAE was expanded just before the last evaluation and the main concern at that time was that the computer facility be utilized to its full capacity. Project 0182 has greatly increased the computer assisted analysis capability and has trained a great number of DPAE and regional staff. The computer facility is operating between 8 and 12 hours a day and there is ample capacity for expanded use.

In addition to the IBM 4361 minicomputer, there are over 60 IBM compatible AT and XT microcomputers in the Ministry and personnel are complaining that they do not have enough micro-computers. In discussions about improved output and efficiency, DPAE management stated that whereas before when they requested analysis from staff it used to take months and was full of errors, at present, the same analysis can be completed correctly in a few hours because it is fully computerized. This has had an important impact on the way SSD has been able to react to requests for additional information. DPAE has made a strong commitment to data processing in terms of training and computer resources and this commitment will likely remain strong.

The main concern at this time is different from the concerns expressed in the last evaluation. The IBM 4361 is expensive to maintain because of the high cost of the service agreement (\$60,000 USD per year). Several 486 or 586 computers will provide ample computing power and can be maintained by SSD computer technicians and are therefore more useful and cost effective for DPAE and MARA.

Recommendation: It is recommended that the SSD begin the process of phasing out the minicomputer and obtaining powerful microcomputers. In order to make this change, SSD will need to sell computer time to other divisions and institutions who need computer capacity. In order to make the transition to the powerful microcomputer, SSD may need technical assistance with networking and a hardware expert familiar with advanced 586's. The 586 computer is the latest microcomputer technology and will

probably be available in six months to a year. They will cost under \$10,000 USD but peripheral equipment will be required to serve the many users of the DPAE. The Director of the Computer Center discussed problems associated with this phase out and he indicated that he can allow other divisions in other Directorates or Ministries to have time on the minicomputer and request these users to pay maintenance costs. He indicates that he has trained personnel and does not want to have to retrain all his staff on a new system.

The recurrent costs for the IBM 4361 are as follows:

<u>Hardware</u>	<u>Yearly costs</u>
4361 mainframe	
3 printers	
2 tape units	
3 control units	
3 disk drives	
2 modems	60,000 USD
<u>Software</u>	
SAS	
ETS	
Nonlinear programs and SQL	12,000 USD

These recurrent costs relate directly to the sustainability of the system and the IBM 4361 minicomputer system is more expensive technology than the microcomputer technology. The problem is not that institutions cannot be found that need computer time, but there is difficulty in arranging payment for sharing the cost of computer time.

3.4 Completion of Aerial Photography Laboratory and Aerial Photographs Taken of Primary Crop Production Areas of Morocco

An excellent aerial photo laboratory is operational in DPAE. It has quality equipment and is neatly organized and aerial photographs are available for most of Morocco. There is a catalogue system that allows one to identify a photograph of a specific area on the ground in minutes by looking at a map of Morocco, identifying flight lines and a container where the photographs are stored.

There are trained people in the photo lab to develop film and make enlargements of photos that go up to nearly one meter square. The lab is sustainable because other Ministries are requesting aerial photos. When these Ministries request photos, DPAE charges them for chemicals and photo supplies. The photo lab produces only black and white photos.

3.5 Strengthened Capacity of DPAE to Carry Out Objective Yield Analysis

Definition: Objective yield (OY) surveys are often called crop cutting or crop harvesting surveys. They are completed at harvest time

when sample plots are harvested and estimates are made of the average yields in quintals per hectare. One hectare has 10,000 square meters so it is a simple matter to convert from one square meter to yields per hectare.

Presently, about 20 crops are included in objective yield surveys. Plots are cut in fields and the plants are brought to the OY lab where counts are made of heads, spikelets and kernels and where grain is thrashed and kernels are weighted. The OY laboratory is functioning well. It is clean and well organized.

The OY lab is supporting estimates of four major cereal crops and four lesser important cereals, four important legumes and four less important legumes. It can be maintained and sustained by the current staff in SSD. Objective yield methods are expensive and they require training and field travel. However, the MARA has tremendous interest in cereals production and therefore is willing to finance these surveys. The DPAE must have preliminary forecasts by May 10 of each year. The OY surveys are not complete until after that time so preliminary estimates are made without these survey indications. Obviously adjustments are made in the cereals production forecasts after the OY survey results are known.

One concern is that the OY method needs to be calibrated. OY estimates provide biological yields. What one wants is the economic yield or yield after harvest and post-harvest losses. Some care needs to be taken to estimate these losses. One way of calibrating the OY surveys would be to draw 30 to 50 samples in several fields and then harvest the fields using the usual harvesting procedure. The OY results should indicate more than the actual production and the difference would be this harvest and post-harvest loss.

The Director of SSD has already discussed undertaking this research in Kenitra. This calibration can be completed without technical assistance from outside SSD. There is one other concern about this work. OY methods require exact adherence to sample plot location and harvesting methods or nonsampling errors will be introduced.

Recommendation: The evaluation team recommends that SSD staff in Rabat provide longer training before these surveys. OY surveys are difficult to implement in the field. There should be two days of training for each survey with staff from Rabat attending and supporting the regional office trainers. During survey periods, supervision should be provided for one fifth of the field work until procedures are well established.

3.6 Procurement and Use of Satellite Data for Improving Crop Area and Land-use Estimates and for ASF Maintenance

Satellite imagery has a place in DPAE and project 0182. This activity is weak because of bad advice from US consultants. The first consultant was an expert in geology, not an expert in agricultural statistics. Other advisors were familiar with digital image processing and, in fact that activity was stopped. Finally, the last Mid-Term Evaluation team indicated that elsewhere in Africa, it had not worked well. Satellite imagery replaced the need for aerial photography in Sudan.

The use of satellite images to stratify land into land use categories is still very useful in Morocco when construction of a new ASF is required and aerial photography is out of date. It is cost effective to purchase satellite imagery rather than to require that aerial photography be flown to replace outdated photographs. Furthermore, the stratified areas are more precise and better quality than aerial photographs because color images are better than black and white. One or two satellite images is much easier to manage than the large number of aerial photographs that are required. Consider the costs of satellite imagery. One image costs \$1000 USD but covers 34,000 sq. kilometers, the area of about 900 aerial photos. Two satellite images will suffice for an average province or \$2000 USD. Aerial photo coverage for the same area is 3 DH per hectare or for 30,000 sq kilometers or 3,000,000 hectares, it costs 9,000,000 DH or \$1,000,000 USD.

The use of satellite imagery for digital processing requires extensive training, powerful special purpose computer equipment and the recurrent purchase of satellite images. This activity is not cost effective unless precise estimates of small areas are required.

There has been a technology breakthrough in using satellite imagery to develop ASF's mostly because satellite resolution has been greatly improved since July 1982. Before that time, satellites had sensors (multispectral scanner) with ground resolution of 80 meters and a black and white sensor (return beam vidicon {RBV}) that was not used much. Eighty meter resolution is not sufficient to support stratification and PSU construction in Morocco.

Landsat's 4-6, first launched in July of 1982, have a sensor called the Thematic Mapper (TM) that has 28 meter resolution (some say 30 meter), and this resolution is excellent for stratification and PSU construction in Morocco. The French in conjunction with the European Space Agency (ESA) have launched SPOT with 20 meter color and 10 meter black and white resolution.

Recommendation: Replacement of the ASF is planned to begin in 1992 in provinces where aerial photos are over ten years old and land use has changed extensively. The evaluation team recommends using Landsat TM or SPOT imagery to re-stratify and to develop PSU's instead of requiring new aerial photography. Landsat and SPOT 20 meter imagery is color imagery.

SSD has trained personnel who can utilize satellite imagery to provide land use strata and there is a remote sensing unit in the MARA with trained personnel there. The remote sensing unit has images of some areas and possibly can provide these images at reduced costs. This activity can be carried out without USDA assistance. They will need funds set aside for purchase of satellite imagery but the funds should come from the budget of obtaining new aerial photos. 20,000 USD will go a long way to cover main areas of Morocco. SPOT images are 5 times more expensive but are still cost effective compared to full coverage aerial photography for the same area that will cost 20 million USD.

3.7 Increased Monitoring and Evaluation Capacity

DPAE is being requested to conduct special purpose surveys of an ad hoc nature in project areas for the USAiD, World Bank, IFAD, FAO and other donor banks. It is because of the project 0182 that these requests are being made. SSD has established itself as an important institution with strong technical capabilities and experience in data collection and summary.

When surveys have been undertaken, new questionnaires have not been made up but old ones slightly modified to survey objectives. This is unsatisfactory and a serious deficiency within survey operations. Either because of poor planning or lack of interest on the part of staff, questionnaires are not always done to adequate standards. This is one of the reasons the links between SSD and SEEMP are poor--the quality of surveys is not what it should be. Therefore, this component needs further TA and possibly some short term training (not currently planned). The TA should be funded out of project budgets rather than out of 0182. If this can not be done then 0182 should support these activities.

3.8 Development of a computerized data bank for DPAE

In 1987, USDA sent a computer specialist to work in SSD to assess the hardware and software capabilities and to develop a plan for the data base. A Moroccan cadre was provided short-term training. When he returned, he worked several months and resigned. SSD was not able to salvage work that had been completed so it began to train and develop new personnel for this component.

A computerized data bank will allow people to retrieve data easily by going through a series of menus and responding to questions about what is required. The Data Bank should make it easy for an inexperienced computer user to obtain data that is in the Data Bank.

Because of set-backs caused by the trained person leaving, this task is only starting. The difficult task is to develop concepts of how the computer program will work. After that, programs must be developed to carry out the plans. There are five persons assigned to this task who are located in the Data Bank Bureau in SSD. The Bureau Chief for Data Processing Center is currently the acting Bureau Chief for this Bureau. Currently, there are two engineers (one in training in Japan) and one who is developing software and five agents working on this task. Three agents help the engineers and 2 are keypunch personnel. It will be difficult to find technical assistance for this component because of the requirements--expert in COBOL, ISPF, SQL, and fluent in French and English.

The Data Bank is still being pursued by SSD. It will take a long time for this task to be implemented. The Bureau Chief of the Computer Center indicates that SSD will continue to work on this component with or without U.S. technical assistance. This component should be monitored and when DPAE wants assistance, then support should be provided.

3.9 Development of a Documentation Center for DPAE

The Documentation Center for DPAE is organized and could be a major initiative that is useful in DPAE and MARA. Two problems remain and both can be solved. The center is physically separate from DAE and SSD and therefore not useful. Second, it can be tied to the library systems in Rabat which are in turn tied to other libraries around the world. Both these deficiencies can be corrected. Space is being prepared for this center in a new building where all of DPAE will be moving. Finally, the links to other library facilities in Rabat will be important and should be supported by the project.

3.10 Technical Assistance in SSD

SSD has expertise in ASF construction including expertise to stratify areas, construct PSU's, measure and select PSU's, subdivide PSU's into sampling units and select segments. In fact, SSD has been doing these tasks without TA. The team leader was not involved in these activities. SSD may need some technical assistance in a few new areas such as sample rotation, tree-crop OY surveys and remote sensing. SSD could use TA to develop clients in the private sector, to identify clients in the public sector outside DPAE, and to promote their publications and to hold user meetings with and develop user inputs for SSD planning.

Recommendation: DPAE needs to study the lack of coordination between SSD and economists. Data that are available are not used as they could be by researchers. The users need to communicate their data requirements and SSD should be more willing to conduct surveys that are not so routine. There is likely a need here for technical assistance to "bridge the gap" between the two services.

3.11 DPAE Activities and Plans of the Next Three Years and Beyond

These categories were established as a result of items identified in the first evaluation. The plans for the future were presented by these same categories which were taken from the FY 1990 workplan. In most cases, these are more status reports than plans for the future. Comments about these "plans" follow. In addition to discussion about the plans in this section, comments are found in the main discussion of each item as well.

3.11.1 Area Frame Development

The ASF activities and progress was presented in a section above. SSD has expertise in this task, has managed these activities for several years, and is confident of its decisions. This activity is institutionalized. There is some TA planned when SSD starts rotating samples and in other specific new areas.

Training is scheduled for the ASF Bureau Chief to visit the U.S. ASF section and be provided theoretical training and practical day-to-day management of the ASF materials. This will be useful since the ASF Bureau

Chief is new and has never seen the ASF section in Fairfax, Virginia. USAID does not need to worry about the ASF activities. It is institutionalized. If SSD requests TA or training, then it will be useful.

3.11.2 Timely Statistical Releases

The plans for this activity are mostly discussions of nonsampling errors rather than timeliness issues. SSD is working on timeliness of publications in their own way. USAID should continue to monitor SSD about this because Mr. Sasson and other important users including the Minister of Agriculture, are all pressuring SSD for more timely data and much can be accomplished.

Recommendation: It is recommended to regionalize computer data entry. This activity is planned for several regional offices that will have two microcomputers with software to enter data. It is also planned that these six regional offices will enter data for neighboring provinces. There are several recommendations that will make publications more timely in Morocco: a) regionalize data entry, b) reduce the sample size, and c) manage the data collection and data editing in the regional offices. Project plans are not specific in this area but nevertheless, SSD is providing computers to its regional offices as quickly as they have micros.

3.11.3 Expanded Data Processing Capacity

Data processing should be expanded in the regional offices. In Rabat the problem is to reduce expensive technology with more sustainable technology. The present effort in Rabat should be redirected to developing ways to sharing the costs with other users who will help share the maintenance costs. Although this activity is internal to DPAE. Project 0182 may need to provide a hardware expert and a networking person.

SSD is thinking that they should use SAS in place of the Generalized Edit (GE) program developed at USDA/NASS and the evaluation team agrees with this idea. SAS programmers are available in SSD and SAS is a commercial program. SSD may want TA for this change.

3.11.4 Aerial Photo Laboratory

The aerial photo lab is functioning "flawlessly" according to plans. Technical assistance is needed to identify calibration points for rectification which will support making enlargements more to scale. This will allow measuring between points on the aerial photos to correspond better to measurements on the ground. At present, enlargements lack precise calibration points. TA is planned, is appropriate and is required.

The DPAE is to develop a plan to obtain reflights on a regular basis for photography that is 10 years old or at least for DPAE to consider this plan. DPAE should consider the less expensive color products available from satellite imagery. There is a long discussion of this alternative in the section on remote sensing. The critical issues are usefulness and

cc ts. The Satellite alternative has advantages in both areas for stratification. The aerial photo lab will still be required to provide PSU contact prints and segment enlargements.

3.11.5 Strengthen Objective Yield Program

These plans are vague and call for development of OY methods for citrus work in Kenitra Province. The training and supervision have not been stressed enough in the plans for the future.

3.11.6 Remote Sensing

Planning activities fall short because of unclear ideas from consultants. Remote sensing is not geographic information systems (GIS). GIS is put with remote sensing because the GIS expert is also the remote sensing expert. The GIS is a computer program that allows the user to show and display logical relationships between geographic layers of information. Certainly, satellite imagery is one layer of information. Other layers include the highway system, soils maps, rainfall maps, land use maps, population maps, land value maps and so forth. These layers of information can be registered in the GIS system and land areas identified that meet conditions on several of these layers at the same time. For example, land can be located that is valued under a certain amount, that has soils of a certain type and that is utilized a certain way.

The GIS system could be useful to the Planning Division, depending on what the Planning Division is working on. The current GIS system is sustainable because it is paid for and there are low recurrent costs. The GIS software is installed on a microcomputer and consists of the joint use of two programs - ERDAS which is a digital image manipulation program and CRIES which is an inexpensive GIS. The system seems adequate even though SSD has only a demonstration program.

3.11.7 Data Base

This activity is going forward without technical assistance at a slow but steady pace. It was discussed in the previous section. If USAID wants to push this activity, it would need to provide some TA that is fairly specific.

3.11.8 Documentation Center

There is considerable discussion about this activity in the previous section. Plans for future work are general and until a better, more accessible location is found for the Documentation Center, it will not be fully utilized.

3.12 Role of Long-Term Training Participants

Staff members returning from the U.S. with advanced degrees may find themselves in a difficult position. They are supposed to return to their previous positions. However, in their absence, colleagues have been carrying on with their original work assignments so there must be a transfer of responsibility, which may or may not be smooth. One or the other will have to be displaced from a position. Also, management expects that returnees will perform to a higher and more productive level soon after they return. This is perhaps an unrealistic expectation.

Other issues may arise as well. Some returnees may find that perquisites such as cars and other benefits are passed out in a seemingly arbitrary fashion. In fact some returnees have already remarked on how they may see very little connection between quality and quantity of work, and being provided perks. Some of these same returnees find there is very little communication between cadres and division chiefs because the division chiefs are typically too busy. The returnees feel that there is a barrier that keeps them from advancing and demonstrating their newly acquired skills.

Recommendation: It is recommended that communication be improved between the various levels of DPAE management and the staff. There are no immediate suggestions or solutions to this problem. This problem will not go away but only get worse since only a small percentage of the persons have returned (There are over 19 who have yet to return).

3.13 Clients for DPAE Data, Distribution Channels and User Interface

New clients need to be obtained for the SSD data. This issue is crucial for the entire system of agricultural statistics in the future. Current plans are not sufficient for this activity to advance. So far, the main data users are DPAE researchers and staff and other users in the MARA. In the U.S., although these equivalent users are important, the private sector users are more crucial--the farmers and major producers, cooperatives, merchants and traders. This variety of users has been neglected completely in Morocco. A major effort needs to be made by SSD to cultivate demand from outside users.

Further, DPAE has not actively pursued other public sector users. As the effort to complete the ASF for the country is now finished, it is time to develop clients. This should be done by an agricultural economist, perhaps one of the returning staff members from SSD. It is important that DPAE/SSD begin a dialogue between themselves and the users of their data. Mr. Sherman has discussed this with SSD often but very little progress has been made because it really was not necessary when project 0182 was paying for many of the start-up activities. Soon SSD will need to justify its budget. A suggestion to help develop more users is the matrix of agriculture data users, originally devised for Ecuador by Dr. Dale Colyer who was the agricultural economist in USAID/Quito and is currently a professor at West Virginia State University at Morgantown. (See Appendix).

3.14 Data User Involvement in SSD Planning and Operations

The economists and other staff at DPAE are major users of the SSD statistics although it is recognized that there are other clients who should be cultivated. Thus, it is in the interest of SEEMP to assist SSD in any way possible so that SSD data may be made more responsive to SEEMP's needs. SSD must strive to provide timely, accurate data to those who use the information (at present, principally SEEMP) in order to have the continued support of its data users and, thus, to continue the program.

Recommendation: It is recommended that SSD formalize a means to find out what SEEMP's data needs are and to explain in turn the limitations of SSD's data collection system. There needs to be more systematic interaction so that SSD's resources can be more fully used by other branches of DAE. There is a wide variety of data SSD can provide and SSD's capabilities and potentialities should be more fully exploited.

4.0 ECONOMICS

4.1 Project Objectives

The three major objectives of the project for economics and planning as stated in the project paper supplement from 1987 were:

Increased policy analysis capacity to assist policy formulation within MARA;

Strengthened planning capability to do economic analysis of development plans; and

Improved project monitoring and evaluation capacity.

The first of these objectives which relates principally to the Service of Economic Studies, Markets and Prices (SEEMP) is one of the central objectives of the project. The other two which relate to planning while important, did not receive the same level of attention. In addition, the activities that the Division of Planning are engaged in are outside of the project whereas many of the activities in SEEMP relate directly to project goals and outputs.

4.2 Inputs

4.2.1 Long-Term Technical Assistance

One of the principal inputs to serve the first of these objectives was the provision of a long-term resident technical advisor placed within this service. Dr. Wallace Tyner, an agricultural economist from Purdue University arrived in September, 1985 for a three year stay and left at the end of 1988. Though his main purpose was to build capability to conduct economic analysis within SEEMP by training the cadre in basic computer skills, economic theory, research methodology and use of various statistical programs, personnel from other services participated in the courses as well. These other services included DAE/SI, DP/SP, and DP/SPE.

Dr. Michael Bertelsen was the second resident agricultural economist provided to the project working within the Division of Planning. His main task was to provide continued computer training and economic instruction for the cadres, to assist in achieving the second two objectives specified above. Dr. Bertelsen remained in DP/SP from February 1988 until June 1990.

4.2.1 Microcomputers

The second input provided to the DP/SP was microcomputers, which were delivered in late 1985. The computerization and the programs available to all staff, secretarial, cadre and managers, has vastly improved the performance of all aspects of DP/SP's operations. The speed with which work can be accomplished has improved immeasurably, since prior to the

installation of the systems all calculations were done by hand, mistakes were often made and personnel were inefficiently using their time. The presentation of work for other MARA offices and outside the government has been vastly improved. Overall efficiency and performance has been improved at every level of the DPAE.

4.2.3 Long-Term Training in U.S.

The third input to meet these objectives was long-term training in the U.S. The plan for this training within SEEMP and DP was:

	PhD.	Master
SEEMP	4*	5
SIP	0	1
Suivi Projets	2	2
Suivi Plan	0	3
Ser. Exter.	0	4
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Total	6	15

* Two of these Ph.D.s have been financed from outside the project. Training of SSD personnel is dealt with in Chapter III on SSD.

Originally, budgets included training for more Ph.D.'s but these numbers were reduced because it was decided that training to the Masters level was more appropriate. It is also less costly and requires staff to be in the U.S. only two or two and a half years instead of four or more years.

4.2.4 Short-Term Training

The fourth input has been the short-term training provided by the resident advisers, university professors in Morocco or on TDY from the U.S., and by other short-term visitors. These included courses in introduction to micro computers, econometrics, data base management, linear programming DOS, and computer maintenance. In addition, there were roughly nine DAE and DP staff members who went to the U.S. for short-term training. These attended courses on econometric modeling, management, survey techniques and office management. (There were seven other SSD staff members who were also sent for training in subjects related to their work.)

All of the stated inputs have been delivered and with good effect. Dr. Tyner's residency was quite effective in training staff members and building the necessary institutional capacity, particularly within the SEEMP, to conduct high quality economic research and policy analysis. In addition, his presence provided a cohesiveness and ultimately brought an awareness to top-level managers and other MARA officials of the importance of quality research on economic policy issues. Decision makers are now aware of the need for economic analysis that it is available and will be increasingly so within SEEMP.

Dr. Bertelsen's stay was equally productive in continuing training and boosting the level of performance for the cadre within the Division of Planning. Though the visibility of their work has not nor will never be equal to that of the SEEMP because of its nature, they have made improvements qualitatively and quantitatively in their work.

4.3 Outputs

Outputs envisioned by the project fell under four headings.

4.3.1 Studies

The major study to date has been the "Agriculture Prices and Incentives Study," the first phase of which began in 1984 and the second in 1988. It has had a significant impact on policy decisions, particularly on the ASAL II negotiations and it has enhanced the reputation of DPAE, particularly, SEEMP, which helped carry it out in conjunction with Agro-Concepts and Dr. Tyner. Phases of some studies have now been completed, such as the multi-market model and farm modeling for two provinces. In some cases, results have not been widely disseminated or delayed in their publication. (The studies are described in detail in section 4.4.3.)

4.3.2 Data Bases

Data bases were supposed to be established to meet needs of researchers. Work has proceeded on the creation of an international trade data base and one on farm budgets. Some of the data comes from surveys SSD has done, but much of the data is cobbled together from a diversity of sources. There is not one central source for the data and various researchers have assembled their own data sets. There needs to be greater effort to unify and build larger and more thorough data bases.

4.3.3 Reports

SEEMP began publishing a monthly Situation and Outlook Report in May, 1987 on world markets for agricultural products of interest to Morocco. It summarizes market trends and presents current data from a variety of sources, not easily accessible to many people. It is a worthwhile publication that should be continued, but DPAE limits its distribution officially to 15 persons or organizations. It should be more widely distributed.

4.3.4 Institutional Development

A major aim of the project was to improve the capability of DPAE to conduct economic research and analysis to help in policy decision making on the issues that are facing Morocco. The inputs mentioned above were supplied to do this, and it appears that the project has achieved this goal. Within DPAE there is now a cadre of economists who have done work under the guidance of Dr. Tyner and they have shown results on a number of studies. They have received in-country training in computer programs, economic theory, research methodology and econometrics, while others have been sent to the U.S. for advanced degrees. The level of expertise has

vastly improved within DPAE and continues to do so as the cadres work on the studies now underway. The level of professionalism in the work is improving and motivation is high for many cadres as their skills and potential have been improved through project activities. The problems now confronting DPAE will be to manage these newly enhanced resources.

4.4 Plans for Coming Years

4.4.1 Economic Reform

A process of economic reform has been underway in Morocco since 1983 as part of a structural adjustment program. The GOM has been compelled to undertake a wide range of policy reforms, particularly in the agriculture sector, which include eliminating food subsidies to consumers, reducing subsidies on agricultural inputs and limiting government intervention in agricultural marketing. In addition, because the agriculture sector is heavily dependent on earnings from exports, especially to the EEC and economic integration planned for 1992 is now imminent, Morocco must make its agricultural export sector more efficient to maintain its market position. In order to measure the impact of policy reforms and formulate policy alternatives, the GOM must have continuous sound and professional economic analysis. Up until a few years ago, major policy decisions were made with little or no systematic economic analysis. Now DPAE's capability to do this has raised the level of policy analysis and discussion within the MARA.

4.4.2 Five Year Development Plan

The Five-Year Development Plan formulated by the Ministry of Agriculture for 1988-92, proposes a budget for DPAE of 150,000,000 DH and activities intended to: "provide DPAE with a capacity for analysis, formulation and monitoring of agricultural programs and policies based on an enhanced statistical capability and knowledge of national agriculture." The assignment of such resources to DPAE expresses a commitment on the part of the MARA and the government in general to the essential work carried out by DPAE. Much of the work on policy related issues is being carried out by SEEMP and relates to the economic imperatives for reduced government intervention and improved performance in the export sector. The studies currently underway address a number of policy issues critical to Morocco's economic future and are specified in the project's annual workplan for 1990.

Despite the fact that resources have been allocated to DPAE and its operations, it is not clear how long lasting or dependable this commitment actually is. Neither the Five Year Development Plan nor the annual workplan of DPAE specify in much detail what the priorities are or the level of funding for particular activities. The question therefore arises as to the vulnerability of DPAE to funding exigencies and whether the current level of commitment will continue. Political imperatives could dictate changes that would be disadvantageous to DPAE and this uncertainty is always a possibility. Thus the level of commitment needs to be more clearly specified.

The areas of stated need for research and policy analysis in the workplans are:

- a. Trade liberalization studies
- b. Prices and incentives analysis
- c. Representative farm models
- d. Multi-market modeling
- e. Econometric modeling of the cereals sector
- f. Analysis of the cost of production data
- g. Foreign trade modeling and analysis

4.4.3 Status of Studies

These studies are at various stages of completion. Most are on-going projects that will be carried out over the course of the next year or two. Completion of some of the work has been slowed by the absence of some staff away for long-term training in the U.S. and from the demands placed on the service for short-term work.

a. Trade liberalization studies. These are intended to establish a program of liberalization of trade for over 800 agricultural commodities, 284 of which have been liberalized as of 1989, and the remainder by 1992. A liberalization plan has been established containing the year each product will be liberalized and the method of protection that will be used (ad valorem tariff, variable levy, etc.). The first part of the study has been completed and will continue.

b. Prices and Incentives Analysis. The first phase of this study was completed in 1984 and the second phase in 1989. One of the objectives of this study was to create the capacity within SEEMP to periodically update the prices and incentives analysis and the capability now exists to do this.

This study has had a marked impact on policy reform as the first major piece of research that received wide recognition and visibility throughout the MARA. It was helpful in addressing subsidy problems and redirecting the policy dialogue. In fact one important spin-off of this study was that DPAE was able to compute protection coefficients for GATT negotiations, a task which was previously beyond their capacity. The study will be updated periodically and will be made use of continually. Its distribution was not as wide as it could have been, however.

c. Representative farm models. Two models using linear programming methods to estimate farm production levels and product mix have been constructed for two provinces. Data for one of these models came from the USAID funded project in Settat, a result of collaboration between DPAE and the staff in Settat. Results from these first two models were published this May and work on modeling other provinces is progressing.

d. Multi-market model. This study has been completed. This modeling effort intended to capture interactions between the cereals and livestock sectors so that elasticities could be estimated to judge the production effects of various price levels of policy options. This study will be

published in the next month.

e. Econometric modeling of the cereals sector. This work has proceeded slowly because of a lack of Moroccan data available and various econometric problems. By the end of the year it will be decided whether this activity will be continued or dropped altogether from the workplan. This study could be picked up by the USAID-funded Cereals Marketing Reform Project, which is scheduled to be underway by the end of this year.

f. Cost of production data. Data have been collected and analyzed but results have not yet been released. There is much doubt about the quality of the data and therefore the results. Until or unless other data can be obtained and confirmation of the results can be made, then the study will not be released. It is not clear how this will be resolved because managers are reluctant to release results which seem less than dependable. On the other hand, since no other studies or data exist about cost of production, any publication would be helpful, no matter how heavily it must be qualified.

g. Foreign trade modeling. This work has been undertaken to analyze Morocco's agricultural exports and levels of earnings under a number of scenarios. So far preliminary work has been accomplished in reviewing literature and assembling data to model Morocco's performance under various policy formulations. One researcher in SEEMP has made one trip to the U.S. for work at Purdue on modeling and to gather literature and data that will be useful on this study. In addition, Dr. Abbott from Purdue made a short trip in April of this year to direct and assist in this work.

4.4.4 Workplans

The Five Year Development Plan published by the MARA and the Five Year Workplan for the project, present the areas of general interest that will be addressed by DPAE, but neither gives detail about priorities or the resources devoted to them. The annual workplan DPAE uses, presents only slightly more detail with a general schedule of work and personnel assigned to various activities. This workplan was drawn up by the resident technical advisers as a first step to encouraging DPAE to generate a more detailed version. However, no more thorough plans have been forthcoming. This lack of more elaborate and thorough plans which should specify not only personnel assigned the work, but precise time needs, performance criteria for staff, job descriptions, and resources devoted to each activity, is a serious deficiency. Without such plans, staff remain uncertain about how they will be evaluated, what their full responsibilities are and how they will be supported to complete the necessary work. The fact that a number of staff members are away for long-term training boosts the workload of those who are now working within DPAE, making better planning even more of an imperative.

Recommendations: DPAE needs to be convinced of the value of precise and thorough plans and encouraged to draw them up. Such plans need to specify priorities, time allocated for each activity, personnel performance criteria, job descriptions, and resources that will be devoted to the work set out in the plans.

4.5 DPAA's and DAE's Proper Mission

DPAA's responsibilities are: "for the collection and analysis of agricultural statistics, as well as for the preparation of economic studies and agricultural development plans. In addition to annual data collection on crop production, DPAA is charged with conducting 20 other surveys on selected crops, markets and prices, agricultural employment and production techniques and costs. It is also mandated to institutionalize a system of monitoring and evaluation of agricultural projects."

The lack of planning is a result of DPAA's failure to define and commit itself to the tasks before it. This is especially critical to DAE and within that SEEMP. According to its stated responsibilities and the purpose of the project, DAE should be concerned with medium- or long-term research that can support policy analysis. DPAA's reputation has recently been greatly enhanced due to the research results it has distributed that ultimately had an impact on several important policy decisions. This newly won notoriety has caused demand for its services to rise, but for short-term requests on a wide array of topics from a huge variety of sources both inside and outside the government. As a result, these constant requests which inevitably require resources to be quickly allocated, undermine the longer term research work. Staff are drawn from their usual tasks, sometimes for days, to provide answers to questions top level managers feel compelled to answer.

Within DAE and DPAA, there is not clear statement of priorities or any system in place by which DPAA can insulate itself from the constant barrage of demands it faces. This further exacerbates DPAA's operations, and especially SEEMP which handles most requests. The disorder of this situation upsets staff schedules and creates the sense that their longer term needs are not adequately looked after. Both functions of providing short-term information and conducting longer term research are legitimate and well within DPAA's capabilities, but DPAA needs to clearly state which function takes priority, if any, and how to fulfill its expressed choice.

Recommendation: DPAA come to terms with the two functions it now performs with regard to short-term information requests and its longer term plans for research to support policy analysis. It is recommended that some sort of management specialist, from the private sector, look carefully at DPAA's operations, particularly DAE and SEEMP within that, to establish a system that could help answer short-term requests while allowing longer term work to continue smoothly.

4.6 Policy Issues

As stated earlier, there are several expressed areas of interest for the GOM in economic and agricultural policy. They are:

- a. Trade liberalization studies
- b. Prices and incentives analysis
- c. Representative farm models
- d. Multi-market modeling
- e. Econometric modeling of the cereals sector

- f. Analysis of the cost of production data
- g. Foreign trade modeling and analysis

These are the chosen areas of concentration for the coming years. These are to a extent, demand driven, dictated by the needs of the government for negotiating with the World Bank, in GATT and the structural changes it has agreed to undertake. These are areas that will be crucial, but not the only ones that DPAE could potentially concentrate on.

Under the recently signed P.L. 480 agreement, the GOM has agreed to conduct research on technology adoption, especially for varieties of wheat. The SSD has been informed of this and will likely collect the necessary data as part of its regular surveys. This is one of the issues of vital interest to USAID and DPAE seems poised to take it on as part of their work plan. There are other issues related to the general listing above that have not yet been addressed such as the implications of GATT agreement on domestic and trade policies, analysis of potential scenarios for losing privileged entry of products into EEC markets, and impacts on the poultry industry of current and potential domestic and trade policies, to mention a few.

In addition there are other areas that have not begun to be considered but no less important. Natural resource questions are not addressed by stated plans. Thus, any number of issues could be tackled relating to water use, rangeland, soil conservation, and land use patterns and their economic consequences. Another kind of research which could serve many of the same policy goals as the trade modeling and farm production work, is on rural-urban exchanges and regional development. Looking carefully at linkages between urban centers and rural hinterlands, at the effects on incomes from choices of agricultural production can be helpful in discerning effects of policies at a different level than do models. This research could potentially offer insights into agricultural policies that may so far be lacking.

Recommendation: It is recommended that the work on technology adoption be undertaken as soon as possible since it is of keen importance to USAID. Also, topics of many kinds be entertained as possibilities for research to enlarge the approaches and points of view of research done to improve policy formulation.

4.7 Impact of Improved Policy Analysis

The project has had a significant impact on DPAE's capacity to conduct economic analysis and contribute to the policy decisions being made in the MARA. It has made it possible to analyze the impact of various policy formulations and enhance the quality of recommendations available to advisers in DPAE. The importance of the work done by DPAE and its growing recognition have translated to an ever increasing dependence of decision makers on analysis on critical issues now facing Morocco. Decision makers have been taking risks that depend on the validity and quality of the data and analysis and have come to see the importance of systematic methods to look at policy effects. Whereas before, many policy decisions were made with little quality data or information, now they can be infused with more

up to date, informed and scientifically reached conclusions and recommendations. There is no question that in recent months decisions have been largely affected by analysis and conclusions indicated by DPAE's research.

There have been concrete policy results from DPAE activities. One has been with the recent Agriculture Sector Adjustment Loan which stipulated areas of priority in which policy changes would be undertaken. Alternative policy choices were examined in some of the studies prepared by SEEMP. The methodology that is used to investigate comparative advantage has been adopted and effects of government protection have also been accepted. These were elements that derived from the "Agricultural Prices and Incentives Study". Negotiations on the ASAL II agreement were directly aided by the specific details of policy analysis that was provided by work in SEEMP. And now with negotiations proceeding on GATT, analysis of distortions caused by production and consumptions is needed and the expertise is available to help conduct the analysis.

The institutional improvements that have occurred within DPAE and DPAE's new found role has also made other policy makers within MARA more aware of economic principles and the need for sound, reliable economic analysis. According to Dr. Tyner, the long term resident economist in SEEMP, there seems to have been a fundamental change in the way agricultural policy questions are approached. This is a direct result of the project's activities. It also accounts for the increase in demand for information and quick policy analysis of price series or other matters, that DPAE is constantly faced with. There is a new founded demand for their services and the needs they can satisfy. There has been tremendous progress in improving capability within DPAE and the credibility they have recently come to warrant and enjoy. Proper questions are now being asked and resources exist to answer them in a meaningful and thorough way. This is a major achievement of the project, one that shows the project has met one of its main purpose level goals.

There are specific areas in which economic analysis has had an effect on particular problems. A brief list will suffice:

1. Negotiations on ASAL II,
2. Pricing of by-product feedstuffs,
3. Analysis of powdered milk subsidies,
4. Trade liberalization,
5. Liberalization of oilseed cake,
6. Price formulation and trade,
7. Studies of short-term nature.

5.0 PLANNING

5.1 Project Objectives

The objectives of the project with regard to planning were:

Strengthened planning capability to do economic analysis of development plans;

Improved project monitoring and evaluation capacity.

The planning division received fewer resources and was relatively less involved in the project from the outset. Its involvement began only in 1987 after the project was amended. Many of the Planning Division's activities are supported from elsewhere and its work entails activities outside of this project. Nevertheless, there was some involvement, in the form of a resident adviser being placed within the Division of Planning, computer systems installation, staff training in economic theory, computer programs and computer maintenance.

5.2 Project Activities

Major activities that received assistance were:

a. The strengthening of DP capacity to formulate national strategies for agricultural development. A system of national agricultural accounts was established with the help of contracted technical assistance from the University in Rabat. Also methods for collecting and analyzing average and marginal rates of capital investment were developed.

A data base has been developed within the DP with the installation of microcomputers. Such a data bank is still being worked on, but it will greatly enhance the planning procedures. It includes information on rainfall, crop production, yields and hectarage, producer and consumer prices, etc.

b. Improving methods of analyzing agricultural policy alternatives. Capacity to conduct analysis has been enhanced by the installation of microcomputers, basic and advanced training in computer literacy/technology and training in applied economic theory through formal courses.

c. Assistance in improving the coordination and monitoring of the Agriculture Plan and Agricultural Projects.

Training has taken place on various programs that have been installed which improve techniques for managing budgets, doing financial analysis, and conducting various surveys within different services.

Though most of the resources targeted to the DP and SEEMP were devoted to training of economists and economic methodology, much training was done of the cadre of the DP. However, the view was expressed that their particular training needs were not satisfactorily met by the training

they received in project monitoring and evaluation, financial analysis or other specific activities. Many thought that the economics courses while of interest, were of limited practical use. Nevertheless, the major contribution to their work was the installation and training for use of computers and essential programs. Both output and quality of work has been greatly enhanced by the installation of the minicomputers, peripherals and software and the training of their use and maintenance. Timeliness, precision and presentation of work have all been improved as a result of the project and this alone has been a great improvement for the division's performance.

Recommendation: More training for Division of Planning be programmed if possible. Courses should be offered on public finance, project evaluation and other specialized topics of a practical nature that meet the particular needs of planning staff.

5.3 Five Year Development Plan and Annual Workplan

5.3.1 Service du Plan

The Five Year Plan of the Ministry of Agriculture gives equal emphasis to the Division of Planning as it does to DAE. It emphasizes a number of areas.

Under Service du Plan (SPL) it specifies:

1. conduct sectorial analysis;
2. analysis of agricultural investment;
3. formulate a method to follow annual economic budgets;
4. develop national account;
5. define precisely the data needs for planning systems and economic analysis of policies;
6. improve capacity for regional DPAE staff in planning and project monitoring throughout the country;
7. improving monitoring and evaluation of the plan

5.3.2 Service du Suivi et d'Evaluation

Under Service du Suivi et d'Evaluation du Projets (SP), activities included:

1. initiating a system of monitoring an evaluation that suits the needs of regional MARA offices so that project needs can be met on a national scale;
2. conduct base studies and periodic monitoring of project to better follow project progress;
3. liaison with ORMVA on the study of use of extension information.

As with the above mentioned Five Year Plan, the workplan drawn up within DPAE contains only a list of activities that are on-going or are scheduled for coming years. The main areas are:

- a. Strengthen planning capability;
- b. Budget preparation and monitoring;
- c. Economic Accounts (Update);
- d. Agricultural development and evaluation;
- e. Increase project monitoring and evaluation capability.

There are however, no budgets or allocation of personnel specified. Without precisely stated plans for executing the activities, the likelihood is reduced that they will be effectively and efficiently carried out. As with DAE, this remains one of the major deficiencies of performance in this division. The performance of DP with regard to its response to the project has been of less concern within the project than SEEMP. The Division of Planning is involved with other activities outside the scope of the project and does not coincide directly with the stated project goal of improved policy analysis. Though improved project monitoring and evaluation does ultimately have an impact on development policy, planning activities were not the focus of project 0182. Therefore, the training and improvement of information systems has been the main focus of project efforts within the Division of Plan.

Recommendation: Division of Plan be encouraged to draw up detailed work plans that specify particular staff members to carry out work, time allocated for the work, performance criteria to be used, and resources allocated to each activity. Though work progresses in the DP without such plans, it is preferable to have a specified and precise plan to make it clear to staff where their priorities have been established and how they will accomplish the work.

6.0 GENERAL ISSUES

This section of the report addresses issues that derive from the preceding discussion. Elaborating these issues is one of the main purposes of this report. This is by no means an exhaustive treatment; they are the issues that seem the most apparent or pressing, and arose in conversations with staff, or have been generally observed. Some have to do with the project itself, while others have to do more with wider issues within the GOM, with styles of management, or other elements which are part of the picture in any bureaucracy in Morocco.

6.1 Training

6.1.1 Long-Term Training

As has been mentioned before, training particularly long-term degree training in the U.S. has been one of the major inputs to this project. Most of the staff who have gone for training have not yet returned, though within the next two years the majority of the 19 or so students who were sent will return to DAE or the DP. As long as there are no clearly specified workplans that allocate man-months, specific cells and precise levels of funding for all concerned, the work will proceed inefficiently.

For the returned students to be assimilated they will have to have workplans and places into which they can fit. Their training has been geared to specific areas of interest within DAE or DP, but they will need to have workplans that allocate slots and time for them to feel part of the system. In addition, incentives will have to be provided especially to returning PhD.'s so that they will remain at DPAE. Adequate outlets and resources for intellectual growth, stimulation and exchange will have to be devised so that their professional interests and motivation can be maintained at a high level. Without being able to integrate these personnel back into the system, the DPAE risks losing the potential for them to contribute to the important research tasks and the vastly improved and visible role DPAE plays in formulation of government policy.

In addition, it must be recognized that a certain lead time is necessary before returned PhD.'s can become fully productive. They must be re-assimilated back into their families, their lives in Morocco and the work environment which is, of course, very different from university life in the U.S. In addition, though these returning staff members will have all the necessary technical skills, it will take time for them to feel fully confident in the work they can produce. There is likely a period during which they will need additional advice and supervision from more senior researchers. Whether or not this is available is a critical matter in their feeling at home and able to produce to their level. Some system to find more senior experienced economists to assist them in their work needs to be found, whether locally through the university or some yet to be established professional association of agricultural economists.

There appears to be on the part of management a somewhat unrealistic expectation for these returned students. Those being trained will have had full scholarships during their stay in the U.S. along with their full

salaries. During the three or four years of their time away they will have produced nothing tangible for the DPAE, though they have been absorbing resources. The expectation will arise that as soon as they are back they can immediately produce to a level that is probably unrealistic, especially because as has been mentioned earlier they will need a certain lead time to adjust. The expectation will be for very high level work which will not likely be possible even within the first year. Economic research, particularly on agricultural development problems not only takes a vast array of technical skills, but an intuitive feeling for data, for methods and results that enriches interpretation and ultimately the kinds of recommendations one makes to policy makers. Such understanding is not automatically bestowed with a PhD. but comes from experience and working with other experienced researchers. This too is part of the investment that is being made in the people coming back. More time will be necessary for them to re-adjust than appears will be granted them. This is a cautionary note that should be seriously considered. Short or medium term technical assistance could well solve the dilemma in terms of technical advice to researchers.

Recommendation: Care needs to be taken in re-absorbing the returning staff from graduate programs. There must be clear statements about their positions, what is expected of them, how much responsibility they will have, and how they will be judged in their performance. In addition, USAID with the help of DPAE should investigate the possibility of setting up a center of agricultural economic study to give assistance to staff researchers. Whether this occurs at the university or some other place is immaterial. What is important is that USAID encourage ways for researchers to get necessary assistance on research, and be able to share results with other professionals.

6.1.2 Training and Links to Morocco

It is the impression of the evaluation team that students doing dissertations in the US will be encouraged to undertake topics related to Moroccan agriculture. Initially this seems a reasonable and logical idea. However, there are potential problems which have recently been brought to light. First, students are dispersed at a number of different universities in the US. But not all the universities have faculty who are specialists on development, or African agriculture or Morocco, so it may difficult for some students to obtain the assistance they need from resident faculty. Second, though the expressed preference is for students to tackle topics that have relevance for policy problems, there is no stated list of priorities and no one specified who can take responsibility for suggesting topics. Third the assumption is that students will return to Morocco to conduct their research, but this puts them at risk of returning to US at all since it is often the case that students do not finish, or take longer who return home for their research. Fourth, it poses the question about the speed with which a topic can be selected if professors at their US institutions do not have ample experience to guide them effectively and there is not proper supervision in Morocco. Furthermore, when they are conducting their research in country they will need academic assistance and it is not clear how that would be made available, if at all. Standards and research methodology may differ from the US institution and students can

risk spending a lot of time carrying out work that may not be of ultimate use. There are many pitfalls in having students return to do research here and these must be confronted in the coming years. It may be more effective to have students remain in the US for the research to complete the degree faster, but deny the DPAE the possibility of having a body of dissertations done on Moroccan problems. This issue will have to be solved soon as students preparing to do their research begin making demands for guidance and for the possibility to return to conduct fieldwork.

6.2 DPAE Management

Problems do exist within DPAE. With a lack of clear planning as was mentioned before, cadres are left to wonder about their place in the organization and their importance. There have been morale problems due to giving insufficient recognition to cadre for work completed, not paying careful enough attention to their needs and having a management system that is not very flexible or responsive. Status is an important part of the organization and it is difficult to mix and feel at ease in the organization. There is always the problem of demanding that cadres work on the short-term immediate requests and this means diverting them from their usual workload. The selection of people for training and what criteria are actually used is also a point of contention. There seems to be no clear criterion used for this. Some staff have been waiting over two years for definite answers about training and others will not have the chance. There is confusion about how the system works. Overall, there are serious problems that can vitiate efforts to make sure DPAE runs smoothly.

Staff have been trained and are carrying out work that is important to DPAE and within MARA. The intellectual infrastructure is in place, people are trained to conduct research. But there is a risk in losing the potential to make DAE and DPAE in general first rate, visible essential part of the MARA if care is not taken to manage the resources properly. Cadres need to feel better taken care, more responsibility and integrated into the system.

6.2.1 Management Issues

There are several issues that are of prime importance to DPAE's functioning which have to do with management. Some have already been mentioned, but it is useful to reiterate them.

a. **DPAE's principle role.** This needs to be clarified and its central function(s) clearly and decisively stated so that staff at every level are aware of what the organizations' aims are. The most pressing problem is one of answering the constant stream of information requests that are made on DPAE, principally in SEEMP. Precious resources are diverted to answer questions which injects a disorderliness in the operation. If both purposes of being an organization that provides research for policy makers and a source of information for many needs, then DPAE should allocate its resources this way. This is a top level management decision which has never been made. Many other things would flow from settling this question.

b. **Planning.** As recommended in the previous evaluation and as seen by the present evaluation team, concise, thorough planning efforts are not made within DPAE. Though workplans do exist, there are no clear procedures for short or long-term planning that helps to clarify workloads, expectations of productivity, budgets and the priorities of the institution.

c. **Staff Management.** There is a very tangible sense that top management does not carefully and systematically look after cadre needs, that not enough attention is paid to managing the cadre and leading them as needed. Top managers seem to be preoccupied with top levels of MARA rather than dividing their time equally between upper level contacts and working more closely and consistently with the cadre. A sense of neglect does exist and this must be solved somehow.

d. **Liaison with SSD.** The system of data collection for the Area Sample Frame is in place and has been collecting reputable data for some time. Data needs in SEEMP are extensive and varied and there are some sources that SSD can provide, especially on farm production costs. There may be other areas where it could provide data but these need to be relayed to them by SEEMP. To date, though the offices are under the same direction there has been relatively little coordination of data collection and user needs. This relationship needs to be more precisely and carefully worked out. SSD is a resource that shouldn't be neglected by SEEMP though it appears there has been far less collaboration than would seem normal.

6.3 Technical Assistance

The long-term technical advisers played an essential role in the operation of the project. It is due largely to their efforts that the project has shown so much progress and that many of the project goals have been realized. Their level of expertise was quite high and each in his way imparted a vast amount of knowledge and devoted their efforts to improving the operation of DPAE. The personalities of each were different so that each created a different kind of niche for himself, though each in his way did a very fine job. The impression of the present evaluation team is that each adviser was widely respected and deeply appreciated, not only for their professionalism but for their commitment to making the project work and improving all aspects of its operation. They all gave tirelessly of their time and instructed very thoroughly in their specialties. The level of enthusiasm and motivation displayed by the cadres is striking and is a testimony to the improvements and sense of enhanced skills that they now possess. It is apparent that the institutional development has taken place and the cadre are indeed ready to carry on their work. But it must be repeated that the sense of dissatisfaction and apprehension emanates from the fact that many feel that management has not paid ample attention to their needs. The organization is well equipped now to do much work, but without proper management the commitment to the work may wane and the institutional improvement could be wasted. This cannot be emphasized enough.

Recommendation: Technical assistance within SEEMP should consist of short-term visits to assist researchers with their work. Presumably this would be someone who knows the work already and has had experience in Morocco.

Courses and training should be set up on an as needed basis.

6.4 Current Management of Project

Madame Cathy Raissouni has now taken over all the administrative functions for USAID. She has been working on the project for over five years and has the most thorough knowledge of projects details of anybody associated with it. Her administrative and organizational skills are first-rate and her relations with DPAE personnel are quite good. Matters are in very capable hands. But now that the resident technical advisers have departed, much of the burden beyond her strictly administrative functions will fall on her shoulders. It should be made clear what her role needs to be and that USAID support her in every way possible. She must be given resources to cope with the demands that will be placed on her and her compensation should be commensurate with her responsibilities. She is essentially doing work of three people now, continuing with her own original administrative work, carrying on for Will Sherman and Mike Bertelsen where possible, and conducting training for secretarial help. She has a very full load of responsibilities and should be supported in her efforts.

Recommendation: Ties to Madame Raissouni be kept strong from the USAID side and she be given proper support in her activities. Regular contact should be made with her, to demonstrate interest and to help backstop her work.

APPENDICES

APPENDIX A

SCOPE OF WORK FOR SECOND MID-TERM EVALUATION PLANNING, ECONOMICS AND STATISTICS FOR AGRICULTURE PROJECT

I. Statement of Evaluation Purpose

The evaluation will be from the outset a practical, qualitative one that is intended to satisfy specific objectives. It has been proposed at this time because the project is at a convenient point where the resident advisers have recently left and plans for the final three years of the project have now been formulated but not finalized. This exercise can serve to assess the progress made since the last evaluation two and a half years ago, to discover areas of potential problems and make recommendations about current operation of the project and plans for the future. It is not intended to be the equivalent of a full-scale mid-term evaluation nor as all-encompassing as a final end of project evaluation. It will give a more general, extensive view of the project rather than an intensive treatment of all the project's activities. It will not give a detailed breakdown of all the project's inputs and outputs nor of the budgets and precise elaboration of every facet of the project and its workings, but rather summarize activities and present analysis of general trends, prospects for continued performance and make recommendations on particular points.

It is necessary to reduce the original scope of work because it demanded too broad and detailed coverage of matters for which there was not ample time. An effort has been made to address the major critical points that will help USAID personnel and DPAE staff assess the progress that has been made to date and assist the execution of their future workplans.

II. The Project and Progress to Date

The overall purpose of the project is "to improve the GOM's ability to collect data and publish timely agricultural statistics, undertake economic policy analyses, and plan, monitor and evaluate agricultural projects". The evaluation will assess the progress made in satisfying this purpose by looking precisely at a number of specific outputs:

1. Development of an area sampling frame (ASF) for agricultural surveys;
2. creation of a functioning program of current, scheduled agricultural statistics based on the use of ASF;
3. expansion of the data processing capability of the DPAE;

4. completion of an aerial photography laboratory and aerial photographs taken of the primary crop production areas of Morocco;
5. strengthened capacity of DPAE to carry out objective yield analysis;
6. procurement and use of satellite data for improving crop area and land use estimates and for ASF maintenance;
7. increased policy analysis capacity for DPAE;
8. a strengthened DPAE planning capability;
9. increased project monitoring and evaluation capacity;
10. development of computerized agricultural data bank for the DPAE;
11. development of a Documentation center for the DPAE.

The evaluation will assess whether or not these outputs have been delivered and the quality of their operations.

III. Plans for Coming Three Years

The second area of concentration will be plans for the next three years, how appropriate they are in meeting the overall purpose of the project and DPAE's priorities, what activities are scheduled and how training is integrated into plans for the future. Constraints to carrying out these plans will be addressed and other necessary issues having to do with management and operations of DPAE.

IV. Policy Issues

A. Research Agenda

The third area of concentration will be policy issues which are addressed by the research now underway and planned for the next three years in the DAE. An elaboration of what is planned, how it fits in with other economic problems facing Morocco, what other areas of research could be addressed that fit USAID's specific needs and goals and others that may be less urgent but no less useful for future economic policy making.

B. Impact of Policy Analysis

The impact of the research which DPAE has undertaken will be discussed to judge whether one of the main purpose level goals of the project has been satisfied by the training and research.

V. Other Issues

Other issues which will receive coverage but less attention in this evaluation have to do with:

1. Training component and the impact this has had on DPAE's performance and how returning staff members from degree programs in the US will be re-integrated into DPAE,
2. Managemet performance and obstacles to achieving necessary goals of DPAE's operations,
3. USAID and USDA performance in managing the project and handling technical assistance.
4. Finding other users for SSD data, more widely in the GOM and in the private sector as well.

VI. Recommendations

The evaluation will provide recommendations with regard to the most pressing areas which need attention in the team's view. It will briefly comment on the status of the recommendations made in the last evaluation and assess what progress has been made since then.

VII. Summary

It must be reiterated that in conducting the evaluation in order to touch the huge array of points and issues the team proposes to give a broadbrush treatment rather than an in-depth analysis of particular areas. It seems more useful at this time to point out deficiencies or problems so that corrective action can be taken rather than go into minute detail about each aspect of the project. What is lost in detail for a number of limited topics is gained in the overall view of a more general approach. The team has a limited amount of time and it cannot deal with all the issues that AID/Rabat would ideally like to have addressed.

APPENDIX B

GLOSSARY OF TERMS¹²

Accuracy: It is closeness of an estimate to the parameter. "Accuracy of data" might refer to measurement error. "Accuracy" is a generic term.

Area Sampling: A special case of cluster sampling. The sampling units are areas of land, commonly called segments, which have identifiable boundaries. The idea is to divide the entire land area of the population to be surveyed into segments and to select a sample of such segments. The process of area sampling is usually accomplished by selecting the sample in stages which avoids the necessity of dividing the entire population into segments.

Calibration: The act or process of comparing certain specific measurements in an instrument with a standard.

Cluster Sampling: The selection of clusters of elements. That is, the sampling units are "clusters" of elements. Identification of elements belonging to each sampling unit (cluster) in a sample is often a part of the field operations. There must be rules for associating each element of the population with one and only one cluster.

Coefficient of Variation: It is the ratio of the standard error to the mean in percent.

Coverage Error: Error caused by the omission or duplication of elements, or parts of elements, that are defined for inclusion in a survey or a census.

Data: A collection of tables, estimates, figures or numbers either on tape, or paper. These data may or may not be useful for decision-making.

Digital Tape: A magnetic tape which records data in discrete levels, often for subsequent computer analysis.

Domains: A general term for subdivisions of a population for which estimates are made. Domain specifications have an important bearing on sample design and estimation procedures.

¹ Houseman, Earl E. Annotated Glossary of Selected Sampling Terms. U.S. Department of Agriculture Statistical Reporting Service (July 1979).

² Brosius, Craig A. et al. Remote Sensing and the Earth. Florida, 1977. The remote sensing terms in the Glossary are reprinted from the Manual of Remote Sensing, 2nd ed., 1983.

Double Sampling: Sampling in two phases: Phase One, the collection of a small amount of data from all units in a sample; and, Phase Two, the collection of more detailed data from a subsample. The purpose of the first phase is to improve the sample for the second phase and achieve more accurate estimates for characteristics included in the second phase than would be possible from a single-phase sample at the same cost.

Estimation: Producing a statistic that indicates present conditions

Estimator: A mathematical rule, method, or formula for estimating a population parameter from a sample. An estimate is a random variable when derived from a probability sample.

Forecasting: Predicting future events or conditions.

Image: The recorded representation of an object produced by optical, electro-optical, optical mechanical, or electronic means. It is generally used when the EMR emitted or reflected from a scene is not directly recorded on film.

Imagery: The products of image-forming instruments (analogous to photo-graphy).

Information: Data that can be used for making decisions. The data are accurate, timely, objective, comprehensive, replicable, etc. In any case, decision makers can make decisions based on something they know - this knowledge is information.

Measurement Error or Response Error - (for an individual element): The difference between an observed value, X_i , and a "true value," T_i . The measurement errors in statistics are functions of the differences $X_i - T_i$. The importance of measurement error varies widely with the nature of the characteristics, with the purpose of the survey, and with the magnitude of measurement error compared to other sources of error, particularly sampling error.

Multiple frame Sampling: Joint use of more than one sampling frame. Collectively, the frames should include all elements of the population. Some elements will be included in two or more frames. Probably, the most common application is two frame sampling, where one frame is an area sampling frame that includes all elements and the second frame is a list of elements that are most important for the survey.

Nonresponse: Refers to missing data. For various reasons, data might be missing for some elements. Methods of assigning values for missing data or methods of adjustment must be prescribed.

Nonsampling Error: A general term applied to all sources of error other than error attributable to sampling. It includes error from any defects in the sampling frame, response error, and mistakes in processing the data.

Objective Estimate: A phrase that refers to the method of estimation. The estimates do not depend on a persons or groups opinion. Usually the estimates are based on probability and sampling theory.

Precision: It is variation of estimates obtained in repeated trials under the same conditions around the expected value. Standard error is a measure of precision. Precision is an attribute of the sampling distribution of an estimator. It is the closeness of possible estimates under specified conditions to the related parameter of the distribution.

Primary Sampling Units: Sampling units at the first stage of sampling in a multistage sampling plan.

Replicated Sampling: The selection of more than one sample under the same sampling plan. Each sample provides estimates of the parameters. When replicated samples are selected independently, a very simple method is provided for estimating the standard error of an estimate.

Resolution: The ability of an entire remote sensor system, including lens, antennae, display, exposure, processing, and other factors, to render a sharply defined image. It may be expressed as line pairs per millimeter or meters, or in many other manners. In radar, resolution usually applies to the effective beamwidth and range measurement width, often defined as the half-power points. For infrared line scanners the resolution may be expressed as the instantaneous field-of-view. Resolution also may be expressed in terms of temperature or other physical property being measured.

Return Beam Vidicon (RBV): A modified vidicon television camera tube, in which the output signal is derived from the depleted electron beam reflected from the tube target. The RBV can be considered as a cross between a vidicon and an orthicon. RBVs provide highest resolution TV imagery, and are used in the ERTS (Landsat) series.

Sample Design: Specifications for selecting a sample. Such specifications are determined with regard to the purpose of the survey and achieving low sampling errors (efficient sampling for a given cost). Simple random sampling as defined above, is seldom used in practice but the theory for it is of fundamental importance and extends readily to many sampling plans (for example, stratified random sampling). Reducing sampling error by improving the sample design is often less expensive than increasing the size of the sample.

Sampling Error: Random error attributable to sampling. "Sampling error" is a general term. It is commonly used as a short term for longer expressions such as "sampling standard error" or "standard error of an estimate." Error attributable to sampling can have variable and constant components. Likewise, error from sources other than sampling can also have variable and constant components. Generally, in practice neither variable components of error nor biases are separable by sampling and nonsampling sources. The standard error of an estimate, as computed in practice, is a nonsampling; and the bias is a

combination of all biases. The computed standard error is usually dominated by error associated with sampling; and with carefully controlled probability sampling, the overall bias is likely to be comprised mostly of biases associated with nonsampling sources. When considered in detail and exactly in a practical setting, error concepts become complex and difficult to communicate. In the interest of simplicity and owing to the problem of communicating technical concepts, standard errors of estimates are usually described in statistical reports simply as measures of "sampling error," even though variable error from sources other than sampling are embraced in the computed estimates of standard errors. Additional statements are often made pointing out that nonsampling error also exists and is not included in the standard error of the estimate. In this context, "nonsampling error" refers to any biases that might exist.

Sampling Frame: A list, or the equivalent of a list, of all sampling units of the population. It enables probability sampling. The phrase "or the equivalent of a list" is inserted because frames often account for all sampling units (and elements) in a population without having every sampling unit explicitly listed or defined in advance. A frame is needed whether sampling or a census is involved.

Segment: The selected sampling unit. The block of land that is selected for data collection.

Sensor: Any device which gathers energy EMR or other and presents it in a form suitable for obtaining information about the environment. Massive sensors, such as thermal infrared and microwave, utilize EMR produced by the surface or object being sensed. Active sensors, such as radar, supply their own energy source. Aerial cameras use natural or artificially produced EMR external to the object or surface being sensed.

Statistics: Totals, averages, percentages, and other numbers computed from population or sample data. "Statistics" also means statistical methods.

Stratification: The classification of sampling units in a population of the groups called strata. The strata might be defined as domains for which estimates are derived, or as homogeneous groups of sampling units to reduce sampling error, or for both purposes. Stratification is used in most sampling plans.

Stratified Random Sampling: Selecting a probability sample from each stratum of a stratified population. Sampling variance depends on the variation among sampling units within strata. Therefore, one goal in stratification is to form strata so the variation among sampling units strata is small. Sampling variance is also affected by how the sample is located in reference to the strata. Gains in sampling efficiency from stratification are generally moderate to substantial and rarely negligible or negative.

Subjective Estimates: This phrase refers to estimates that are produced based on personal knowledge about an item. The estimates are not objective but are

influenced by opinion of individuals.

Unbiased Estimate: An estimate produced by an unbiased estimator. Such an estimate is "unbiased" only with regard to the techniques of selecting the sample and of estimation. It is not free of possible bias from other sources. The term has often been misleading.

APPENDIX C

Technical Assistance

Recipient	Subject	Trainer	Time
SSD/Survey	Questionnaire Design (Levels of Technology)	USDA/Other	1 mn
SSD/Survey	Enumerator Manual	USDA/Other	1 mn
SSD/Computer Center	Hardware Expert 586/networking	Hardware Comp.	1 mn
SSD/ASF	Sample Rotation	USDA	3 wks
SSD/OY	Citrus OY	USDA	2 wks
SSD/ASF	Remote Sensing Stratification	USDA/Other	1 mn
SSD/Computer Center	SAS Data Edit Switch from GE	USDA/Other	2 wks
SSD/Survey	Farm Production Expend. Survey	Dr. Ron Krenz	2 mn
SSD/Managemt	Data Clients Private Public Sectors	USDA/Other	1 mn
SSD/Computer Center	Hardware movement	Other	2 wks
SSD/Data Base	Logics of Data Base	?????	3 wks
SSD/Data Base	Cobol, SAS, SQL, ISPF	?????	1 mn
SSD/ASF	Census Data	Other	2 mn

Training Courses for Project 0182

Recipient	Subject	Trainer	Time
SSD/Survey	Questionnaire Design (Levels of Technology)	SRI/UofMich.	12 wks
SSD/ASF	ASF management	USDA	1 mn
SSD	Basic Sampling	SRI/UofMich.	12 wks

APPENDIX D

Data User's Matrix for Agricultural Information
Dale Colyer Ph.D. modified by W.H. Wigton

(This matrix was developed for Ecuador and most certainly does not apply to Morocco. A matrix needs to be developed for Morocco.)

USER'S MATRIX FOR AGRICULTURAL INFORMATION

=====					
----- PRIVATE SECTOR -----					
DATA	USER	FARMERS	COOPERATIVES	MERCHANTS	CONSUMER
DISSEMINATION	RADIO	NEWSPAPER	NEWSPAPER	NEWSPAPER	RADIO
=====					
BASIC PRODUCTION DATA					
CROP PRODUCTION PRIORITY	YES MED	YES HIGH	YES HIGH	YES HIGH	YES LOW
LIVESTOCK PROD. PRIORITY	YES MED	YES HIGH	YES HIGH	YES HIGH	YES LOW
STOCKS ON HAND PRIORITY	YES MED	YES HIGH	YES HIGH	YES HIGH	NO LOW
OBJECTIVE YIELDS PRIORITY	YES HIGH	YES HIGH	YES HIGH	YES HIGH	NO LOW
CROP FORECASTS PRIORITY	YES HIGH	YES HIGH	YES HIGH	YES HIGH	NO LOW
=====					
BASIC PRICE DATA					
FARM GATE PRICES PRIORITY	YES HIGH	YES HIGH	YES HIGH	YES HIGH	NO
AGRI LABOR PRIORITY	YES HIGH	YES HIGH	YES HIGH	YES HIGH	NO
FERTILIZER PRIORITY	YES HIGH	YES HIGH	YES HIGH	YES HIGH	NO
PESTICIDES PRIORITY	YES HIGH	YES HIGH	YES HIGH	YES HIGH	NO
=====					
OTHER DATA					
HOUSEHOLD SURVEY PRIORITY	NO	YES LOW	YES MED	YES HIGH	YES HIGH
LAND USE CHANGES PRIORITY	NO	YES MED	YES HIGH	YES HIGH	NO
=====					

USER'S MATRIX FOR AGRICULTURAL INFORMATION

----- PRIVATE SECTOR -----					
DATA	USER	FARMERS	COOPERATIVES	MERCHANTS	CONSUMER
ENERGY USE PRIORITY		NO	YES MED	YES LOW	NO
FOREST INVENTORY PRIORITY		NO	NO	YES LOW	NO
TECHNOLOGY LEVEL PRIORITY		NO	YES MED	YES LOW	NO

USER'S MATRIX FOR AGRICULTURAL INFORMATION

----- PUBLIC SECTOR -----					
DATA	USER	DONORS	MIN. OF AGRI	BANK CENTRAL	OTHER
DISSEMINATION		REPORTS	REPORTS	REPORTS	REPORTS
BASIC PRODUCTION DATA					
CROP PRODUCTION PRIORITY		YES HIGH	YES HIGH	YES MED	YES
LIVESTOCK PROD. PRIORITY		YES HIGH	YES HIGH	YES MED	YES
STOCKS ON HAND PRIORITY		YES HIGH	YES MED	YES MED	YES
OBJECTIVE YIELDS PRIORITY		YES HIGH	YES HIGH	YES HIGH	YES
CROP FORECASTS PRIORITY		YES HIGH	YES HIGH	YES HIGH	YES
BASIC PRICE DATA					
FARM GATE PRICES PRIORITY		YES MED	YES HIGH	YES MED	YES
AGRI LABOR PRIORITY		NO	YES MED	YES MED	YES
FERTILIZER PRIORITY		YES LOW	YES MED	YES MED	YES
PESTICIDES PRIORITY		NO	YES MED	YES LOW	YES

USER'S MATRIX FOR AGRICULTURAL INFORMATION

----- PUBLIC SECTOR -----

DATA USER | DONORS | MIN. OF AGRI | BANK CENTRAL | OTHER

OTHER DATA

HOUSEHOLD SURVEY PRIORITY	YES MED	YES MED	YES LOW	YES
LAND USE CHANGES PRIORITY	YES LOW	YES HIGH	NO	YES
ENERGY USE PRIORITY	YES MED	YES HIGH	YES LOW	YES
FOREST INVENTORY PRIORITY	YES HIGH	YES HIGH	YES MED	YES
TECHNOLOGY LEVEL PRIORITY	YES MED	YES HIGH	YES LOW	YES

This matrix was a simple way to systematically identify users of the DPAA type data, prioritize the survey resources, provide required data to the users when it was published and obtain feed back on the usefulness of the estimates.

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