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PAKISTAN AGRICULTURAL DATA COLLECTION PROJECT
PHASE II IMPLEMENTATION PLAN

by

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and

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AGRICULTURAL DATA COLLECTION PROJECT

I. PHASE II IMPLEMENTATION PLAN

A. Project Purpose and Rational

This implementation plan is for continuation and completion of work initiated in the Agricultural Data Collection (ADC) Component of the Food Security Management (FSM) Project. That project, for which a PASA was signed with the United States Department of Agriculture (USDA) in July 1985, ends June 30, 1990. The project planners for the ADC did not anticipate the extent of the administrative delays that were faced during Phase I, resulting in a two year delay in beginning Phase II.

The purpose of this project is to strengthen the agricultural statistics system in Pakistan. A major objective will be development of a capability to produce and release timely and reliable acreage and production estimates for major crops at provincial and national levels. This will be done primarily through establishment of Area Sampling Frame (ASF) technology in all four provinces. ASF procedure allows smaller sample sizes, reduced costs, greater flexibility, and more timely results than current methods. A subset of fields drawn from the ASF provide samples for objective yield surveys of major crops to generate preharvest yield forecasts and timely, reliable indications of final yields. A program of regular surveys and subsequent orderly data releases will improve the timely flow of agricultural data to data users. Plans for phasing in the ASF surveys and modification of the existing system for duplicated functions will be developed in later stages of the project. During the latter one half of the project, efforts will also focus on improvement of agricultural prices statistics in the country.

B. Project Organization

This project will be implemented by Federal Bureau of Statistics (FBS), Statistics Division (SD), Ministry of Finance (MOF) under the direction of the Secretary, SD, and in collaboration with the Provincial Departments of Agriculture (PDA)s and the Federal Ministry of Food, Agriculture and Cooperatives (MINFA). The MINFA Economic Wing will develop a close relationship with the FBS in it's role as a primary user of agricultural statistics in the development of economic and policy analysis for the agricultural sector. In particular, the Directorate of Agricultural Statistics in the Economic Wing, MINFA will maintain a close working relationship with the FBS as users/producers of agricultural data. USAID/Pakistan responsibility for the project lies with the Head of the Economic, Marketing and Policy Analysis Division,

(EMFAD) within Agricultural and Rural Development (ARD), and/or their designees. Technical assistance for this project will be provided by the National Agricultural Statistics Service (NASS), United States Department of Agriculture, under the direction of the Director, International Programs Office. Administrative support for the USDA/NASS activities will be provided by the USDA Office of International Cooperation and Development (OICD).

C. Project Objectives

The ADC was designed to modify the agricultural statistics data collection system in Pakistan to make it more accurate and efficient. The objectives, goals, and expected outcome of the Phase II are basically the same as in the original project plan. This implementation plan implies that strengthening of the infrastructure for agricultural statistics in federal and provincial counterpart agencies is necessary for successful project implementation.

1. Key elements

- Introduction and implementation nationwide of the ASF methodology which, based on the objective characteristics of land use, permits a higher degree of accuracy with minimum sample size, thus reducing survey cost and shortening data collection schedules;
- Use of growth models, which use ASF survey data to forecast production prior to harvest and subsequent objective measurement of major crop yields;
- Implementation of a quarterly schedule for collection and dissemination of basic agriculture data, independent of the revenue system, providing earlier estimates necessary for improved economic analysis, planning and policy decisions;
- Implementation of an automated data processing system for compilation and analysis of raw data, making agriculture statistics available to decision makers on a more timely basis and reducing errors associated with hand processing.
- Review and development of a plan to improve the agricultural prices and inputs data program.

2. Project Goals

- Complete national area sampling frame (ASF);
- Implement provincial/national ASF survey program on regular quarterly basis;
- Ensure computer hardware and software is in place in the FBS and four PDAs needed to process survey data and perform statistical analysis;
- Develop the skills required to build the ASF, select probability samples, conduct field surveys using the ASF and objective yield techniques, and process and analyze survey data on computers following strict guidelines, through an intensive in country training program;
- Build a cadre of highly trained statisticians capable of maintaining and expanding use of the ASF through training abroad and in country statistics short courses;
- Strengthen the ongoing statistics program by providing short term consultants in data processing, sampling and survey methodologies;
- Improve the agricultural prices and production inputs data series;
- Educate data users about need for reliable and timely statistics for planning and policy decision making.

3. End of Project Status

At project end, it is expected that items indicated above in key elements and project goals would have been completed. A time frame for ASF construction, survey operation, and system phase-in is provided later in this report. A functioning system of quarterly ASF surveys would be operational and providing data users with provincial and national indications for a program of timely and reliable estimates for major crops. The operational agricultural statistics system would have a close relationship with the MINFA Economic Wing, and provide for input into program scope and changes to meet the needs of data users.

D. Area Sampling Frame Construction

The major component of Phase II is building the National ASF. The construction of the National ASF would be initiated during the fifth year of the existing ADC project, and continue through

December 1992. The frame will be developed at the provincial level. Within each Provincial strata, each count unit will be assigned a district code. Area sampling frame development is a sequentially stepped process as described below.

1. Stratification

The process of land use stratification is the delineation of land areas into land use categories or strata. Common types of strata classifications are extensive agriculture, minimal agriculture, villages, urban areas, and forests. The purpose of stratification is to reduce sampling variability by creating homogeneous groups of sampling units. Although certain parts of the process are highly subjective in nature, precision work is required by the personnel stratifying the land area to ensure that overlaps and omissions of land area do not occur and land is correctly stratified. Within each stratum, land area could be divided into all the sampling units or segments and then a sample of segments selected for a survey. To reduce time spent developing and sampling the ASF, each stratum is divided into primary sampling units called 'frame units' approximately equal in size to a predetermined number of segments. During the sampling process selected frame units are further divided into segments, one of which is selected for collecting basic agricultural data.

a. Stratification Medium

SPOT satellite imagery provides a basis for visually identifying different strata. The physical delineation of the different strata is recorded on topographic maps. SPOT imagery is currently available from SUPARCO, and will be acquired by FBS. Topographic maps are readily available from the Survey of Pakistan (SOP). The major advantages of SPOT are that it is current and the different colors directly relate to the intensity of growing vegetation. With aerial photography, the intensity of agriculture is only implied from the presence of fields, irrigation canals, and other features of cultivation.

The best timing for SPOT image acquisition for land use identification is during the peak vegetative growth period. Image dates of early October and late January/early February are probably most appropriate in Pakistan for Kharif and Rabi seasons, respectively. Ideally the images used for the national frame will be no older than the previous year.

b. Stratification Procedure

Most stratification using SOPF is done with the use of a high precision instrument called a zoom transfer scope (ZTS). The ZTS facilitates transferring of information from the SPOT image to the base topographic map. SPOT scenes used in this

stratification method are 1:400,000 scale and the topographic sheets are 1:50,000 scale. In a one step process, the ZTS adjusts the scale of the SPOT image and overlays it on the topographic map. With the SPOT image projected on the topographic map, various land use strata are delineated by hand. Frame units equal in size to a predetermined number of segments are then outlined on the topographic map and sequentially numbered within strata. The next step is to measure each frame unit.

2. Digitizing Frame Units

The conversion of map points into two-dimensional X-Y coordinates is called digitization. Digitization involves electronically measuring the area of each frame unit on the topographic maps. The area of the frame units is needed to determine the number of segments in each frame unit for sampling and data expansion purposes. Electronically measuring and recording the strata areas allows:

- measuring the area accurately;
- quality assurance;
- retaining a digital backup copy of the frame map in the unlikely event that a frame map is lost.

Digitization is done on the topographic maps. The digitizer measures straight line sections around the area to be digitized. Therefore, each straight line section making up the perimeter of each frame unit must be identified at each end with a dot to be read by the digitizer. The digitizer converts the parameter reading to area and stores the result in an attached microcomputer.

When the digitizing is complete and all errors reconciled, the digital file is merged with all other digital map files for the province. The combination of maps and digital data files, properly stored and backed up, is the area sampling frame.

3. Sample Selection

The National ASF will be sampled using a replicated design, at the provincial level. Replicated sampling is characterized by the selection of a number of independent subsamples or replicates from the same population using the same selection procedure for each replicate. Each replicate is therefore an unbiased representation of the population.

Reasons for using replicated sampling include:

- Sample rotation: A sample rotation scheme can be used to reduce respondent burden caused by repeated interviewing, avoid the expense of selecting a completely new area sample each year, and provide the ability to produce reliable measures of change in the production of agricultural commodities from year to year through the use of a ratio estimator. Sample rotation can be accomplished by replacing segments from specified replicates in each land-use stratum with newly selected segments.
- Methodology research: Replication also facilitates quality assurance analysis by allowing data comparisons among years in order to determine if significant differences in survey processes exist over time. For example, segment sizes can readily be compared among replicates to determine if the average size and the variability in size differ significantly from year to year.
- Sample management: Replication simplifies the process of designating a subsample of segments for one-time or repetitive surveys, increasing or decreasing the sample size in a land-use stratum, to improve sampling efficiency, and identifying segments to be rotated out of the ASF sample.
- Variance estimation: Replicated sampling provides a simple, unbiased method for estimating sampling variance using replicate means or totals.
- Rotation effects: Replication readily provides a vehicle for evaluating sample rotation effects. Rotation effects are defined as the impact to survey data resulting from the number of years a segment has been in the sample.

Following the identification of sample frame units, two procedures will be used for segment identification -- on aerial photography and field location.

If low level aerial photography is available and usable:

- transfer the selected frame unit from topographic map to the aerial photography,
- divide the selected frame unit into the proper number of segments on aerial photography, and
- randomly select the segment to be enumerated.

If low level aerial photography is NOT available or usable:

- select a random point within the selected frame/ unit on the topographic map,
- locate the selected point in the field, and
- construct an appropriate size segment around the selected point

E. National Surveys

1. Survey Implementation

A regular schedule of sample surveys using the ASF will provide indications for making timely and cost efficient estimates of area and production for major crops at the provincial and national levels.

a. Implementing Agencies

The FBS Director General has a strong coordinating role and responsibility for wide spread adaptation of the ASF technology in the four provinces. A separate unit in FBS, the ADC Cell, has been established for this purpose. With assistance from the resident advisors, the ADC Cell will construct the National ASF, select samples, print questionnaires, develop survey procedures and prepare instruction manuals, train supervisory field staff, develop quality control programs, develop data processing procedures, and advise the provincial coordinating offices on project implementation.

Project coordinating offices located in the four PDAs will implement ASF surveys in their respective province. Under the direction of the project director, the provincial staff will hire and train field enumerators, supervise data collection and quality control programs, conduct field surveys, process survey data, provide FBS a clean data set following each survey, and recommend to FBS improvements in survey procedures.

The Technical Coordinating Committee provides technical guidance for project implementation. The Committee made up of representatives from FBS, MINFA, the four PDAs, USAID, and the resident advisor will meet at least twice a year to approve provincial sample sizes, annual work plans, and annual survey schedules, identify training needs, and recommend program changes.

The Steering Committee will provide high level coordination and policy decisions concerning the project and agricultural statistics issues. It will be Chaired by the Secretary, Statistics Division, and have representation from the FDA's Secretaries of Agriculture, Joint Secretary and Economic Consultant-Food Division-MINFA, and Director General, FBS.

b. Timing

Provincial ASF surveys will be phased in as samples are selected from the completed provincial ASF's and the staffing is provided, with the first national survey conducted in January 1993. The first provincial level ASF's will be constructed so that survey activities could begin in Punjab and Balochistan by July 1991, followed by Sindh in July 1992, and NWFP in January 1993. When each provincial ASF is constructed, staffing will be increased and preliminary survey work on a limited basis will begin. This phase in period will enable the Nationwide survey program to be more effective as it is initiated in January 1993. During the initial provincial survey activity, a survey cycle will be established to provide provincial coordinating offices and FBS experience in processing and analyzing ASF data.

c. Data Collection

Responsibility for data collection lies with the Directors of the four provincial project offices. Working with the ADC Cell, they will determine field staff needs, reallocate staff where necessary, assure that all survey materials are available, administer data collection programs, and serve on the Technical Committee.

Data collection will center around regularly scheduled surveys for crop area indications. Annual objective yield surveys to provide yield indications for major crops will be conducted in a subsample of fields from ASF surveys. Other surveys as deemed necessary to meet data needs may be undertaken.

A second resident advisor will arrive in July 1992 for 24 months. This agricultural statistician, working under the direction of the Team Leader, will assist the team leader in survey operations activity, and also work on agricultural prices and production inputs surveys. The ASF will be used in conjunction with other sampling and survey methodologies to strengthen the country's data series on harvest prices and prices paid for production inputs. A scope of work for this technician will developed at a later date.

2. Survey Processing

The large data files generated by provincial and national surveys will require enhancements to existing computer hardware capacity for processing. A major activity of Phase I was introducing microcomputers and training staff in PDAs and FBS in their use. Building on this experience, additional microcomputers will be placed in PDAs as needed for data analysis. The larger capacity hardware required for processing provincial and national surveys will be available in SD and provincial headquarters. USAID is funding a separate project to enlarge and modernize the Statistics Division's computer capability. Under this project,

minicomputers are to be installed at Islamabad, Lahore, Karachi, Quetta, and Peshawar. Computers should be operational at all sites by the end of 1991.

a. Data Flow

Survey questionnaires from enumerators will be collected at strategic locations in each province and forwarded to provincial data processing centers where microcomputers or other data entry equipment has been installed. Following hand edit and coding, questionnaires will be key entered. Machine edits will validate the survey data and produce a clean data set. Data sets from remote locations will be hand carried on magnetic media (diskettes or tape) to the provincial FBS minicomputer site for merging into a provincial data set. All provincial data sets will be sent to FBS where the data will be summarized to produce provincial and national indications. Summary results will be returned to PLs for setting their provincial area and yield estimates. Both provincial and national indications will be available for setting national estimates.

b. Estimation Procedure

A streamlined procedure for reviewing and approving official estimates is recommended by USDA/NASS, based upon experience in Phase I. The provincial review process is a major constraint to timely execution of the existing system. PDAs have responsibility for agriculture, which has been broadly interpreted to include statistics on agriculture. SD has general oversight authority for all statistics for the country. MINFA is responsible for releasing the estimates through publication in the Gazette. This presents an unclear picture of who has responsibility for national estimates, particularly when such data depend upon the PDAs for support. If a workable system cannot be developed through discussions among the agencies involved, new policy may be required to solve the problem. This subject should be an agenda item for the Steering Committee.

Following is a suggested framework for developing a data flow system. The first step requires establishing a politically independent federal Agriculture Statistics Review Board made up of representatives from MINFA, the PDAs and FBS chaired by the Director General, FBS. All official national estimates established by the Board would be approved by the Secretary, Statistics Division before release. The Board would approve all data collection, review and release procedures. The Board must be recognized as the single source of official national agricultural estimates and have authority to hold accountable any data providers who do not follow established procedures. The Board would:

- develop procedures for creating a timely, efficient agricultural data system;
- develop a crop estimates and release calendar;
- approve field surveys to support the National Board estimates release dates;
- review and approve national estimates for all major crops before releasing them to data users;
- have authority to set any provincial estimates not forthcoming from the PDAs;
- release official estimates on a predetermined date.

PDAs submit recommended estimates to the National Board along with all supporting survey data. The Board would already have access to the provincial ASF data to use as an indication in reviewing provincial estimates. The Board would have authority to change PDAs estimates based on the national indications, which should be the most statistically reliable. Board approved provincial estimates would be transmitted to the PDAs for release.

c. Release of Data

One of the major problems with the current system is the uncertainty it creates about which of the many estimates appearing in the press are official. This situation can be corrected only by recognizing a single body as the source of official estimates. This body could be the Federal Agricultural Statistics Review Board. The Board should have responsibility for releasing official estimates for all major crops. Provincial estimates would be released by the Board and the PDAs at the same time national estimates are released. This subject should be included as an agenda item for the Steering Committee.

F. Phase In With Current System

1. General

The implementation of the ASF survey program in all four provinces will necessitate an adjustment to the current system. The purpose of the ASF system is to provide timely and reliable estimates at the provincial and national levels. The current system does not provide timely provincial and national estimates because of inherent deficiencies such as provision of data on smaller geographic areas as outlined in other sections of this report. The two purposes are not compatible. While the ASF will serve a need that is not being adequately met currently, it's

implementation will create some duplication of effort and competition for resources that will need to be addressed as it is institutionalized. However, it is recognized that there will need to be a period of time in which the two systems operate in parallel in order to assure the GOP that the new system is soundly in place and meeting their needs before modifying a familiar procedure.

Review of overlap between the existing system and the ASF should begin during the last 18 months of the project. The ASF construction is scheduled to be completed for all four provinces and a full cycle of ASF surveys initiated by January 1993. The review should be completed so that the phase out of duplicate processes can begin during the last six months of the project.

2. Implementation

The FBS has responsibility for initiating the review for duplication in the systems. It also has responsibility for developing scope and time frame of the actual phase out of duplicative portions of existing systems, in collaboration with the PDAs and MINFA. A policy level decision may need to be made regarding the implementation of phase out recommendations. This subject, along with other matters that may require policy decisions, will be included in the Steering Committee agenda.

3. Institutionalization

The FBS has responsible for planning and coordination of the ASF survey system in Pakistan in association with the PDAs. FBS will ensure that procedures are uniformly followed, and that the data is released to the data users in a timely and orderly manner. It is the role of the FBS to adjust the operational system to insure data collection and processing occur in an orderly and timely manner.

The PDAs have administrative control, and responsibility for, data collection, data entry and processing for the ASF surveys in their respective provinces. They will provide the necessary staff and associated resources for accomplishment of these functions. Funds and authority for staff positions will be provided to the PDAs by the MOF.

6. Project Time Frame

1. Area Sampling Frame Construction

Begin SPOT Training	Fall 1989
SUPARCO Collect SPOT Data	Oct 1989
SUPARCO Deliver SPOT for 7 Pilot Districts	Nov 1989
Workshop for use of SPOT for ASF	Nov/Dec 1989
FBS begin Provincial ASF with SPOT for	

Pilot Districts	Nov/Dec	1989
GOP Decision to Build ASF for Entire Country	Dec/Jan	1990
SUPARCO Collect SPUT for Remainder of Punjab and for Balochistan	late Jan/early Feb	1990
FBS begin Provincial ASF for Balochistan	Feb	1990
FBS obtain available aerial photography for sample segment construction	Oct	1990
SUPARCO Collect SPOT for Sindh	Jan	1991
Complete Balochistan and Punjab ASF's	June	1991
FBS begin Provincial ASF for Sindh	June	1991
SUPARCO collect SPOT for NWFP	Jan	1992
Complete Provincial ASF for Sindh	June	1992
FBS begin Provincial ASF for NWFP	June	1992
Complete Provincial ASF for NWFP	Dec	1992

2. Survey Activity

Continue Surveys in Pilot Districts	Jan	1990
Begin Provincial Surveys as ASF's are Completed		
Punjab (on limited basis until July 1992)	July	1991
Balochistan "	July	1991
Sindh "	July	1992
NWFP "	Jan	1993
Begin National ASF Survey Program	Jan	1993

3. Phase In/Modification of Current System

Begin Review of Agricultural Prices Programs	July	1992
Begin National ASF Survey Program	Jan	1993
Begin improvement program of agricultural prices	July	1993
Begin Review of Overlap of ASF and current System	Jan	1993
GOP finalize decisions on modifications to current system to phase in ASF	Jan	1994
Begin implementation of modifications to current system	Jan	1994

H. Project Administration

1. Responsibilities

a. USAID

The Head of EMPAD within the USAID Mission's ARD and/or designee will have overall responsibility for managing the project. EMPAD will be assisted in contracting and procurement functions by the Mission's Office of Project Development and Monitoring (PDM).

b. GOP

The project will be implemented by the MOF's SD through the various provincial FDAs. The SD's FBS will handle routine coordination among federal and provincial authorities. MINFA will participate in the Technical Coordination Committee regarding the project. The MINFA's Economic Wing will be a major user of the data developed and released, and will maintain close contact with the FBS. Data needs of the Economic Wing will be considered in periodic FBS program reviews of the data system. SD will be the GOP agency responsible for liaison with MOD and MOF in obtaining their support for the project. In addition, the SD will provide office space for the NASS advisors and staff co-located with the FBS counterparts. Policy issues will be addressed through the Steering Committee.

c. USDA

USDA/NASS will provide technical assistance, training, and limited commodity procurement support to the project. USDA/OICD will provide administrative support for USDA participation in the project, and will be the administrative liaison to AID/Washington.

The implementation of the technical assistance and training components of this project will require some quantitative and qualitative benchmarks to be established to monitor progress toward the objectives and goals of the project. The details of these benchmarks will be fully developed in each individual year's workplan developed by the resident team and FBS, with input from USAID. As an example, the fifth year ADC Workplan has developed benchmarks for work during that project year, with measurable factors to monitor progress. The project goals and objectives will be broken into smaller items to be monitored such as the following examples:

- Training of FBS Staff in construction of provincial ASF using SPOT data for stratification.
- Training FBS Staff in developing sample segments for provincial ASF using field located methodology.
- Training of GOP staff in survey planning, training and supervision of enumerators, survey execution and operation, data edit and summarization, estimation, and data dissemination.
- Training of GOP staff in use of micro-computer packages to do survey processing.
- Construction of ASF for each province.
- Development of survey and release calendar for ASF surveys.
- Implementation of initial survey work in each province.
- After initial provincial survey experience, review experiences, and implement routine province-wide survey program.
- Implementation of nationwide ASF survey program.

- Dissemination of official estimates to data users on a timely schedule.
- Periodic review of program to make necessary adjustments and improvements in scope and procedures.

2. Training

a. Overseas Degree and Non-degree Training

The USDA will assist the GOP in the selection of qualified candidates to attend both long-term and short-term degree and non-degree training programs in the United States and other countries in areas related to the implementation of the ADC project. It is estimated that during the life of the project up to 497 person months (PM); (185 PM short-term and 312 PM long-term) of this type training will be completed. In certain cases, graduate students studying for M.S. degrees will complete their thesis research in Pakistan. The resident team of advisors may be called upon to supervise such research. Participant placement, logistics, and other support services financed separately from this project, is the responsibility of USAID Office of Human Resources and Development or its designee. Requests for all such training shall be reviewed by the Team Leader and approved by GOP and USAID.

b. In Country Training

The Advisory Team supplemented by short-term specialists is responsible for assisting in the design, implementation and evaluation of relevant in country training courses, seminars and workshops including the areas of statistics, surveying, computer software and utilization, area frame construction, and objective yield techniques. Travelers will be reimbursed through the PLA whenever possible. In rare occasions, it may be necessary to reimburse travelers through the project local currency account. An estimated 140 person months of short-term in country training is planned using non-resident expatriate experts. In country training will be carried out at PISTAR in Lahore to the extent possible.

3. Technical Assistance

a. Long Term

Technical assistance will be provided by USDA/NASS. A long term team leader will be posted in Islamabad for the life of the project. The Team Leader will serve a two year tour, with option for extension on an annual basis. The team leader will advise and assist the GOP in the development and maintenance of the ASF nationwide; development and implementation of objective yield surveys; development and expansion of the current ADF system;

design and implementation of short-term in country training; identification of participant trainees; and identification of short-term training needs to implement these activities.

An additional agricultural statistician will be posted in Islamabad in July 1992 for a two year assignment to work with the FBS and other agencies for improvement of the agricultural prices system in Pakistan.

Local staff as deemed necessary and approved by the ARD Project Officer and USAID Personnel Office will be hired to support the resident advisors.

b. Short Term

Short term technical assistance for support of the project will mainly be drawn from USDA/NASS pool of technical expertise, but may utilize other U.S. Government or private consultants when necessary. In the areas where expertise outside the fields of NASS personnel is required, USDA/OICD will acquire the services of other government or private consultants to fulfill the need.

I. Key Elements for Project Implementation

- Access to Mapping Materials: MOD must allow reasonable and timely access to all available mapping, photography, and remote sensing materials not protected for valid security reasons.
- Funding and Staffing: The MOF must sanction positions for the project in a timely and complete manner. Establishment and administration of PLA accounts must be done so funds are available to pay staff on a timely basis.
- FBS Role: The FBS must assume a strong coordinating role to ensure PDA's fulfill their responsibilities for project implementation. In the event PDA support lags, FBS must be ready to fill any gaps with its own resources.
- ASF Construction Schedule: The time schedule outlined for completing the four provincial area frames is an ambitious one, and will require a high degree of commitment by the GOP to accomplish on schedule.
- USAID Role: USAID must monitor GOP counterpart support and deal with problems at the appropriate level.

II. BACKGROUND

A. The Agriculture Sector

Agriculture is the largest sector in the Pakistan economy, accounting for about 50 percent of gross national product, 25 percent from farming and 25 percent from agribusiness. About 50 percent of the labor force is employed in agriculture. The country is marginally self-sufficient in production of wheat, but imports are frequently required to meet domestic needs. Agriculture accounts for about three-fourths of merchandise export earnings. Exportable surpluses of cotton and rice are regularly produced. Raw cotton and derived products account for over one-half of earnings from merchandise exports. Wheat production totaled 12.7 million metric tons (MMT) in 1987/88 and production of rice and cotton was 3.2 MMT and 1.5 MMT, respectively.

Pakistan's agricultural production is concentrated in the irrigated areas of Punjab and Sindh provinces, with both yield and total production lower in the rainfed areas of these provinces, as well as in Balochistan and the Northwest Frontier Province (NWFP). Grain production is centered in the former two provinces, where 15 of the over 70 districts in the nation account for nearly 60 percent of the country's wheat production. Cereal production in the rest of the country is supplemented with imports from these grain surplus districts, although it is estimated that irrigated yields could be much higher. The potential exists for a substantial increase in Pakistan's production of basic grains, if the appropriate mix of policies, institutional support, and infrastructure is established.

The private sector almost entirely controls the agricultural production of the country, and provision of inputs is increasingly being transferred to private merchants and manufacturers. In marketing and storage the situation is mixed, with private sector agents heavily involved in procuring and storing basic grains. The Government of Pakistan (GOP) is particularly active in purchasing and storing wheat for processor distribution and ensuring an adequate price for producers.

B. The Agricultural Statistics System

1. Current System Description

The current system is designed primarily to provide district and provincial estimates and largely ignores the need for timely national information. The system for estimating crop area relies on a series of village surveys for first and second estimates, but the final estimates are based on revenue department patwari data (defined later in this report). Yield indications at

harvest time are obtained by crop cutting surveys in all provinces except Balochistan. These estimates are based upon subjective judgments of agricultural extension staff.

a. Survey Methodology

The Federal Bureau of Statistics (FBS) designed an integrated master sample for Punjab, Sindh, and the Northwest Frontier Province (NWFP) in the late 1970's. Due to a lack of resources, the program was not fully implemented. Sample sizes had to be reduced to stay within available resources, and the sample in effect became a village master sample (VMS). Two village surveys are conducted during each crop season (Rabi and Kharif). The first survey provides indications for estimates of area planted, and forms the basis for selecting fields for crop cutting surveys. In addition to area planted, the second survey provides a subjective indication of yield. The final and official estimate is tied very closely to patwari data reported to the Provincial Revenue Departments. Yield estimates are based on crop cutting data gathered from selected fields in a subsample of villages from the area survey.

The VMS has not been updated since it was put in place, due mainly to the expense of updating the old frame or developing a new one. No information is available about the cost of developing the VMS, nor the resource requirement for the proposed Integrated Master Sample (IMS). FBS has a draft FC-1 for the proposed IMS but the ADC Project Office has been unable to obtain a copy.

The VMS was first used in the Punjab in 1978/79. Over 1,000 sample villages were selected proportional to 1976/77 seeded area of wheat. All crops are included in the village surveys and expanded data are used for setting estimates for both major and minor crops.

Beginning in 1980/81, separate samples of villages were selected for four major crops (wheat, cotton, rice, and sugarcane) in the Sindh. Sample allocation was proportional to the area planted to the crop of interest in a district. This procedure is similar to the IMS procedure. First and second estimates for major crops are based on the sample survey results and minor crops are based on subjective data or no data at all. Revenue data are not used extensively in Sindh due to its late availability.

The VMS was introduced in the NWFP in 1984/85 under the Crop Estimates Improvement Project. Five major crops (maize, rice, sugarcane, wheat and gram) were originally included and the number has grown to 19 crops for 1988/89. The project was funded with GDF development funds and scheduled to become operational in

1988. However, funds for this purpose were not included in the operational budget and it continues on a year to year basis with development funds.

No regular surveys are conducted in Balochistan to collect crop area and yield data. All estimates are based on subjective appraisals of crop conditions by extension agents. Final estimates are summarized and published by the Provincial Agriculture Department, Statistics Wing.

The FBS input into collecting agricultural survey data is limited to filling gaps in the PDA systems. Currently, FBS collects some data on agricultural prices in some provinces, and does crop cutting surveys on cotton and wheat as a check of the provincial system.

b. Data Collection

The VMS survey enumerators visit sample villages during each survey cycle and record the crops growing in each field. Each enumerator is assigned only one village for enumeration. If the assigned village is too large to be surveyed completely during the data collection period, it is subdivided and the raising factor adjusted accordingly. Data are summarized at the village level and only the village totals are forwarded to the district headquarters. Using predetermined raising factors, the village data are expanded to the district total. District totals are sent to provincial headquarters and summed to provincial level. In Punjab and NWFP, village data are forwarded along with district totals to provincial headquarters, but are retained in district offices in the Sindh. First and second estimates are based on a ratio of change in area planted from year to year multiplied by the previous year's patwari data.

c. Estimation Procedures

Although a due date calendar for crop estimates exists, PDAs widely ignore it. Punjab and NWFP have a fairly good record of meeting due dates for first and second estimates, but Sindh and Balochistan are frequently more than a month late in submitting estimates to FBS and MINFA. Final estimates are often late from all four PDAs. Punjab and NWFP have the best record but the final 1986/87 cotton estimate was delayed by 52 days in Punjab, 145 days in Sindh, 47 days in NWFP, and 115 days in Balochistan.

Two factors, survey timing and the review process, account for much of the delay. Survey timing is often adjusted according to progress of planting or harvest, which delays availability of survey indications for setting estimates. The estimates review process is the major contributing factor to late estimates. The Secretary of the Agriculture Departments for Punjab, Sindh, and NWFP approve the first and second estimates, with the Provincial

Agriculture Statistics Coordinating Board approving the final estimates. The Director, Provincial Agriculture Department of Balochistan, approves the first and second estimates, with the Additional Chief Secretary (Development), Government of Balochistan, approving the final estimates. A detailed description of the final estimate approval process is included in the description of the patwari system later in this report. The review process is subject to delays during the absence of key personnel, and is potentially open to pressures from special interests.

2. The Patwari System

The land records system, called the "patwari system" and administratively located in the Provincial Revenue Departments, has existed since the time of the Moguls. The British regime improved the system to some extent by adding responsibility of recording agricultural data. This included both crops and livestock and has become the country's primary source of village data. These statistics are collected for all settled areas, and are intended to provide an accurate report of crop area and production for the 80 to 100 million field plots in Pakistan. In Balochistan and NWFP there are tribal districts and unsettled land areas that have no patwari system.

A patwari is assigned to each patwari circle, which may include one to four villages. He is charged with maintaining voluminous historical land records and collecting current village data. Among his other duties, the patwari is the custodian of the basic record of the government at the village level, i.e., Shujra (village cloth map), Girdawari Register (field inspection register), field book, and demand register.

The patwari makes four inspections of fields in his jurisdiction for agricultural statistics each year -- two each in Kharif and Rabi seasons. The first inspection in each season is conducted at the time of crop seeding when data are gathered on area under different crops and recorded in the field book. The second inspection is conducted during harvest season with area data and a subjective estimate of production collected. This estimate of production, however, is merely a guess based on visual appraisal. For the identification of fields, the Shujra is used. This same data is later entered in the register.

Using the field book, the patwari completes a form for the Revenue Department. This summary form is sent to the Tehsil Assistant Commissioner who reviews the data. The forms are forwarded to the Revenue Department through the Deputy Commissioner. Several persons, each one responsible for a specific portion of the data in the report, review the data before it is passed to the Provincial Revenue Department.

The Provincial Revenue Department transmits the information to the Provincial Department of Agriculture (PDA) and the Provincial Bureau of Statistics (PBS). This is later reviewed and approved by a subcommittee comprised of representatives of the Directors of Agriculture, Bureau of Statistics, Revenue, and Irrigation Departments. Finally the data are reviewed by the Provincial Statistical Coordination Board which is chaired by the Additional Chief Secretary, Planning and Development Department. This Board consists of the Secretaries of Agriculture, Revenue and Irrigation, Provincial Bureau of Statistics, and Federal Bureau of Statistics. After approval, the data are sent to the FBS for preparation of national level estimates. MINFA releases the data through a gazette notification.

The permanent record book is to be updated by the patwari every fourth year, but many appear to be more than four years out-of-date. The PDAs use these data extensively for setting acreage estimates, and for yield data to some extent. The fact that the patwari data are out of date can effect the accuracy of official area estimates.

3. Operation of Current System

Operationally, The present system depends upon a complicated sharing of responsibilities among federal ministries and the provincial governments. Responsibilities are divided as follows:

- The PDAs have primary responsibility for collecting agricultural data, which they undertake through a network of crop reporters on the basis of samples of villages.
- The FBS is responsible for; 1) developing and approving methodology used in agricultural data collection activities; 2) validity of collected data; and 3) coordinating data collection activities across agencies.
- The Provincial Revenue Departments collect agricultural data at level of the individual farmer through the network of patwari, to provide information on agricultural income as part of their continuous monitoring of economic activities. These data provide the final check on early planting estimates and are the sole source of annual livestock statistics.
- The Planning Unit (Economic Wing) within the MINFA has responsibility for the release of official estimates. However, it is mainly a user of the available data at the federal level, provided by PDAs and/or FBS.

- The Secretary, Statistics Division approves all final estimates before release.

The current national system has evolved over the past three decades with donor support, beginning with assistance in the 1960's from Food and Agriculture Organization (FAO) and the World Bank. During the early 1970s the United States Department of Agriculture's (USDA) Statistical Reporting Service (SRS), now National Agricultural Statistics Service (NASS), provided technical assistance in list frame sampling and other methodologies to improve the reliability of data in the Punjab and, to a lesser degree, in Sindh. Technical assistance focused primarily on collection of wheat data, in response to governmental concern of lack of a reliable basis for projecting import needs. Assistance was broadened through Phase I of the Agricultural Data Collection Project (ADC) which demonstrated the Area Sampling Frame (ASF) technology is statistically sound and workable in Pakistan.

4. Information Flow

Information flows within and between these organizations on both a formal and informal basis, eventually merging in published form for broader application. There are four principal problems with the operation of this system:

- **Reliability:** Primary agricultural data are subject to numerous non-sampling errors. Technical problems created by lack of transportation, automated data processing (ADP) facilities, and training, plus the obvious inconsistency generated by linking revenue and taxation with the collection of basic raw data, are more likely important sources of inaccuracies.
- **Timeliness:** Agricultural data are not available on a schedule as needed, which not only impedes analysis, but also makes it difficult for the GOP to make critical planning and economic decisions. Untimely estimates of the wheat and rice crops, in particular, force the GOP to attempt to make last minute arrangements for the sale or purchase and/or movement and storage of basic grains, often at significant cost. Lack of ADP facilities for the efficient handling of data is also a significant problem. Even after data are summarized, they may not be readily available for the data users.

- Efficiency: The current system in Punjab requires a comparatively large sample and is resource intensive. The sample design is based on allocation criteria of wheat crop which is not representative for all crops. In Sindh the sampling plans for each major crop (i.e.: wheat, cotton, rice, and sugarcane) have been developed separately keeping in view the intensity of areas sown to each crop.
- Relevance: The current system does not meet the need for timely provincial and national estimates for use by planners and decision makers.

Progress has been made in improving data collection efforts in the Punjab and Sindh, and the infrastructure now exists, if not in the FDAs, perhaps in the FBS, to meet data needs if improvements are made in the sampling frame, data processing and logistical capabilities. However, in NWFP data collection is less developed, and is just beginning in Balochistan and the required infrastructure does not exist.

5. Constraints

The USDA/NASS consultant team has identified the following principal constraints to greater availability of reliable agricultural data on a timely and cost-effective basis:

- Reliance on a village list frame with a large sample and dependence on revenue data for base line estimates.
- Shortage and/or inefficient use of existing automated data processing facilities.
- Cumbersome administrative and technical review and approval procedures at the provincial and federal levels before release of estimates.
- Difficulty in obtaining information in politically sensitive tribal and border areas.
- Inadequate resources to implement the current sampling methodology.

III. REVIEW OF PHASE I

The Food Security Management Project (FSM)/Agricultural Data Collection (ADC) Component was initiated July 17, 1985 with the signing of a FASA with the USDA for provision of technical assistance, training, and commodity procurement support from the USDA's SRS.

The decision was made to locate the ADC project office staff and development function in Islamabad instead of Karachi, and the data collection function in Islamabad instead of Lahore as specified in the project planning documentation. This was necessary because of the restrictions on obtaining and utilizing aerial photography and mapping materials placed upon the project by the Ministry of Defense (MOD). The Survey of Pakistan (SQP) office that has responsibility for these materials is located near Islamabad. This logistical move at the start of the project was beneficial for project management because of the close proximity to the United States Agency for International Development (USAID) and the Statistics Division (SD) offices in Islamabad.

A. Objectives of Phase I

The ADC was designed to modify the agricultural statistics data collection system in Pakistan to make it more accurate and efficient. Key elements include:

- introduction of the ASF methodology which, based on the objective characteristics of land use, permits a higher degree of accuracy with minimum sample size, thus reducing survey cost and shortening data collection schedules;
- the use of growth models, which use ASF data to forecast production prior to harvest and subsequent objective measurement of major crop yields;
- implementation of a quarterly schedule for collection and dissemination of basic agriculture data, independent of the revenue system, providing earlier estimates necessary for improved economic analysis, planning and policy decisions; and
- introduction of an automated data processing system for compilation and analysis of raw data, making agriculture statistics available to decision makers on a more timely basis and reducing error associated with hand processing.

The implementation plan implies that strengthening of the infrastructure for agricultural statistics in federal and provincial counterpart agencies is necessary for successful project implementation.

B. Goals of Phase I

The project goals established were as follows:

- Phase I: twenty four months - complete area frames and introduce ASF in seven pilot districts;
- Phase II: thirty six months - complete national area sampling frame (ASF);
- Install the computer hardware and software in the FBS and four PDAs needed to process survey data and perform statistical analysis;
- Develop the skills required to build the ASF, select probability samples, conduct field surveys using the ASF and objective yield techniques, and process and analyze survey data on computers following strict guidelines through an intensive in country training program;
- Build a cadre of highly trained statisticians capable of maintaining and expanding the ASF through training abroad and in country statistics short courses;
- Strengthen the ongoing statistics program by providing short term consultants in sampling and survey methodologies; and
- Educate data users about the need for reliable and timely statistics for planning and policy decision making.

C. Structure and Organization

The primary coordination, financial management and implementation responsibility rests with the FBS. The Directorate of Crop Reporting Service (CRS), Punjab Agriculture Department and the Provincial Department's of Agriculture, Extension Services in Sindh, Balochistan and NWFP, had direct responsibility for implementing the project in their respective provinces. While the PDAs are primarily responsible for data collection, the technical support and coordinating role of the FBS was expanded to ensure that the nation's needs for accurate and timely agricultural statistics are adequately met. The FBS also was

given responsibility for coordination, monitoring and liaison with USAID, as well as assuming an active role in coordination and operation of the project as a whole.

A new and separate unit, the ADC Cell, was created within the FBS to carry out project implementation. The ADC Cell is made up of two sections, the Area Sampling Frame Construction Section (ASF) and the Survey Planning and Estimation Section (SP&E). The ADC Cell was adequately staffed for implementation of Phase I with FBS regular personnel, which constituted the total GOP financial contribution to the project. The PDAs were to add adequate staff for data collection, field supervision, and data processing. In addition to the FBS and PDAs, successful implementation of the ADC depended heavily upon support and cooperation from the MOF, MOD and MINFA.

The NASS resident technical advisory team, made up of a senior statistician as team leader, and a survey statistician, were responsible for widespread adaptation of the ASF technology in support of regularly scheduled surveys to generate primary agricultural data of maximum utility to GOP planners and decision makers.

The USAID Office of Agriculture and Rural Development (ARD) had overall responsibility for managing the project. To facilitate coordination among Federal and Provincial Governments, and to oversee project implementation, the ADC Technical Committee was set up in the FBS. The Committee, representing the FBS, PDAs, MINFA, USAID, and the Resident Advisor, met regularly to prepare annual work plans, advise on implementation, and to monitor progress.

D. Technical Assistance

The NASS technical advisory team had responsibility for advising on project implementation and transferring the ASF technology to the GOP. The advisors assisted the FBS in:

1. Procurement of photographic and mapping materials required for ASF development;
2. Identification of appropriate Pakistani staff for long and short-term overseas and in country training, and selection of appropriate institutions;
3. Technical assistance and training in construction of the ASF and ASF survey implementation including objective yield surveys.

4. Design and execution of in-county training for Pakistani staff to facilitate project implementation. Short term consultants, primarily from NASS, provided technical expertise in specialized subjects as needed.

E. Accomplishments

1. ASF Methodology Introduction

GOP counterparts recognize the ASF efficiencies that permit reliable, cost effective agricultural statistics on a timely basis, and see it as the best option for improving the agriculture statistics system in Pakistan to meet the national need for timely provincial and national estimates. The FBS ADC Cell staff is a well trained unit, capable of developing the National ASF, and leading efforts to install the new data collection methodology in the PDAs. Technical and procedural problems were almost nonexistent, and all major constraints were of an administrative nature, stemming from a lack of coordinated support from the GOP.

2. Area Frame Development

The most critical step in implementing the ASF methodology is construction of the area sampling frame. Frame development depends upon an adequate medium for land use stratification. The needed materials are under the control of the MOD, with the SOP acting as custodian. Difficulties in gaining unrestricted access to these materials were a major factor limiting the pace of frame construction.

Aerial photographs for Sheikhpura District, the first pilot site selected for frame construction, were released to FBS in November 1985. However, use was restricted to SOP facilities in Rawalpindi. After remodeling of space at FBS offices in Islamabad according to MOD security specifications, the photographs were allowed to be moved from the SOP offices in July 1986. Use of the materials was restricted to the frame construction laboratory, and the request to take the photography to the field for ground truth work was not granted until October 1986, when 44 percent of the photographs for the district were cleared for field use. Alternative sampling procedures had to be adopted for 56 percent of the area in the district where photographs were not allowed in the field, adding several weeks to the time required to complete the frame. The frame for Sheikhpura District was finally completed in December 1986 and sample selected by March 1987 with the first ASF survey conducted in April.

Subsequent to the experiences with the first district, the FBS reached agreement with MOD for case by case approval for taking photographs to the field. Although MOD agreed to act on each request within four weeks, the normal approval time was four to six months. This problem delayed frame construction work on the remaining pilot districts temporarily, but the impact was lessened by requesting approval far in advance of when the photographs were needed.

Aerial photographs for all seven pilot districts had been released to FBS and the pace of frame construction improved by early 1988. Frames for all seven districts were complete by the end of calendar year 1988.

3. Sampling and Data Collection

ASF technology uses smaller sample sizes compared to VMS to provide reliable and cost effective estimates for major items. Flexibility in questionnaire design and survey data expansion techniques allow the collection of a variety of data in a single survey. The small sample size allows the data to be collected in a relatively short time frame, which provides a capability to produce timely estimates of production and acreage on major crops.

a. Area Sampling Frame Surveys

ASF field surveys are conducted four times a year, approximately on a quarterly schedule, and follow the progress of each Kharif and Rabi crop from planting intentions through harvest. The ADC Technical Committee made the decision at its June 1988 meeting to move the major Kharif planted area survey from July 1 to August 15. The Technical Committee meeting held September 1987 in Lahore produced a decision to start this survey beginning July 15th each year. Delaying this survey from the original schedule gave a better indication of rice area planted since sowing continues into late July in northern districts of the Punjab. The July and January surveys provide the sampling frames for

selecting fields for objective yield surveys on Kharif and Rabi crops, respectively. Following is a brief summary of the kinds of data collected on each survey:

July - Kharif area planted,
Rabi area harvested,
production of major Rabi crops,
method of harvest of major Rabi crops,

October - Rabi intentions to plant,
Kharif final area planted.
source of irrigation water for Kharif crops,
fertilizer and pesticides used on Kharif
crops,

January - Rabi area planted,
Kharif area harvested,
production of major Kharif crops,
method of harvest of major Kharif crops.

April - Kharif intentions to plant,
Rabi final area planted,
fertilizer and pesticides used on Rabi crops,
source of irrigation water for Rabi crops,

The first ASF survey to collect crop area data was conducted in Sheikhpura District in April 1987. Nawabshah District was included in the January 1988 survey, and Faisalabad and Larkana were added in August 1988. Surveys were conducted in all seven pilot districts beginning in January, 1989. Results are encouraging. Coefficients of variation (C.V.) for direct expansions of major crops is consistently in the 4-6 percent range. Appendix 1, Government of Pakistan Performance Report of Agricultural Data Collection Component of Food Security Management Project, July 1985 - June 1989 provides more detail on survey results.

The Provincial Coordinating Offices have demonstrated that they are capable of doing the quality of work required to control nonsampling errors and meet survey time schedules. However, delays in sanctioning personnel positions by the MOF necessitated the use of FBS field staff to complete surveys which should have been done by the PDAs.

b. Objective Yield Surveys

The GOP was vitally interested in developing the crop yield survey potential of the ASF. Objective yield surveys for wheat (WOY) were completed in Nawabshah and Sheikhpura in the Spring of 1988, followed by initiation of cotton, maize, and rice surveys later in the year. This set of surveys is being repeated in 1989 in more districts (Appendix 1). The 1988 WOY Survey

demonstrated that the small number of plots (90 per district, which has been reduced to 60) is adequate to provide a yield estimate with a C.V. less than 7.5%. The yield per hectare indications based on ASF procedure (21.6 square inches) are considerably higher than the current VMS procedures. The pattern of higher yield indications from the ASF procedures is consistent in all districts. There are many possible reasons which should be researched before the objective yield survey procedures are finalized:

- Erroneous survey procedures used in one or both systems (non-sampling errors analysis)
- Plot size: i.e. 15' x 20' in VMS compared to 21.6" square in ASF.
- Sample Sizes: i.e. 420 in ASF compared to 1704 in VMS.
- Measurement of Harvest Loss to adjust biological yield indications.

c. Work in Balochistan and NWFP

Although Balochistan and the NWFP were not included in Phase I, a major effort was made to strengthen ongoing statistics programs, and develop the skills to implement the ASF in these provinces in Phase II. It was not possible to provide funds or staff, but technical assistance, microcomputers and training furnished by the project had a major impact on statistics programs in these two provinces.

1. Balochistan

The Balochistan Statistics Wing of the Ministry of Agriculture's Extension Service relies upon extension agents to provide annual subjective estimates based on farmer opinion and visual observation of crop area and yield. No regular surveys to collect production data exist. The Statistics Wing compiles and publishes the estimates in an annual statistical bulletin. Microcomputers and training provided by the ADC have greatly improved the quality and timeliness of these publications.

Balochistan produces much of the deciduous fruit grown in Pakistan, and fruit crops are a major contributor to farm income in the province. A census of fruit orchards is conducted approximately every ten years, and annual production estimates are based on projections from the most recent census. The last census, covering the 1985-86 crop, was completed in early 1987. The ADC office staff assisted the Statistics Wing in processing the survey results on microcomputers. Almost 40,000 records were key entered, edited and summarized by the ADC staff. The resulting publication, issued in late 1987, was the first of its kind issued in Balochistan and was very popular with data users.

Using the 1986 census as a sampling frame, the ADC staff assisted the Statistics Wing in selecting a probability sample of fruit orchards for conducting annual production surveys in 1989. ADC continues to support these activities in the province. The first survey is currently underway.

2. NWFP

Work in the NWFP has concentrated on improving existing sampling methodology and converting survey data processing to microcomputers. All village master sample survey crop area and crop cutting data are now processed on microcomputers furnished by the ADC, resulting in more timely, higher quality publications. A review of summary procedures revealed that survey data expansions were being computed incorrectly, resulting in erroneous estimates. Adopting revised procedures put the estimates on a statistically sound basis.

F. Commodities

1. Microcomputers

Improved and expanded data processing capacity was necessary to support the ADC, and strengthen the data processing and analysis capabilities of counterpart agencies. In this regard, more than thirty microcomputers have been turned over to the GOP. Counterparts readily adopted automated data processing, and now depend upon microcomputers for processing ASF survey data, and have converted much of their ongoing work to computers.

2. Vehicles and Motorcycles

The logistical capabilities for data collection were strengthened by providing vehicles and motorcycles to counterpart offices. Improved transport strengthened the quality of field supervision and shortened the data collection periods.

3. Printing Equipment

Equipment was procured to expand the FBS printing facility in Karachi and establish small shops in Hyderabad and Lahore. A 25 inch printing press, vertical process camera, exposure unit and paper cutter were installed in Karachi. The shop in Hyderabad has been provided with a 19 inch printing press, vertical process camera and exposure unit. The equipment for Lahore is the same as Hyderabad except a paper cutter was added.

G. Training

The ADC included a large training component to develop the skills needed for project implementation and to support the ASF methodology when it is institutionalized. Over 400 persons

received training in ASF development, agriculture statistics and survey management, data collection procedures, and computer data processing.

1. Foreign

The program was designed to produce a cadre of statisticians trained in sampling and survey methodology through academic training in the U.S. Observation tours and nondegree courses introduced participants to the organizational structure, sampling methodologies, survey procedures, and data processing practices of statistics organizations in the U.S.

Over 20 persons have gone abroad for training under the ADC. Progress was limited by the shortage of qualified MS Statistics candidates in the provinces, difficulties in candidates clearing the TOFEL, and the lengthy GOP participant nominating process.

2. In Country

In country training concentrated on introducing the ASF methodology on a practical level, improving basic skills in statistics, and developing automated data processing procedures through a series of workshops and short courses. The program was one of the most successful and productive activities of the project, and provided training for nearly 400 persons. In country training expanded beyond expectations in response to the demand for training in microcomputer use, and the difficulties of getting participants cleared for training abroad.

3. Statistics Training Institute

The ADC supported the SD's establishment of the Pakistan Institute of Statistics Training and Research (PISTAR) in Lahore. When fully operational, the institute will serve as a facility for training newly hired and existing personnel of the three bureaus of the SD. It will offer regular curriculum courses in statistics and automated data processing, as well as special workshops and short courses designed to meet specific training needs. Twenty five microcomputers were purchased with project funds to equip the microcomputer training laboratory. Some of the project's in country training will be turned over to the PISTAR.

H. Computer Modernization and Expansion Project

USAID is funding a separate project to modernize and expand the data processing capabilities of the SD. Minicomputers are to be installed at Islamabad, Karachi, Lahore, Peshawar and Quetta. Regional and field offices will be equipped with microcomputers or clusters of terminals mainly for data entry. Realizing the complexities of designing such a system, preparing procurement

specifications, installing hardware and software, training staff and converting to the new system in time to process the 1991 Population Census, the SD requested long term technical assistance for implementing the project. A consultant with experience in designing systems and working with the U.S. Government procurement system was funded for two years under the ADC. The new data processing system will provide the hardware needed to process provincial and national area frame surveys.

I. Constraints

Many constraints delayed ASF development and project implementation. Some of these can be attributed to start up problems and largely were resolved. However, some major long standing problems remained that must be solved to implement the National ASF. Improved cooperation of the MOD and MOF is vital to sustained progress in frame development and project implementation.

1. Access to Photographic and Mapping Materials

Despite a "Condition Precedent" included in the project agreement stating that the required materials for land use stratification would be made available to the FBS, the lack of cooperation of MOD was the major factor causing the project to fall two years behind schedule. Because of restrictions placed on access to aerial photography, seventeen months were required to complete the area frame in the first pilot district. Subsequent to the experiences with the first district, the FBS reached agreement with MOD to release photographs for individual districts on a case by case basis. Although MOD did not meet its commitment to act on each request within four weeks, and usually required four to six months, the procedure worked for Phase I because the frame was constructed one district at a time.

2. Stratification Medium

Existing aerial photography is not adequate for building a high quality ASF. The 1976 coverage used in Phase I is limited to about fourteen districts in the Indus Plain of the Punjab and Sindh. This photography may be usable but is out of date in some districts. Coverage for the remainder of the country is 1952 vintage and is poor quality and of no value for ASF construction. The attempt to secure new low level aerial photography was delayed in the GOP, and now is impossible because funds are no longer available from USAID.

SFOT satellite imagery offers the best possibility for providing material for land use stratification on a timely basis, and in the volume needed to support sustained rapid progress in frame development. Pakistan Space and Upper Atmosphere Research Commission (SUPARCO) has a ground receiving station near

Islamabad to receive SPOT imagery. FBS has ordered SPOT imagery for the seven pilot districts, and will use this medium for stratification for the entire country.

3. Funding

The lack of consistent and dependable local currency funding has been a major perennial constraint to project implementation. The FBS and SD were diligent in their efforts to assure that the ADC budget requests received proper consideration by the Finance Division. However, their efforts did not prevent a near total disregard by MOF of the project's needs.

The lack of funds had a devastating effect on project implementation. FBS and the provincial coordinating offices were unable to get maintenance contracts for most of the more than 30 microcomputers provided by the project, or provide needed maintenance for project vehicles. The lack of adequate maintenance is beginning to show up as the frequency of breakdowns increase.

Equally serious was the impact on the morale and productivity of the field staff. Operating for long periods (up to six months in some cases) without funds meant the field staff did not get paid their salaries. Some persons assigned to the provincial coordinating office staffs requested to be disassociated with the ADC and returned to their previous jobs. It was not possible to obtain suitable office space, furniture and equipment needed to properly outfit the provincial offices.

4. Staffing

It was apparent from the early stages of Phase I that more staff would be needed for frame construction in Phase II. Following recommendations of the Mid-term Project Review Team, 10² statistical assistants were added to the ASF on deposition, raising the professional staff allocation to 17 in the ASF.

Staffing concerns are not limited to the ADC Cell. MOF sanctioning of personnel posts for the provincial coordinating offices was inconsistent and restrictive.

The number of field enumerators was insufficient for timely data collection. For example, the same enumerators had to be used in two different districts, in both Punjab and Sindh in August 1980, extending the data collection period from two to four weeks. In later surveys, FBS enumerators were used to conduct field enumeration.

5. Organization of Provincial Coordinating Offices

The project coordinating office in Punjab, Crop Reporting Service (CRS), is independent of the PDA Extension Service. The CRS has its own field staff reporting to the director and has been in place for several years. The infrastructure is strong enough to support a fully operational ASF. Implementation depends upon small statistics wings within the Ministry of Agriculture's Extension Services in Balochistan, NWFP and Sindh. Field staffs are under the direction of the District Assistant Director of Extension, and share data collection activities with their extension duties. An independent unit reporting only to the project coordinator needs to be installed to carry out ASF implementation in these three provinces.