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**FOOD SECURITY MANAGEMENT
PROJECT (391-0491)
STORAGE TECHNOLOGY DEVELOPMENT
AND TRANSFER**

Contract No. 391-0491-C-00-6080-00

Semiannual Report

July - December 1986

Food Security Management Project (391-0491)
Storage Technology Development and Transfer
Contract No. 391-0491-C-00-6080-00

Semiannual Report

FOOD AND FEED GRAIN INSTITUTE
Kansas State University
Manhattan, Kansas 66506

July - December 1986

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SECTION I

PROJECT ACTIVITIES

The goal of the Storage Technology Development and Transfer (STDT) program is to improve the capacity of the Government of Pakistan (GOP) to manage the national food security system effectively and efficiently. The activities will ultimately enhance the capabilities of public-sector agencies and concerned private-sector firms to store food grains over extended periods of time. The purposes of the program are (1) to strengthen the capabilities of the Pakistan Agricultural Research Council (PARC) and cooperating institutions for testing and developing improved grain storage technologies appropriate to local conditions, (2) to organize and implement training programs for the rapid extension of improved technologies to all levels of managerial and operational personnel in the grain handling and storage sector, and (3) to provide training to enhance the skills of researchers and those personnel responsible for training programs.

Within the framework of the general objectives of the program, specific objectives for the 6-month time period covering June to December 1986 were set forth as follows:

1. Establish initial cooperative ties with collaborating GOP agencies
2. In collaboration with MINFA and selected personnel, initiate and complete the review of studies on the feasibility of public sector bulk storage facilities
3. Initiate development and complete a work plan of project activities including research, training, and postharvest information
4. Carry out actions required for logistical arrangements in establishing a Food and Feed Grains Institute (FFGI) office in Pakistan to carry forward project activities.

Progress to Date

During this 6-month period, work was begun on implementing project activities according to the specific objectives described above. Efforts were focused primarily on the bulk storage feasibility studies and the development of work plans.

Cooperative Ties with GOP Agencies. Initial establishment of cooperative ties with collaborating GOP agencies was accomplished through visits to these institutions, some of which are found in each province. All initial visits with institutions/agencies were made in the company of a USAID official and/or a representative of a GOP counterpart group.

Bulk Storage. The Joint Secretary (Food), MINFA, arranged for a working group to meet on September 8 to initiate the review of the results of studies on the feasibility of public sector bulk storage facilities. The group decided on the studies to be reviewed and the manner of their evaluation. It was also decided that the Working Group on Bulk Wheat Handling and Storage would hold a second meeting in October.

After the first meeting, short-term engineering consultants from FFGI visited almost all the bulk wheat storage and handling facilities of the country, including some unfinished facilities. Silos, plastic-covered "open bulkhead" storage, bag godowns converted for bulk handling, and hexagonal bins converted for bulk filling by mechanical means were all examined. Discussions were held with the Association of Wheat Millers.

The final meeting of the Working Group on Bulk Wheat Handling and Storage was held during the first week of October. At this meeting, a report on the Bulk Storage Studies Review was prepared. The final draft copy was reviewed by all members of the Working Group, and comments were inserted as requested. The short-term FFGI consultants -- Harlan Shuyler, Henry Lembeck, Ekramul Haque, and Roe Borsdorf -- prepared a consultants' report entitled "Review of the Feasibility of Bulk Wheat Handling and Storage in Pakistan" based on field study and discussions with Pakistani members of the Working Group and other GOP and private-sector personnel.

The above reports were submitted to USAID/Islamabad for review and comment. The consultants' report was submitted to the Joint Secretary (Food) for review. A review session was then held with the Joint Secretary (Food) to discuss the contents of the consultants' report. Following this discussion the report was finalized and distributed in final draft form. At the request of the Joint Secretary (Food), the FFGI team prepared a 4-page briefing paper for submission to the Secretary of Food and Agriculture along with a copy of the consultants' report.

Work Plan for Research, Training, and Postharvest Information. Development of work plans was fostered through the initial cooperative ties established as a result of visits to all collaborating GOP agencies. After these visits, extensive discussions were held with PARC. Tentative plans of work were developed for each of the research and training elements of the project as well as for support of postharvest information services. A meeting was then held with the lead and participating institutions involved in research and training activities under the project to finalize the research and training work plans. The work plan for the postharvest information component was finalized after discussions with the long-term advisor's counterpart and the NARC Documentation Center.

Preliminary equipment lists were developed and reviewed by the lead and participating institutions during the work plan development meeting. Further development of equipment specifications was to take place after lead institutions supplied additional details.

The finalized work plans are attached as Annex I.

Research Activities. Equipment catalogs have been prepared for shipment to Pakistan during January. Based upon specifications received from lead institutions and other catalog information, further refinement of equipment lists was undertaken and completed. The equipment lists with refined specifications will be discussed with PARC and lead institutions in January.

Training Activities. No training activity took place during this time period. Preliminary training plans for researchers were developed and will be presented to PARC in January. A list of international technical meetings has

been prepared for PARC and related institutions, and will be presented in January.

Postharvest Information Activities. No postharvest information activities in Pakistan took place during this time period. Based on the plan of work, FFGI has taken initial steps in developing an overall scheme to meet the objectives of this component, has structured the required training programs, and has become familiar with the software used by the NARC Documentation Center.

Logistics. A number of logistical arrangements were made. Office space was assigned to FFGI in the FSM building. An amendment to the contract was requested to allow for funding one local staff training specialist and for funding subcontracting to implement training cells. Position descriptions were developed and approved for three local staff positions (program specialist, secretary, training specialist). Based on the finalized work plans, a schedule of required technical assistance was developed for on-campus and in-country TDY assignments. An equipment list approval request was prepared and submitted to USAID/Islamabad Project Officer, and a marine cargo insurance approval request was submitted to Project Officer and Contracting Officer.

Office furniture and equipment for the FFGI local office were ordered through USAID/Islamabad. A project vehicle has been assigned and a driver has been retained to serve as the permanent driver for the life of the project.

Constraints

Originally it was intended that the long-term advisor for the project, Harlan Shuyler, would arrive in Pakistan on or about January 5, 1987. However, Shuyler informed FFGI on November 13 that due to his wife's health problems he could not accept the long-term advisor's position in Pakistan. During December, FFGI began recruitment to fill the position of the long-term advisor. It is planned to have an acceptable replacement on station during March 1987.

Given the situation described above, a major delay is seen in implementing certain project activities. However, with the use of short-term consultants, FFGI will attempt to implement as many planned activities as possible.

Another major constraint foreseen in project implementation of training activities is the unnecessary delay in granting clearance for individuals to leave the country for short- and long-term training. This delay, caused by an unwieldy bureaucratic system, can not be directly resolved, and it is expected that certain delays will occur in the scheduling of participants for training.

Six-Month Plans

Project Activities. The following activities are programmed for the first quarter of 1987.

1. Assist in implementing short-term training (external) for researchers and personnel to be involved in project training activities
2. Implement equipment procurement

3. Implement postharvest information activities
4. Assist in the development of the structure of training cells for in-country training as set forth in Plan of Work
5. Assist in implementation procedures for academic training in postharvest technology areas
6. Assist in implementing training via workshops, seminars, and meetings (external)
7. Provide any requested assistance arising from the Bulk Storage Studies Review activity during September and October of 1986
8. Assist research lead institutions in development of research project design and data collection and analysis procedures

Logistics. The following activities are programmed for the first quarter of 1987.

1. Finalize set-up and operation of FFGI office in Pakistan
2. Hire necessary local staff to assist in project operations
3. Select long-term advisor and dispatch to post

SECTION II

ADMINISTRATIVE REPORT

Expenditures

Expenditures for project activities to date are detailed in Table 1. Expenditure amounts by category, as would be expected, follow the type of inputs which were required in the project during the initial implementation stage as set out in the Contract Statement of Work.

Foreign Country National Trainees

As reflected in the project activities described in Section I, no personnel training took place during this time period.

Personnel Employed

Food and Feed Grains Institute staff and consultants were the only personnel employed during this time period. Time utilization of FFGI staff and consultants is shown in Table 2.

Specific personnel employed under the project during the time period are as follows:

<u>Name</u>	<u>Position</u>	<u>Activity Area</u>
<u>FFGI STAFF</u>		
M. Brookman	Secretary	Home office administrative
R. Borsdorf	Agricultural Economist Coordinator	Home office administrative Bulk storage studies review Work plan development
K. Dungey	Executive Assistant	Home office administrative
K. Foster	Editor	Development of list of inter- national seminars and workshops
E. Haque	Agricultural Engineer	Bulk storage studies review Equipment lists/work plan Equipment lists/procurement
J. Pedersen	Grain Storage Specialist	Work plan development Research designs Technical support
B. Peters	Secretary	Home office administrative
D. S-Hamlin	Postharvest information specialist	Development of plans of action for PHIS/NARC
H. Shuyler	PHM specialist Long-term advisor	Work plan development Bulk storage studies review
<u>CONSULTANT</u>		
H. Lembeck	Engineer	Bulk storage studies review

TABLE 1

KANSAS STATE UNIVERSITY/FOOD AND FEED GRAIN INSTITUTE
 Food Security Management Project
 Storage Technology Development and Transfer
 Contract No. 391-0491-C-00-6080-00

Total Expenditures
 (\$)

	Budget Amount	This Period	To Date 12/31/86	Balance
	\$	\$	\$	\$
Salaries and Wages	661,000.00	61,064.11	61,064.11	599,935.89
Fringe Benefits	119,650.00	9,518.45	9,518.45	110,131.55
Overhead	627,700.00	50,864.00	50,864.00	576,836.00
Consultant Fees	8,000.00	8,060.00	8,060.00	-60.00
Local Staff Salaries	73,200.00	0.00	0.00	73,200.00
Travel, Transportation and Per Diem	351,550.00	47,624.32	47,624.32	303,925.68
Expendable Supplies	86,000.00	242.29	242.29	85,757.71
Non-Expendable				
Property	378,350.00	24.97	24.97	378,325.03
Participant Costs	270,200.00	0.00	0.00	270,200.00
Other Direct Costs	<u>60,800.00</u>	<u>5,605.13</u>	<u>5,605.13</u>	<u>55,194.87</u>
TOTAL	2,636,450.00	183,003.27	183,003.27	2,453,446.73

TABLE 2

FOOD AND FEED GRAIN INSTITUTE/KANSAS STATE UNIVERSITY
 Food Security Management Project
 Storage Technology Development and Transfer
 Contract No. 391-0491-C-00-6080-00

Time Summary Comparisons
 December 31, 1986
 (Person-days)

Year	TDY Technical Assist In-Country		Technical Assist On-Campus		Long-Term Advisor		Home Office Admin		Total Time	
	Budgeted	Actual	Budgeted	Actual	Budgeted	Actual	Budgeted	Actual	Budgeted	Actual
1: July 86 to June 87	320.0	248.5	149.0	38.0	265.0	38.0	345.0	131.0	1,009.0	465.5
2: July 87 to June 88	396.0		96.0		260.0		345.0		1,097.0	
3: July 88 to June 89	171.0		47.0		260.0		345.0		823.0	
4: July 89 to June 90	124.0		0.0		260.0		345.0		729.0	
5: July 90 to Nov 90	0.0		0.0		65.0		0.0		65.0	
TOTAL	1,011.0		292.0		1,040.0		1,380.0		3,723.0	
M/M	(52.75)		(15.25)		(48.00)		(72.00)		(188.0)	

DETAILED PLANS OF WORK
BY PROJECT COMPONENT

PLAN OF WORK

RESEARCH

TITLE: Ecology of Storage Losses

OBJECTIVE: Create a base of factual observations to assist in developing systems for assessing and controlling public-sector storage losses. This informational base will be used in conjunction with the IPM research program.

DESCRIPTION: This program will carry forward the results generated in the loss assessment survey of 1984-85 (Losses in Public Sector Storage in Pakistan, PARC, 1986) and will reinforce the current work promoted by PARC on determining the relationship of the density of stored-product insect populations to the occurrence of storage losses.

A sampling survey will be developed for various regions and levels of the grain marketing system where significant quantities of grain are held for more than 2 months. This survey will identify principal pests of stored grain and evaluate the importance of the deterioration they cause. Reports describing the physical conditions, quantities, and length of time grain is stored at each level of the marketing system, and pest control practices will be compiled.

LINKAGES WITH OTHER ACTIVITIES: This activity needs to be coordinated with the IPM research, the insect resistance studies, and the pesticide residue investigations. Each can influence the other with respect to interpretation of results and planning of further work. A current, ongoing study, promoted by PARC, regarding the relationship of insect population densities and grain losses should have linkages with this activity.

EXPECTED RESULTS: This activity will result in a determination of the more important grain pests and the deterioration they cause. Losses at different seasons in different regions will be analyzed. Densities of populations of pest species will be studied for correlation with variations in losses. Correlation of pest control practices with loss reduction will be drawn. In addition, recommendations will be made for increasing the efficiency of public-sector warehouses through internal systems of pest monitoring and control.

TIME PERIOD: This activity will be conducted over a period of approximately 3 years.

LEAD INSTITUTION: National Agricultural Research Center, Storage Group, Islamabad.

PARTICIPATING INSTITUTIONS:

Grain Storage Research Laboratory, Karachi
University of Agriculture, Department of Entomology, Faisalabad
Sind Agricultural University, Department of Plant Protection, Tando Jam
NWFP Agricultural University, Department of Plant Protection, Peshawar
Agricultural Research Institute, Entomology Department, Quetta

ACTIVITIES

TIME PERIOD

Year 1:

Conduct review of previous work	Jan. '87
Finalize loss assessment procedures and proformas	Jan-Feb 87
Develop sampling survey for ecology of losses study	Feb-Mar 87
Select sites for field sampling - prepare for analysis	Feb-Mar 87
Collect samples and analyze them	Apr-Dec 87

Years 2 and 3

Conduct annual review of work	Mar-Apr 88
Continue to compile and evaluate data	Mar-Apr 89
Recommend techniques of pest monitoring and control to increase efficiency of grain storage	

PLAN OF WORK

RESEARCH

TITLE: Pesticide Residues in Grain and Grain Products

OBJECTIVE: (1) Determine whether the use of insecticides as grain protectants (in admixture with grain) will result in undesirable residues in Pakistani cereal-based foods, and (2) determine the level of insecticidal residues in foods commonly consumed in Pakistan.

DESCRIPTION: Wheat will be treated with insecticides which are approved for direct application to food grains. The wheat will then be evaluated under laboratory and field conditions. Residue levels in wheat will be determined at various intervals after treatment and storage under environmental conditions which occur in Pakistan. The fate of residues will also be determined at various stages of the processing and preparation of commonly-consumed cereal foods.

LINKAGES WITH OTHER ACTIVITIES: The pesticide residues studies need to be coordinated with the IPM research. Either activity may need revision as a result of findings of the other researchers. Similarly, the work on insect resistance may influence the studies on residues. Linkages with the activity concerning ecology of storage losses may lead to improvements in the conduct of both activities.

EXPECTED RESULTS: A determination will be made of the grain protectant insecticides which may result in undesirable insecticide residues in commonly-prepared cereal foods in Pakistan. Data gathered will be useful in determining the potential for alternative usage of grain protectants in public-sector integrated storage management programs.

TIME PERIOD: This research will be conducted over a 3-year period.

LEAD INSTITUTION: Federal Pesticide Research Laboratory, PARC, Karachi

PARTICIPATING INSTITUTION: Grain Storage Research Laboratory, Karachi

ACTIVITIES

TIME PERIOD

Year 1:

Conduct review of previous work	Feb. 87
Complete detailed research plans	Mar 87
Receive equipment	Jun 87
Test methodology	Jul 87
Apply protectants to grain in laboratory	Aug 87
Test residues and analyze data	Dec 87

Year 2:

Conduct annual review of work	Mar-Apr 88
Similar to year 1, except protectants are applied to grain in storage and then testing and analyses of residues proceed	

Year 3:

Similar to year 2, except that protectant residues in grain products will be studied.

PLAN OF WORK

RESEARCH

TITLE: Monitoring for Insect Resistance to Pesticides

OBJECTIVE: Determine the general level of insect resistance in Pakistan to chemicals used in residual spraying, protectants applied directly to grain, and fumigants.

DESCRIPTION: Repeated and constant use of a given pesticide in a large segment of storage can lead to development of a tolerance or resistance to that pesticide in an insect population. In addition, improper usage of pesticides at sublethal dosages can also allow surviving insects to develop resistance to the pesticide.

A survey of local insect populations will be conducted to determine whether resistance currently exists to malathion, phosphine or other approved insecticides. Representative samples of insect populations will be obtained from public-sector godowns at various locations throughout Pakistan. As much background on pesticide usage as possible will be obtained for sites where test populations are acquired.

LINKAGES WITH OTHER ACTIVITIES: The insect resistance studies need to be coordinated with IPM research program, which may be adjusted as a result of the findings on resistance. Similarly, the work on pesticide residues may need modification based on results of the resistance investigations. Linkage with the activity concerning the ecology of storage losses may provide a better understanding of the findings of both these activities.

EXPECTED RESULTS: An annual report summarizing available data will be issued. The program will result in an assessment of the incidence of insect resistance to insecticides and fumigants in public- and private-sector storage.

TIME PERIOD: This monitoring program will extend over a period of 3 years.

LEAD INSTITUTION: National Agricultural Research Center, Storage Group, Islamabad.

PARTICIPATING INSTITUTIONS:

Grain Storage Research Laboratory, Karachi
University of Agriculture, Department of Entomology, Faisalabad
Sind Agricultural University, Department of Plant Protection, Tando Jam
AFIP Agricultural University, Department of Plant Protection, Peshawar
Agricultural Research Institute, Entomology Department, Quetta

ACTIVITIES

TIME PERIOD

Year 1:

Conduct review of previous work	Jan-Feb 87
Complete detailed research plans	Feb 87
Select sampling locations and frequency	Jan-Mar 87
Receive equipment	Jun 87
Prepare for testing	Jun-Jul 87
Conduct resistance testing and analyses of data	Jul-Dec 87

Years 2 and 3:

Conduct annual review of work	Mar-Apr 88
	Mar-Apr 89

The follow-up years would be essentially a continuation of the same program with modifications based on experience

PLAN OF WORK

RESEARCH

TITLE: Development of Integrated Pest Management Protocols Including Weather Information for Storage Management

OBJECTIVE: (1) Investigate the application in bag storage of three safe protocols for maintenance of stored-grain quality, (2) recommend a protocol which would provide for the minimum losses at the least cost, and (3) apply this protocol to day-to-day operations of public-sector storage facilities. Knowledge of the storage environment as determined by temperature, relative humidity, and airflow is integral to a successful IPM protocol development. The objective of weather data information is to establish a linkage with a suitable IPM program via design and implementation of a system that provides grain storage facility managers with a set of information on possible moisture movements that cause losses in grain under certain weather conditions. The undesirable moisture movement (migration) during storage could be prevented by formulating suitable aeration programs for various storage weather conditions.

DESCRIPTION: Three basic IPM protocols will be evaluated in three warehouses (one protocol per warehouse) in Baluchistan and Northwest Frontier (NWFP) provinces while considering the effect of storage environment. Three warehouses will be used for each protocol in Sind and Punjab provinces. Warehouses should have a capacity of 1,000 MT (or 1,110-MT PASSCO design) and should be of standard quality construction and maintenance. The evaluation of each IPM protocol will be based on its technical and economic efficiency.

To be able to determine the storage environment, as much data as available will be compiled on grain moisture content and grain quality for grain purchased by the public sector in these regions. A systematic collection and compilation of data on grain moisture content, temperature, and condition will be compared with atmospheric air temperatures and relative humidities over time in public-sector warehouses in these regions. Grain moisture content/relative humidity equilibrium tables will be developed for typical varieties of grain being stored in public-sector warehouses. An aeration protocol will be observed with the aim of making the IPM program more effective.

Once the weather data have been collected, analysis can begin in which the data are incorporated with accepted psychrometric theory to produce guidelines which can be applied to the storage of local varieties of grain under Pakistani environmental conditions. The guidelines and instructions for their use will then be distributed to participants in the grain marketing system. The data collection and analysis is a continuous process, allowing guideline modifications as necessary.

EXPECTED RESULTS: The results of the IPM research will be improved IPM programs which are appropriate to local conditions in Pakistan and which will be used to reduce storage losses in wheat stored off-farm in the public and private sectors.

A manual of storage strategy guidelines will be developed for use by public- and private-sector participants in the grain marketing system. This manual will contain general guidelines indicating danger periods for grain storage.

More specific guidelines included in the manual will address the grain moisture contents and temperatures to be expected in different regions at different times of the year, aeration/ventilation procedures, and instructions for responding to annual variations in temperature and moisture content in order to minimize grain deterioration. The manual will also present instructions for periodic monitoring of grain condition and remedial measures which may be taken depending on the region, the type and condition of the grain, and the type of storage structure.

LINKAGE WITH OTHER ACTIVITIES: The IPM research and weather data information programs need to be coordinated with the collection of data on the ecology of storage losses. Awareness must also be maintained for the results of the monitoring for insect resistance to pesticides and the data on pesticide residues.

TIME PERIOD: This program will extend over about a 3-year period. It will cover a 2-year storage period and will involve all four provinces with the main emphasis in Punjab and Sind.

LEAD INSTITUTION: Grain Storage Research Laboratory, PARC, Karachi

PARTICIPATING INSTITUTIONS:

Grain Storage Research Laboratory, Karachi
 University of Agriculture, Department of Entomology, Faisalabad
 Sind Agricultural University, Department of Plant Protection, Tando Jam
 NWFP Agricultural University, Department of Plant Protection, Peshawar
 Agricultural Research Institute, Entomology Department, Quetta

ACTIVITIES

TIME PERIOD

Year 1:

Conduct review of previous work	Feb-Mar 87
Complete detailed research plans	Feb-Mar 87
Select godown sites	Mar 87
Receive and install equipment	Apr-May 87
Initiate studies in the Punjab, Sind and NWFP	May-Jul 87

Years 2, 3, and 4:

Complete season's data collection and analyses	Feb-Mar
Conduct annual review of work	Mar-Apr
Train persons for the next period/area of research	
Continue studies and analyses, modified as needed	
Develop recommended protocol	
Extend protocol use to public-sector storage agencies	

PLAN OF WORK

TRAINING

TITLE: Academic Training (External) in Postharvest Technology Areas

OBJECTIVE: Increase the availability of academically-trained personnel in postharvest systems for universities, institutes, research units, government agencies, and private-sector entities in Pakistan.

DESCRIPTION: A minimum of seven persons will be selected for degree training at the M.S. level in the areas of entomology, agricultural engineering, marketing, plant pathology, and grain science. In addition, a minimum of two persons will be trained at the Ph.D. level in the field of entomology. If additional funding and qualified candidates are available, training will be expanded to nine M.S. trainees and four Ph.D. trainees.

ACTIVITIES

TIME PERIOD

Ph.D. Training

Year 1

Request candidates	by Nov 1, 1986
Receive nominations	by Jan 15, 1987
Select candidates	by Feb 15, 1987
Obtain GOP clearance	by May 1, 1987
Submit to university	by Jun 1, 1987
Begin training	Sep 1, 1987

M. S. Training

Request candidates	by Nov 1, 1986
Receive nominations	by Jan 15, 1987
Select candidates	by Feb 15, 1987
Obtain clearance	by May 1, 1987
Submit to university	by Jun 1, 1987
Begin training	Sep 1, 1987

M. S. and Ph. D. Training

Request candidates	by Feb 1, 1986
Receive nominations	by Apr 15, 1987
Select candidates	by May 15, 1987
Obtain GOP clearance	by Aug 1, 1987
Submit to university	by Sep 1, 1987
Begin training	Year 2 Jan 1, 1987

M.S. Training

Request candidates	by Nov 1, 1987
Receive nominations	by Jan 15, 1988
Select candidates	by Feb 15, 1988
Obtain clearance	by May 1, 1988
Submit to university	by Jun 1, 1988
Begin training	Sep 1, 1988

Year 3

M.S. trainees return

Sep 1, 1989

Year 4

M.S. trainees return
Ph.D. trainees return
M.S. trainees return
Ph.D. trainees return

Jan 1, 1990

Sep 1, 1990

Sep 1, 1990

Jan 1, 1991

PLAN OF WORK

TRAINING

TITLE: Short-Term Training (External)

OBJECTIVE: Provide personnel directly involved in project activities with specialized training required by specific project components.

DESCRIPTION: Research I - The two researchers principally responsible for monitoring insecticide resistance and pesticide residues in grain research will receive a minimum of 2 months each of overseas training in the most recent technology related to insect resistance to pesticides and pesticide residue analysis.

Research II - The principal investigators and researchers (11) involved in the IPM research activity will visit research sites where IPM research is being or has been conducted so as to (1) gain a complete comprehension of the possible IPM alternatives and (2) gain assistance in developing IPM designs which are more likely to result in definite conclusions.

The PARC Coordinator for the STDT Program will visit institutions involved in grain storage research and training for planning purposes. This is required for successful oversight and coordination of project activities.

Time allocated for IPM researchers training is 1 month. Time allocated for PARC Coordinator study trip is 6 weeks.

Postharvest Information - In order to assist the expansion of the NARC Documentation Center, a minimum of three personnel from the Center will be selected to attend 10-week specially-designed training courses in information systems or micrographics. These will be customized applied training programs designed to transfer applicable skills required for day-to-day operations of a documentation center and provision of service to clients. These programs will be conducted by the Postharvest Documentation Service (PHDS) of the FFGI at Kansas State University (KSU).

Training Cells - In order to establish training cells, qualified personnel from cooperating institutions will be selected to attend the annual 7-week Grain Storage and Marketing Short Course (GSMSC) at KSU. Following the GSMSC, these participants will be provided an additional 2 weeks of training in the use and preparation of audio and visual training aids, training schedules and lesson plans, methods of training, and audio-visual equipment maintenance.

ACTIVITIESTIME PERIODResearch I

Receive nominations	by Jan 1, 1987
Select researchers	by Feb 1, 1987
Finalize training program	by Feb 1, 1987
Obtain Travel Clearance	by Mar 1, 1987
Begin training	Apr-May 1987

Research II

Receive nominations	by Jan 1, 1987
Select personnel	by Feb 1, 1987
Finalize travel program	by Mar 1, 1987
Obtain travel clearance	by Mar 1, 1987
Begin IPM research unit and grain storage institutional visits	Apr-May 1987

Postharvest Information

Year 1

Receive nominations	by Jan 1, 1987
Develop training programs	by Feb 1, 1987
Select first trainee	by May 1, 1987
Obtain travel clearance	by Jun 1, 1987
Begin training	Jul-Sep, 1987

Receive nominations	by Jun 1, 1987
Select second trainee	by Jul 1, 1987
Obtain travel clearance	by Aug 1, 1987
Begin training	Sep-Nov, 1987

Year 2

Receive nominations	to be determined
Select third trainee	in revised work
Obtain travel clearance	plans for year 2
Begin training	

Training Cells

Select personnel (5)	Year 1	by Mar 1, 1987
Obtain travel clearance		by May 1, 1987
Begin GSMSC training		June-Aug 1987

Select personnel (5)	Year 2	by Mar 1, 1988
Obtain travel clearance		by May 1, 1988
Begin GSMSC training		June-Aug 1988

Select personnel (5)	Year 3	by Mar 1, 1989
Obtain travel clearance		by May 1, 1989
Begin GSMSC training		June-Aug 1989

Select personnel (5)	Year 4	by Mar 1, 1990
Obtain travel clearance		by May 1, 1990
Obtain GSMSC training		June-Aug 1990

PLAN OF WORK

TRAINING

TITLE: Workshops, Seminars, and Meetings (External)

OBJECTIVE: Assist researchers working on STDT programs in acquiring the latest developments in their field of expertise.

DESCRIPTION: An effort will be made to secure funding for STDT project personnel to travel to international workshops, seminars, or organizational meetings in their field of expertise.

ACTIVITIES

TIME PERIOD

FFGI will provide PARC with a list of upcoming international workshops, seminars, and meetings in postharvest grain systems which are scheduled for the coming year

by Jan 1, each year
by July 1, each year

FFGI and PARC will consult with donor agencies, foundations, and other international organizations on available funding

continuous

Based on available funding, PARC and FFGI will inform various institutions of the international workshops, seminars, and meetings and the available travel support

continuous

PLAN OF WORK

TRAINING

TITLE: Specialized In-Country Training

OBJECTIVES: Develop an awareness of the need for proper grain quality preservation practices concerning operational stocks and food security reserves. Participants in these programs will be able to improve their technical capabilities, receive instruction as to the importance of integrated pest management, and reduce the potential for dangers relating to pesticide application and contamination of stored grain.

DESCRIPTION: A series of seminars, workshops, and conferences will be conducted as follows:

An executive seminar on Grain Quality Maintenance in Storage will be presented to executive administrators and officials of public and private organizations and agencies to inform them of storage problems encountered on a day-to-day basis. The seminar will cover the role of the public sector as related to maintenance of grain quality in operational stocks, operational carryovers, and food security reserves. The main focus of the seminar will be to look at major policy issues relating to coordination of efforts by the GOP for preserving stored-grain quality in regular supplies, operational reserves, and food security reserves.

A conference on Quality Maintenance of Stored Grain will present an administrative overview of grain storage fundamentals, the postharvest system, types and causes of losses, quality preservation methods, and an integrated approach to storage management to operational administrators and managers. The conference will include the most recent information on grain losses and loss prevention, and discussions on how integrated pest management programs can be applied to storage conditions in Pakistan to provide safe storage of grain over extended periods of time. Conference manuals dealing with these topics will be prepared and distributed to participants.

Two workshops on Grain Storage and Quality Preservation will be conducted to upgrade the technical capabilities of operational supervisory personnel. The workshops will be comprised of lectures, laboratory sessions, and field trips dealing with basic fundamentals of grain storage, pest biology and identification, methods of grain preservation and pest control, and implementation of integrated storage management programs. Workshop manuals dealing with these topics will be prepared and distributed to participants.

A workshop on Management and Preservation of Grain in Silo Storage will provide training in the storage of large quantities of bulk grain for managers and operational personnel of grain silos. The workshop will address the problems that may be encountered in large-scale bulk storage and the methods to preserve the quality of grain under these conditions. The highly-mechanized nature of the storage and handling of grain in silo facilities will also be addressed with emphasis on equipment use and maintenance. A grain storage operations manual will be distributed to participants.

A conference on Safe Pesticide Use in Grain Storage will be presented for researchers and other personnel responsible for recommending the use of pesticides. This conference will emphasize the various types of pesticides available for use in preservation of food grains, and their effectiveness, hazards, and uses. Recommended pesticide application procedures and equipment, safety equipment, and first aid procedures will also be discussed.

LEAD INSTITUTION: PARC C/U

PARTICIPATING INSTITUTIONS: All cooperating institutions in the STDT project

<u>ACTIVITIES</u>		<u>TIME PERIOD</u>
	Year 1	
Schedule presenters		Jan-Feb 1987
Invite participants		Feb 1987
Complete arrangements		Mar 1987
Conduct Executive Seminar		Mar-Apr 1987
Schedule presenters		Jul-Aug 1987
Invite participants		Aug 1987
Complete arrangements		Sep 1987
Conduct Conference on Quality Maintenance		Oct 1987
Schedule presenters		Oct 1987
Invite participants		Oct 1987
Complete arrangements		Nov 1987
Conduct Conference on Pesticide Use		Nov 1987
	Year 2	
Schedule presenters		Jan 1988
Invite participants		Jan 1988
Complete arrangements		Feb 1988
Conduct Workshop I Grain Storage		Mar-Apr 1988
Conduct Workshop II Grain Storage		Mar-Apr 1988
Schedule presenters		Jul-Aug 1988
Invite participants		Aug 1988
Complete arrangements		Sep 1988
Conduct Workshop on Grain in Silo Storage		Sep-Oct 1988

PLAN OF WORK

TRAINING

TITLE: Training Cells for In-Country Training

OBJECTIVE: Develop provincial training cells which will function as individual operating units to provide a wide range of grain storage and handling training services to Pakistani institutions and personnel.

DESCRIPTION: This training activity will be structured in four Provincial Training Cells, each responsible for carrying out training functions within its province. Overall direction, control of activities, and resource support will be the combined responsibility of the PARC C/U and FFGI. Actual training operations will be implemented by the Provincial Training Cells under the auspices of agricultural universities in the provinces of Sind, Punjab, and NWFP, and the Agricultural Research Institute in Baluchistan. Training will be contingent upon the concerned institutions giving assurance of continuity and improvement in applied and academic grain postharvest training over the long-term.

The provinces of Punjab and Sind will be the initial target areas for the development of training cells, with the training cells for the NWFP and Baluchistan provinces developed at a later date. The assignment of lead and participating institutions for each province will be undertaken as part of the implementation of work plan activities.

In order to fully develop the training cells, it will be necessary to train a cadre of qualified persons from lead and participating institutions to conduct in-country training. This cadre will receive training at the annual 7-week GSMSC at KSU. Following the short course the cadre will be provided with an additional 2-week instruction course in the use and preparation of audio and visual training aids, training schedules and lesson plans, methods of training, and audiovisual equipment maintenance.

Two mobile training units will be used to support initial training operations. These units will each consist of a van-type vehicle equipped to provide audiovisual training capability in remote warehouse and procurement center locations. This provides flexibility and mobility, when and where desired, in providing training to a maximum number of persons with minimum transport or relocation of personnel.

In the first stage of development of the training cells, available cadre will assist and participate in the specialized seminars, workshops, and conferences directed towards creating an awareness of the need for proper grain quality preservation practices.

The initial training to be presented by the training cells will consist of a series of 6-day workshops for storage inspectors and procurement personnel on grain inspection and preservation in godowns. As results from STDT research projects become available, the content of the training actions will be modified to include new developments. Other training programs will be developed as requirements for additional training are determined over time.

EXPECTED RESULTS: Fully operational training cells that will be staffed by trainers with the appropriate training and equipment to be able to present in-country workshops, seminars, and short courses as required, as well as develop new training programs to meet changing needs.

COORDINATING INSTITUTION: PARC C/U

IMPLEMENTING INSTITUTIONS: To be determined

<u>ACTIVITIES</u>	<u>TIME PERIOD</u>
	Year 1
Designate institutions and training cells in Punjab and Sind	Jan-Apr 1987
Begin equipment ordering process	Jan-Feb 1987
Designate individuals who will be assigned training responsibilities	Feb-Mar 1987
Train first group of trainers	Jun-Aug 1987
Begin equipment arrival	Aug 1987
Trainers assist with and participate in the in-country seminars, workshops, and conferences	Sep 1987 onward
	Year 2
Develop training program for 6-day workshops	Jan-Mar 1988
Schedule test workshops	Mar 1988
Conduct test workshops	Mar-Apr 1988
Modify training program as required	May-Jul 1988
Train second group of trainers	Jun-Aug 1988
Schedule workshops for Punjab and Sind	Aug 1988
Begin workshops in Punjab and Sind	Sep 1988
Designate institutions for training cells in NWFP and Baluchistan	Sep-Oct 1988
Begin equipment ordering process	Oct 1988
	Year 3
Designate individuals who will be assigned training responsibilities	Jan-Feb 1989

Begin equipment arrival	Mar 1989
Update training activities	May-Jul 1989
Train third group of trainers	Jun-Aug 1989
Schedule workshops for NWFP and Baluchistan	Aug 1989
Begin workshops in NWFP and Baluchistan	Sep-Oct 1989
	Year 4
Update training activities	May-Jul 1990
Train fourth group of trainers	Jun-Aug 1990
Continue in-country training operations	Sep 1990

PLAN OF WORK
POSTHARVEST INFORMATION

TITLE: Support in Postharvest Information

OBJECTIVE: Provide a centralized information source, known as the Postharvest Information Service (PHIS) through the current facilities of the NARC Directorate of Scientific Information on all aspects of postharvest grain systems for the use of researchers, technicians, extension personnel, and administrators within the various universities, institutes, research units, government agencies, and private-sector entities in Pakistan. The specific objectives are to (1) provide the centralized information source for the persons concerned with postharvest technology, (2) provide access to the database compiled by PHDS/KSU by acquiring all documents in the form of microfiche, (3) notify clients about the latest additions in this database through regular Selective Document Information (SDI) service, (4) submit Pakistani documents published on grain postharvest systems to the main database, and (5) maintain and update the client register concerned with the postharvest discipline and maintain their interest profile.

DESCRIPTION: Provide support to the Directorate of Scientific Information in five areas: (1) computer equipment required to expand the current storage capacity for computerized agricultural bibliographies, (2) equipment and supplies to increase the ability to service client requests, (3) short-term training in information systems and micrographics, (4) a copy of the (PHDS) computerized bibliography on grain postharvest documents, and (5) a copy of the PHDS specialized collection of grain postharvest systems documents on microfiche.

EXPECTED RESULTS: The establishment of a permanent file of postharvest literature to be used as a basis for document distribution to individuals and institutions involved in the grain postharvest sector in Pakistan.

<u>ACTIVITIES</u>	<u>TIME PERIOD</u>
Order equipment	Year 1 Feb 1987
Start reproduction of bibliography at KSU	May 1987
Receive equipment	Jun-Jul 1987
Review other support requirements	Jun 1987
Train personnel (information systems): individual appointed under project funding (see external short-term training work plan)	Jul-Sep 1987

Order additional supporting equipment or supplies

Aug 1987

Train personnel (micrographics): see external
short-term training work plan

Sep-Nov 1987

Years 2, 3, and 4

Receive equipment

To be programmed at
time of annual
review of work plans

Start preparation of literature files to
microfiche at KSU

Train personnel (information systems)

Place postharvest bibliography at NARC

Begin shipment of microfiche literature files

Continue shipment of microfiche literature files

Continue update of files and bibliography at NARC