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ANNUAL REPORT

REVIEW OF ACTIVITIES

FY 1991

KSU

KANSAS STATE UNIVERSITY

FOOD & FEED GRAINS INSTITUTE
MANHATTAN, KANSAS 66506

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LIST OF ACRONYMS

ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
ADRA	Adventist Relief Agency
AID	Agency for International Development
APASC	Agroindustrial Project Analysis Short Course
BFA	Banco de Fomento Agropecuario
BMB	Belize Marketing Board
CEEMAT	Centre d'Etudes et d'Experimentation du Machinisme Agricola Tropical
CILSS	Comite Permenante Inter-Etats de Lutte Contre la Secheresse dans le Sahel
CIMMYT	International Maize and Wheat Improvement Center
CIRAD	Centre de Cooperation Internationale en Recherche Agronomique pour le Developpement
CURD	Corn Utilization Research Database
DAO	District Agricultural Officer
EAP	Escuela Agrícola Panamericana
EW	East Wing (MINFA)
FAMSC	Food Aid Managers Short Course
FAO	Food and Agriculture Organization of the United Nations
FFGI	Food and Feed Grains Institute
FFP	Food for Peace
FSM	Food Security Management
FVA	Bureau for Food for Peace and Voluntary Action
GASGA	Group for Assistance on Systems Relating to Grain After-harvest
GOB	Government of Belize
GOES	Government of El Salvador
GOGB	Government of Guinea-Bissau
GOP	Government of Pakistan
GSMSC	Grain Storage and Marketing Short Course
GSRL	Grain Storage Research Laboratory
GTZ	Gesellschaft fur Technishche Zusammenarbeit (West Germany)
IDB	Inter-american Development Bank
IDRC	International Development Research Center
IGP	International Grains Program
INCAP	Instituto de Nutricion para Cento America y Panamá
INEP	Instituto Nacional de Estudos e Pesquisa, Guinea-Bissau
IRA	Institute Regulador de Abastecimiento
IRAM	Institute des Recherches et d'Applications des Methodes de Developpment
KSU	Kansas State University
LTC	Lahore Training Center
MAG-MEC	Programa de Banda de Precios
MOA	Ministry of Agriculture
MINFA	Ministry of Food, Agriculture, and Cooperatives
MSC	Multipurpose Service Center
MSU	Mississippi State University

NCBA	National Cooperative Business Association
NCGA	National Corn Growers Association
NWFP	Northwest Food Province
NRI	Natural Resources Institute
OAR	Office of AID Representative
OCOPROY	Oficina Coordinadora de Proyectos con Fondos Externos
OICD/ITD	Office of Interntional Cooperation and Development/International Training Division
ONDRI	Overseas National Development Research Institute
OSPA	Oficina Sectorial de Planificacion
PA	Planning Assistance
PAM	Policy Analysis Matrix
PARC	Pakistan Agricultural Research Corporation
PASSCO	Pakistan Agricultural Storage and Services Corporation
PDO	Project Development Officer
PEPF	Polyethylene Enclosure and Phosphine Fumigation
PFD	Provincial Food Department
PHDS	Postharvest Documentation Service
PIP	Postharvest Institute for Perishables
PMRI	Pest Management Research Institute
PPFD	Punjab Provincial Food Department
PS/TAMP	Public Sector Component/Toledo Agricultural Marketing Project
PVOs	Private Voluntary Organizations
QUA	Quad-I-Asam (University)
SADCC	South African Development Coordination Conference
S&T/AGR	Science and Technology/Agriculture
STDT	Storage Technology Development and Transfer
STL	Seed Technology Laboratory
TARI	Tropical Agricultural Research Institute, formerly PMRI
TSFDP	Toledo Small Farmer Development Project
UNAS	Universidad Nacional Agraria de la Sebro, Peru
USAID	United States Agency for International Development
VITA	Volunteers in Technical Assistance
WFPs	World Food Programmes

SECTION I

OVERVIEW

Since 1967, the Food and Feed Grains Institute (FFGI) at Kansas State University (KSU) has been providing assistance to developing countries in Africa, Asia, Latin America, and the Near East. This assistance has involved activities in the storage, handling, processing, and marketing of grain and legumes, and allied agribusiness development and operations.

Areas of Activity

Based on problems encountered in developing countries, research activities are designed to provide new information which can be used in solving problems in postharvest grain systems and agribusiness operations. These activities are of an applied or adaptive nature and are conducted under actual or simulated developing-country conditions. The overall objectives of the research activities have been to apply solutions to problems existing in developing countries, assist developing-country institutions in improving human resources and research technologies, and provide applied training for developing-country researchers. Research activities at FFGI and in developing countries are conducted by staff members as well as graduate students who are receiving academic training at KSU.

FFGI staff members and associated consultants provide technical assistance in postharvest grain systems and related agribusiness operations to organizations in developing countries through cooperation with donor agencies. These efforts address such areas as feasibility studies, marketing studies, food system studies, policy actions, marketing system improvement, development of grain reserves policies, improvement in management and operations of firms, equipment requirements and design, improvement of grain storage and handling facilities, improvement of grain storage and handling procedures, and improvement of grain preservation.

Technology transfer involves publication and dissemination of reports and instructional materials, presentation of research results at conferences and meetings, disseminating information from the Postharvest Documentation Service (PHDS), responding to technical information requests, hosting visitors, and publishing a postharvest newsletter. The purpose of technology transfer is to provide information which can be used to solve postharvest problems in developing countries.

PHDS is a computerized information retrieval system created in 1978 to centralize a collection of documents pertaining to postharvest systems of cereals, grain legumes, and oilseeds; and to distribute copies of these documents upon request. To aid in the dissemination of information on postharvest grain systems, FFGI provides access to PHDS to researchers, government agencies, and private institutions in developed and developing countries. Services available from PHDS include a bi-monthly "Documents By Mail" flyer containing new document titles in storage, computerized subject searches, and document copies.

In-country training provides for special short courses and programs which are presented upon request to institutions in developing countries who wish to strengthen the knowledge base of their personnel. These programs are designed so that the subject matter presented in the course meets the individual needs of the given developing country and the personnel undergoing training. Training manuals are prepared by the FFGI staff for each course presented overseas. In addition, staff members also take training materials with them to the training site or make arrangements for needed materials to be available upon their arrival. In-country training programs are also presented in conjunction with long-term projects such as the Storage Technology Development and Transfer (STDT) project in Pakistan. These training programs are also designed so that the subject matter presented in courses meets the individual needs of the participants. In addition to presenting training courses which are developed and sponsored by FFGI, staff members are also invited to participate in training programs sponsored by other agencies and organizations.

On-campus training includes staff support for foreign students involved in academic training at KSU, the Grain Storage and Marketing Short Course (GSMSC), the Agroindustrial Project Analysis Short Course (APASC), the Food Aid Managers Short Course (FAMSC), and special short courses and programs as requested.

Activities involving collaboration with research and developmental institutions are conducted given available resources to do so.

Contractual Arrangements

FFGI activities during FY 1991 were conducted under the contractual arrangements described below. Descriptions of project activities are attached in the corresponding appendices.

Appendix	Cooperative Agreement, Contract, or Purchase Order
I	A cooperative agreement (DAN-4144-A-00-5095-00) entitled "Postharvest Grain Systems" with AID/S&T/AGR was initiated October 1, 1985, and was in effect until February 15, 1991. A project extension, through a new cooperative agreement (DAN-4144-A-00-1020-00) was initiated February 16, 1991, and will be in effect until December 31, 1992.
II	A basic ordering agreement (DAN-4144-B-00-6002-00) with AID/S&T/AGR was initiated April 1, 1986, as a companion agreement to the cooperative agreement, and will be in effect until December 31, 1992.
III	A contract with USAID/Islamabad (391-0491-C-00-6080) entitled "Storage Technology Development and Transfer" (STDT) was initiated May 1, 1986, and will be in effect until October 31, 1992.
IV	A contract with USAID/Belize (505-0016-C-00-9097-00) entitled "Public Sector Component, Toledo Agricultural Marketing Project"

(PS/TAMP) was initiated January 1, 1989, and was in effect until March 31, 1991.

V A contract with OICD/USDA (53-319R-9-023) entitled "Agroindustrial Project Analysis Short Course (APASC)" was initiated March 1, 1989, and will be in effect until December 31, 1991.

VI A purchase order from Pakistan Participant Training Program (No. 2) entitled "Pakistani Flour Mill Executive Training Program" was initiated May 1, 1990, and was completed September 12, 1990.

VII A contract with OAR/Bissau (657-0510-C-00-0096-00) entitled "Cashew Market Study - Guinea Bissau" was initiated May 25, 1990, and was completed September 30, 1990.

VIII A contract with the National Cooperative Business Association (NCBA-1) entitled "Technical Assistance for an Assessment of Proposed Plan to Privatize the Basic Grain and Edible Bean Market in El Salvador" was initiated August 15, 1990, and was completed December 15, 1990.

IX A contract with the Rhone-Poulenc Company (Rhone-Poulenc - 1) entitled "Field Trials of Iprodione on Stored Corn in Kansas" was initiated September 1, 1990, and will be in effect until August 31, 1993.

X A contract with the National Corn Growers Association (NCGA-1) entitled "Database of Funded Research on Corn Quality and Utilization" was initiated October 1, 1990, and will be in effect until September 30, 1992.

XI A contract with OAR/Bissau (~~675~~ 657-0510-C-00-0173-00) entitled "Policy Seminar Series/Guinea-Bissau" was initiated September 1, 1990, and was completed November 31, 1991.

XII A cooperative agreement with OAR/Bissau (~~675~~ 657-0510-C-00-0096-00) entitled "Technical assistance for Project Paper Preparation (Guinea-Bissau) was initiated November 16, 1990, and was completed February 28, 1991.

XIII A purchase with OAR/Bissau (657-0510-~~0-00~~ -C-00-1042-00) entitled "CILSS Study Review/Study Recommendation" (Guinea-Bissau) was initiated April 18, 1991, and completed May 17, 1991.

XIV A contract with the Adventist Relief Agency (ADRA-1) entitled "Assistance for Food Handling and Storage Workshop" was initiated May 18, 1991, and was completed June 9, 1991.

XV A contract with Planning Assistance (PA-2) entitled "Technical Assistance to the Institute of Nutrition for Central America and Panama (INCAP)" was initiated April 15, 1991, and will be in effect until November 30, 1991.

Staff

Ulysses Acasio, Storage and Processing Engineer -- Major areas of expertise include storage, drying, processing, handling, and mixing of grains and their by-products with special emphasis on rice milling equipment, procedures, and operations. Long-term advisor to the STDT project in Pakistan.

Maurice Baalman, Market Research Analyst -- Major areas of expertise include construction, application, and operation of computer programs to marketing research techniques.

Roe Borsdorf, Agricultural Economist/Coordinator -- Major areas of expertise include marketing management, marketing systems analysis, price and commodity analysis, analytical techniques, warehouse management, and project management. Manages day-to-day operations of FFGI.

Do Sup Chung, Storage and Processing Engineer -- Major areas of expertise include storage, drying, processing, handling, and mixing of grains and their by-products, and systems analysis.

Charles Deyoe, Director -- Major areas of expertise include protein quality evaluations of cereal grains, feed manufacturing processes, and nutritive value of ingredients.

Merla Brookman, Keyboard Operator II -- Major responsibilities include preparing and editing training manuals and supplemental materials; preparing and distributing technical assistance reports, research reports, and special reports; typing correspondence; typing and submitting trip reports; handling electronic mail.

Karen Dungey, Office Specialist -- Major responsibilities include assisting the coordinator in the day-to-day operations of FFGI including maintaining travel records on staff members, preparing travel requests and vouchers, preparing activity reports, maintaining FFGI filing system, processing procurement orders, payment vouchers, and assisting in the preparation of budgets, proposals, amendments, and contracts.

Ekramul Haque, Storage and Processing Engineer -- Major areas of expertise include storage, drying, processing, handling, and mixing of grains and their by-products.

Cornelius Hugo, Agricultural Economist -- Major areas of expertise include grain marketing, price and commodity analysis, feasibility analysis, computer application to marketing, warehouse and facility management, and project management.

Khalid Kebatti, Linguist -- Major areas of expertise are simultaneous interpretation and written technical translations in French and Arabic.

John Lea, Agricultural Economist -- Major areas of expertise include marketing research, food policy, and the application of microcomputer to numerical analysis.

Richard Maxon, Agricultural Economist -- Major areas of expertise include marketing research, development, and policy. Long-term advisor and Chief-of-Party for the STDT project in Pakistan.

Mary Ann Muth, Keyboard Operator II -- Major responsibilities include preparing and editing training manuals and supplemental materials; preparing and editing technical assistance reports, research reports, and special reports; typing correspondence.

Kenneth Neils, Agricultural Economist -- Major areas of expertise include marketing analysis, marketing strategies, food policy, and the application of microcomputer to marketing research.

John Pedersen, Grain Storage Specialist -- Major areas of expertise include stored-grain insects and their control, grain quality preservation, food plant sanitation, integrated pest management programs, warehouse and facility management, and research project management.

Richard Phillips, Agricultural Economist -- Major areas of expertise include grain marketing, food systems development, policy analysis, and computer application to marketing and policy analysis.

Carl Reed, Grain Storage Specialist -- Major areas of expertise include stored-grain insects and their control, grain quality preservation, integrated pest management programs, and research project management.

Donna Schenck-Hamlin, PHDS Coordinator -- Major areas of expertise include computerized informational services and management of information systems. Manages day-to-day operations of PHDS.

Department of Grain Science and Industry -- Millers, Bakers, Feed Manufacturing Specialists, Operational Specialists, Nutritionalists, Cereal Chemists

Lembeck and Associates, Consulting Engineers -- Major areas of expertise include storage, drying, processing, handling, mixing of grains and their by-products, and related systems engineering and management.

Staff Utilization

The following table summarizes staff time input to all activities. Additional details by activity category and project activity are presented in the appendices.

Activity Category	Person-Days	Percent of Total Time
Research	324.0	8.8
Technical Assistance	1,237.0	33.6
Technology Transfer	1,024.0	27.8
Training	435.5	11.8
Networking	22.0	0.6
Administrative Support	642.0	17.4
TOTAL	3,684.5	100.0

SECTION II

SUMMARY OF PROJECT ACTIVITIES

Research

Research activities conducted during the past year are described below by project and research activity.

Postharvest Grains Systems

- Design, construction, and testing of a natural convection grain dryer
- Effectiveness of chlorpyriphos-methyl as a grain protectant under varied conditions of storage
- Naturally-occurring pesticides, Phase 3
- Three-roller cereal mill and milling using triangular roll configuration
- Effect of rice storage conditions on milling
- Field infestation of grains by stored-product insects
- Development and application of a computerized system for feasible agribusiness development for microcomputer application
- Analysis of food grain security programs in developing countries
- Quantitative analysis to support developing-country grain policies and programs
- Improvement of grain marketing systems in developing countries

STDT

- Insect resistance to pesticides
- Integrated pest management protocols
- Fumigation techniques and programs
- Bulk wheat handling and storage

Field Trials of Iprodione on Stored Corn in Kansas

- Large scale trials of Iprodione in stored corn
- Effect of formulation and time of treatment on efficacy of Iprodione

Technical Assistance

Technical assistance activities conducted during the past year are described below by country, staff member or consultant, project and activity.

Country	FFGI Staff	Project/Activity
Belize	Kenneth Neils	PS/TAMP, long-term advisor to project
Belize	Ekramul Haque	PS/TAMP, assistance in implementing improvements for Belize Marketing Board (BMB) rice mill complex

Country	FFGI Staff	Project/Activity
El Salvador	Cornelius Hugo	Technical Assistance for an Assessment of Proposed Plan to Privatize the Basic Grain and Edible Bean Market in El Salvador, team leader for three-person team in assessment of feasibility of proposed plan
Guinea-Bissau/ USA	John Lea	Cashew Market Study, conduct study, analysis, and prepare report
USA	Cornelius Hugo	Cashew Market Study, study analysis and prepare report
Guinea-Bissau	John Lea	Guinea-Bissau Policy Seminar, conduct a series of policy seminars relating to rice and cashew markets
Guinea-Bissau	John Lea	Technical Assistance for Project Paper Preparation (Guinea-Bissau), design a project concentrating on actions leading to privatization in the agricultural sector
Guinea-Bissau	John Lea	CILSS Study Review/Recommendation (Guinea-Bissau), review CILSS report on Guinea-Bissau agricultural sector and make recommendations for future courses of action
Pakistan	Richard Maxon	STDT, long-term advisor and chief-of-party for project
Pakistan	Ulysses Acasio	STDT, long-term storage and training advisor
Pakistan	Donald Erickson Patrick Gormely	STDT, non-degree academic training program design
Pakistan	Donald Erickson Andrew Barkley	STDT, non-degree academic training program implementation
Pakistan	Patrick Gormely Donald Erickson	STDT, non-degree academic training program implementation
Pakistan	Roe Borsdorf	STDT, assist with the Bulk Wheat Handling and Storage Conference

Country	Consultant	Project/Activity
Guinea-Bissau	Carlos Cardoso	Cashew Market Study, assist in conduct of study
Guinea-Bissau	Roger Fox	Guinea-Bissau Policy Seminar, conduct a series of policy seminars relating to rice and cashew markets
Guinea-Bissau	Mark Langworthy	Technical Assistance for Project Paper Preparation (Guinea-Bissau), design a project concentrating on actions leading to privatization in the agricultural sector
Pakistan	Marilou Montemayor	STDT, bulk wheat handling and storage research program performance evaluation
Pakistan	Asif Javed	STDT, equipment fabrication, repair and maintenance
Pakistan	Gary Gilbert	STDT, mechanization of bulk wheat procurement and bulk wheat storage, silo management systems
Pakistan	Arif Javed	STDT, design and procurement of local manufactured equipment
Pakistan	Hofiz Ahmed	STDT, advise and conduct research in grain quality protection
USA	Gary Gilbert	STDT, prepare operation manuals for equipment and grain cleaning

Technology Transfer

Reports and Instructional Materials

TECHNICAL ASSISTANCE REPORTS

Hafeez Ahmed, M. Sajjad Ahmad, T. Mahmood, and M. Ahmed. Integrated Pest Management in Hexagonal Bins, Storage Technology Development and Transfer Project Report No. 5, Kansas State University, Food and Feed Grains Institute

Lea, J., C. Hugo, and C. Cardoso. 1990. "A Review of the Cashew Subsector in Guinea-Bissau", Technical Assistance Report 119, Kansas State University, Food and Feed Grains Institute

Neils, K., and F. Gorrez. 1991. "Strategy for Privatization of the Marketing Centers and the Marketing Board's Big Falls Rice Complex in Toledo (Belize)",

Public Sector Component/Toledo Agricultural Marketing Project, Report No. 4, Kansas State University, Food and Feed Grains Institute

SPECIAL REPORTS

Lea, J., C. Hugo, K. Kebatti, K. Dungey, and M. Baalman. May 1991. "Glossary of Terms - English, Spanish, French - Marketing, Volume II", Special Report No. 29, Kansas State University, Food and Feed Grains Institute

Phillips, R. February 1991. "Economic Impact Analysis for Agroindustrial Development", Special Report No. 30, Kansas State University, Food and Feed Grains Institute

Phillips, R. March 1991. "Programma Para el Analisis de Factibilidad Economica Para uso en Microcomputadores con MS-DOS", Supplement to Special Report No. 23, Special Report No. 31, Kansas State University, Food and Feed Grains Institute

OTHER PUBLICATIONS

Anderson, K., B. Schurle, C. Rees, and J. Pedersen. 1990. "An Economic Analysis of Producer's Decisions Regarding Insect Control in Stored Grain", North Central Journal of Agricultural Economics 12(1):23-24

Chung, D., and K. Park. 1990. "Importance of Feed Quality for Livestock Production", Korea Journal of Vet. Res., Vol. 3, No. 2, 5-18

Chung, D. 1990. "Evaluation of Imported Feed Grains Handling and Distribution Systems in Korea", Korea Feed Association

Chung, D., and J. Lee. 1991. "Principles of Parameters for Grain Cleaning and Separation", Uniformity by 2000, Proceedings of International Conference of Maize and Soybean Quality, 103-123

Haque, E. "Theory of Size Reduction and Application to Roller Mill Design and Operation", paper presented at the first engineering symposium of the American Association of Cereal Chemists Annual Meeting, October 16, 1990, in Dallas, TX

Haque, E. "A Modular On- and Off-Farm Grain Dryer for Developing Countries", paper presented at the American Society of Agricultural Engineers Winter Meeting 1990, December 18-21, 1990, in Chicago, IL

Haque, E. "Theory of Size Reduction and Application to Roller Mill Design and Operation", Cereal Foods World

Maxon, R., and U. Acasio. Bulk Handling and Storage of Grain: A Pakistan Experience, paper presented at the 13th ASEAN Technical Seminar on Grain Postharvest Technology, Bandar Seri Bagawan, Brunei Darussalam, September 4-7

Montemayor, M. Estimated Cost of Bulk Handling of Wheat at PASSCO Storage Complex, Depalpur, Consultants Report, Storage Technology Development and Transfer project

Montemayor, M. Performance of Bulk Handling Equipment at PASSCO Storage Complex, Depalpur, Consultants Report, Storage Technology Development and Transfer Project

Reed, C., K. Anderson, J. Brockschmidt, V. Wright, and J. Pedersen. 1990. "Cost and Effectiveness of Chemical Insect Control Measures in Farm-Stored Kansas Wheat", Journal of the Kansas Entomological Society 63(3):351-360

Reed, C., V. Wright, T. Mize, and J. Pedersen. 1991. "Pitfall Traps and Grain Samples as Indicators of Insects in Farm-Stored Wheat", Journal of Economic Entomology 83(4):1381-1387

Song, A., D. Chung, and R. Nassar. 1990. "A Stochastic Compartmental Model Simulating a Grain Cleaning Process", Transactions of ASAE, Vol. 33, No. 3, 877-844

Publications and theses authored by FFGI staff-supported graduate students are as follows:

Cassama, M. 1991. "Farm Level Grain Storage in Guinea-Bissau", Masters Report, Kansas State University, Manhattan, KS

Hooshmand, H. 1991. "Effect on Gamma Irradiation on Mycotoxin Degradation and Protein Quality of Grains with Different Moisture Content", M.S. Thesis, Kansas State University, Manhattan, KS

Ullah, N. 1990. "White Sagebrush, Artemesia ludoviciana Nutt. (Asteraceae) Flower Extract as a Protectant for Wheat Against Stored-Product Insects", PhD Dissertation, Kansas State University, Manhattan, KS

Wongo, L. Factors of Resistance in Sorghum Against Sitotroga cerealella (Oliv.) and Sitophilus oryzae (L.), Insect Sci. Applic., Vol. II, No. 2, pp 179-188, 1990

TRAINING MANUALS AND BOOKLETS

Acasio, U., R. Maxon, A. Javed, and S. Khan. Operation and Maintenance Manual for Bulk Handling Equipment, training manual in English and Urdu, Lahore Training Center, Storage Technology Development and Transfer Project

Ahmed, H., and S. Khan. Stacking in Godown, training manual in Urdu, Lahore Training Center, Storage Technology Development and Transfer Project

Ahmed, H., and S. Khan. Pest Control in Stored Produce, training manual in Urdu, Lahore Training Center, Storage Technology Development and Transfer Project

Ahmed, H., and S. Khan. Principal Stored-Grain Insects, training manual in Urdu, Lahore Training Center, Storage Technology Development and Transfer Project

Ahmed, H., and S. Khan. Inspection, Housekeeping, and Godown Management, training manual in Urdu, Lahore Training Center, Storage Technology Development and Transfer Project

FFGI Staff. "Flour Mill Executive Training Program", training manual, Pakistani Flour Mill Executive Training Program Project, Kansas State University, Food and Feed Grains Institute

FFGI Staff. "Food Aid Managers Training Course, Grain and Grain Products", training manual, Food Aid Managers Training Course, Grain and Grain Products Project, Kansas State University, Food and Feed Grains Institute

Lahore Training Center Staff. Important Pests of Stored Grain, training manual in Urdu, Lahore Training Center, Storage Technology Development and Transfer Project

Lahore Training Center Staff. Pest Control in Stored Wheat, training manual in Urdu, Lahore Training Center, Storage Technology Development and Transfer Project

Report and Instructional Material Distribution

FFGI distributed 213 technical assistance reports, 104 research reports, 331 special reports, and 17 working papers, for a total of 665 in response to requests for such publications. A listing by country of the reports distributed is shown in Table 1.

FFGI distributed 325 training manuals in conjunction with training courses, and 900 training manuals supplied to developing country organizations with no training course conducted for a total of 1,225. A listing by country of training manual distribution is shown in Table 2.

Presentation of research results

Ulysses Acasio and Richard Maxon presented a paper entitled "Bulk Handling and Storage of Grain: A Pakistan Experience" at the 13th ASEAN Technical Seminar on Grain Postharvest Technology in Bandar Seri Bagawan, Brunei Darussalam, September 4-7. At the closing ceremony, a citation was awarded to them for an outstanding conference paper having scientific merit and potential application to the ASEAN region.

Ekramul Haque presented a paper entitled "Theory of Size Reduction and Application to Roller Mill Design and Operation" at the first engineering symposium of the American Association of Cereal Chemists Annual Meeting, October 16, 1990, in Dallas, TX.

Ekramul Haque presented a paper entitled "A Modular On- and Off-Farm Grain Dryer for Developing Countries" at the American Society of Agricultural Engineers Winter Meeting 1990, December 18-21, 1990, in Chicago, IL.

PHDS

In FY 1991, PHDS increased its acquisitions by 1,367 documents to bring the total number of documents in the collection to 19,909. The total number of clients is 1,488, an increase of 185 from FY 1990. PHDS responded to 8,832 requests in FY 1991, bringing the total number to 45,879 since PHDS began its operations.

The dramatic increase in requests during FY 1991 may be attributed to the success of the bi-monthly "Documents by Mail" flyer, introduced this year as a smaller, selective version of the previous "Acquisitions List" which was distributed semiannually.

Table 3 summarizes the document requests fulfilled by PHDS during FY 1991. Documents and searches for information were provided to individuals and institutions in 65 different countries. The number of requests as well as the distribution of requests indicates the need for information by researchers, extension personnel, project managers, and administrators in developing countries.

PHDS continues to explore opportunities for acquiring from, and sharing with, other institutions computerized postharvest reference materials. Donna Schenck-Hamlin traveled to Escuela Agricola Panamericana (EAP) September 23-30, 1990, in Zamarano, Honduras, to collaborate with EAP and the Postharvest Institute for Perishables (PIP) in developing a proposal for cooperative data transfer between these three organizations.

PHDS has initiated a new database service for NCGA. This is described in Appendix X. A preliminary proposal has also been submitted to the Stored Product Insects Research and Development Laboratory in Savannah, Georgia, for cataloging their 17,000 document reprint collection of stored-product pest control. A request for a similar proposal has been received from an entomological research center of Agriculture Canada located in Winnipeg.

Database of Funded Research on Corn Quality and Utilization

In 1990, under a project funded by NCGA, the development of a database that would centralize project information on corn utilization and quality research was initiated.

During 1991, all retrospective project information from NCGA and its associated State Corn Growers Associations was collected and cataloged into the Corn Utilization Research Database (CURD). Over 700 documents were collected that provide directory access to investigators, descriptions of the scope and approach to the work, and lists of sponsors of the research.

In addition, international project information from several countries has been collected. Corn utilization research described in the database includes work on biodegradable plastic products, test of ethanol in commercial vehicles, development of deicers from cornstarch, and coal desulfurization. Projects dealing with corn quality as it pertains to end uses are also included.

Postharvest Newsletter

FFGI published October 1990 and April 1990 issues of the Postharvest Newsletter. This newsletter is directed towards maintaining contact with past academic and short course graduates for the purpose of providing such individuals with a means by which to keep updated on current actions in the world postharvest grains agribusiness sector.

In-Country Training

In-country training activities conducted during the past year are described below by country, staff member, project, and activity.

Country	Staff	Project/Activity
Belize	K. Neils	PS/TAMP, Paddy Pricing/Purchasing Workshop - 140 participants
Belize	E. Haque	PS/TAMP, two-day workshop in grain handling, conditioning, and storage and a grain drying demonstration -- five participants
Belize	E. Haque	PS/TAMP, training provided to farmers in the construction and operation of the natural convection grain dryer and drying procedures -- five participants
Belize	K. Neils	PS/TAMP, on-the-job training for BMB personnel -- six participants
Bolivia	C. Reed	Assistance for Food Handling and Storage Workshop (ADRA) -- 44 participants
Pakistan	U. Acasio	STDT, LTC Staff, Grain Handling, Drying, Storage, and Protection Short Courses -- 48 participants
Pakistan	R. Maxon	STDT, U. Acasio, Flour Milling Technical Seminars -- 107 LTC staff participants
Pakistan	U. Acasio	STDT, LTC Staff, PPFP Fumigation Program Demonstrations and Training -- 122 participants
Pakistan	R. Maxon	STDT, U. Acasio, Bulk Wheat Handling Equipment Operations LTC staff training -- 100 participants
Pakistan	R. Maxon	STDT, U. Acasio, Bulk Wheat Handling and Storage Conference LTC Staff - 98 participants
Pakistan	R. Maxon	STDT, U. Acasio, Flour Milling Technology Seminar -- 20 participants

On-Campus Training

Academic Training Support

The four academic disciplines are agricultural economics, agricultural engineering, entomology, and grain science. Students can work toward M.S. and Ph.D. degrees in these fields. FFGI staff advise and assist students sponsored by other national and international organizations who are working on degrees in fields related to postharvest storage, handling, and marketing practices. In FY 1991, staff members assisted 11 such students from nine countries.

Country	Name	Subject
Costa Rica	E. Arce-Diaz	Agricultural Economics
	W. Barantes	
Honduras	A. Reyes	
	R. Ingle	
Korea	Y. Kwon	
Pakistan	H. Shah	
Zambia	K. Mulenga	
China	Y. Wang	Agricultural Engineering
Costa Rica	O. Negrini	
Indonesia	P. Guritno	Grain Science
Pakistan	F. Anjum	

Students who have completed their academic training and received degrees include F. Anjum, Ph.D. in Grain Science; O. Negrini, M.S. in Agricultural Engineering; and K. Mulenga, M.S. in Agricultural Economics.

Anjum returned to his position with the University of Faisalabad in Pakistan as associate professor in cereal chemistry. He has established a quality control laboratory and is working with the flour milling industry in improving the quality of milled products. Negrini returned to his position with the Consejo Naccional de Produccion in Costa Rica.

Grain Storage and Marketing Short Course (GSMSC)

GSMSC has been presented annually at KSU since 1970. A brochure describing the course is sent each year to USAID missions, other institutions in developing countries, and individuals who have expressed interest in this type of training.

The course is directed towards persons involved in the storage and marketing of cereal grains and legumes in developing countries. Its objective is to increase the knowledge and skills of these persons in the areas of fundamentals of grain storage, causes and prevention of grain loss, grain inspection and loss assessment, grain movement and storage from production to consumption, management and operation of grain businesses, grain pricing and marketing cost relation-

ships, marketing management, auxiliary market functions, and analytical techniques related to grain marketing.

Participants in the seven-week course receive three weeks of instruction on the basic aspects of grain storage and marketing. This basic instruction is followed by three weeks of in-depth instruction in which each participant chooses to specialize in grain storage or grain marketing. Field trips and a seven-day study tour to observe farms, grain elevators, equipment manufacturers, regulatory and research agencies, port facilities, cooperatives, and a board of trade augment the on-campus lectures, laboratory sessions, and discussions. The course is conducted in English with simultaneous interpretation into Spanish and French. Written materials are available in these three languages.

The FY 1991 GSMSC was held at KSU from June 3 - July 19, 1991. The course was attended by 12 participants from eight countries as follows.

Country	Name
Botswana	L. Modidi
Burkina Faso	K. Kabore
Guatemala	J. Ruiz
Morocco	A. Ait El Cadi
	R. El Mezroui
Mexico	E. Herrera
	C. Livas-Hernandez
	J. Zuniga
Nicaragua	E. Vanegas
	G. Perez
Panama	A. Gonzales
Venezuela	E. Guarecuco

Agroindustrial Project Analysis Short Course (APASC)

The objectives of APASC are to train developing country participants in a practical analysis of small- and medium-scale agroindustrial or agribusiness projects within a marketing, procurement, and processing systems framework. Participants will develop knowledge and skills to: (1) identify critical marketing, production, procurement, processing, and distribution components in agroindustrial projects, (2) identify data collection and analysis needs for each component, (3) calculate financial and economic impacts, (4) determine internal rates of return on investment, and (5) identify socioeconomic and institutional factors that affect agroindustrial projects.

The FY 1991 APASC was held at KSU from July 2 - August 10, 1990. The course was attended by 13 participants from 11 countries as follows.

Country	Name
Burundi	P. Camirirwa
Burundi	R. Ntareme
Cameroon	N. Joseph
Egypt	A. Mostafa
Honduras	G. d'Estephan
Indonesia	T. Napitupul
Nepal	T. Shrestha
Pakistan	H. Shah
Rwanda	S. Mugesera
Rwanda	A. Uwizeye
Turkey	Y. Koca
Zimbabwe	A. Rukovo
Zaire	T. Mulubay

Food Aid Managers Short Course (FAMSC), Grain and Grain Products

The purpose of FAMSC, Grain and Grain Products, of the course is to promote non-expert familiarity with the (1) technical aspects of grain and grain products, and (2) procurement and managerial procedures which are necessary for the movement of commodities from producer to final recipient in a developing country.

The FY 1991 FAMSC, Grain and Grain Products, was held at KSU from August 13 - 20 1990. The course was attended by 26 participants as follows.

AID MISSIONS
Cheryl Anderson, USAID/Kinshasa
Martial Bailey, USAID/Port-au-Prince
Jose Barber, USAID/Praia
William Barclay, USAID/Khartoum
Juan Castillo, USAID/Tegucigalpa
Dale Humphrey, USAID/Guatemala City
John Huxtable, USAID/Islamabad
Tim O'Connor, USAID/Kingston
Steve Szadek, USAID/Belize City
Moussa Simaga, USAID/Bamako

AID/WASHINGTON
Sylvia Graves, Office of Food for Peace
Ricki Gold, Office of Food for Peace
Joe Langlois, Office of Food for Peace
Jane Stanley, Office of Food for Peace
Sheldon Schwartz, Office of Food for Peace
Todd Kemp, Bureau of Food for Peace and Voluntary Action

PRIVATE VOLUNTARY ORGANIZATIONS
John Marks, Save the Children Federation
Katharina Puffenberger, Africare
Kenneth Wood, Feed the Children
Sister Ann Duggan, Catholic Relief Services

William Jensen, Adventist Development and Relief Agency
Stan Schirm, Food for the Hungry
Borys Chinchilla, CARE/Guatemala

WORLD FOOD PROGRAMME
A. Gotzmann, Chief - Training and Staff Development Unit
J. Roy, Assistnat Project Officer/Chad

UNITED STATES DEPARTMENT OF AGRICULTURE
Ernie Coggins, Foreign Agricultural Service

Flour Millers Executive Training Program

A Flour Mill Executive Training Program for two Pakistan flour mill executives was conducted July 7 - August 11, 1990.

The training program participants were: Sheikh Mohammed Shabbir, Chief Executive Officer, Rawalpindi Flour and General Mills Ltd., Peshawar Road, Rawalpindi, Pakistan; and Sheikh Tariq Sadiq, Executive Director, Sinhala Flour and General Mills Ltd., I/9 Industrial Area, Islamabad, Pakistan.

The training program included attendance in a two-week International Grains Program (IGP) Flour Milling Short Course. The remaining three weeks of the program provided training in grain quality preservation, grain storage and handling, and flour quality control. A series of field trips to private-sector milling operations, storage and handling facilities, and related businesses was conducted.

Networking

Group for Assistance on Systems Relating to Grain After-harvest (GASGA)

FFGI has been a member of GASGA since 1974. This group, which includes the member nations of West Germany, France, Canada, Great Britain, Australia, the Netherlands, the United States, and the Food and Agriculture Organization (FAO) of the United States, attempts to reduce food losses and increase the quantity and quality of food available to people in developing countries. John Pedersen attended the 23rd Annual GASGA Executive Meeting June 10-14, 1991, in Bulawayo, Zimbabwe. The executive meeting was hosted by the International Development Research Center (IDRC) in conjunction with IDRC's regional office in Nairobi, Kenya.

Seed Technology Laboratory (STL), Mississippi State University (MSU)

Each year, for the past several years, STL and FFGI have exchanged faculty for lectures during their respective short courses. John Pedersen traveled to Mississippi State, MS, to lecture at the Seed Improvement Training Course conducted by STL. Travel dates were June 17-19, 1991.

Activities involved lectures covering grain and seed infesting insects, insect biology and identification, rodent and bird biology and identification, and

integrated pest management in seed storage. Outline manuals were prepared and distributed to the course participants.

Escuela Agrícola Panamericana (EAP)

Cornelius Hugo traveled to Honduras June 26 - July 6, and November 23 - December 1, 1990, to assist EAP in preparing a training proposal in the proper format to present to the Interamerican Development Bank (IDB).

TABLE 1

DISTRIBUTION OF FFGI REPORTS

Country	Technical Assistance Reports	Research Reports	Special Reports	Working Papers
Argentina			1	
Australia		1		
Belize		2	4	1
Benin		3		
Botswana		1		
Brazil	4	2	2	1
Burundi			2	
Cameroon	1		4	
Canada			2	
China			2	
Colombia	1			
Ecuador	1		1	
Egypt			2	
El Salvador			7	
Ethiopia	1			
Gambia			1	
Ghana	1	1	1	
Guinea-Bissau	2		2	1
Guyuana			1	
Haiti	1		1	
Honduras	4	8	6	1
Hungary			2	
India		1		
Indonesia		2	118	
Japan		1		
Jordan		1		
Kenya	8		5	1
Mali			1	
Mexico	7	1	6	2
Morocco	67	17	21	2
Mozambique	1			
Myanmar			2	
Nepal	1	2	3	
Nigeria	12	6	7	1
Pakistan	1	1	3	
Panama		2		
Paraquay			3	1
Philippines			1	
Poland			4	2
Rawanda		4	9	1
Sudan	1			
Tanzania	4		3	
Tunisia	7	7	3	1

TABLE 1 (Continued)

DISTRIBUTION OF FFGI REPORTS

Country	Technical Assistance Reports	Research Reports	Special Reports	Working Papers
Turkey			10	
Uganda	3		1	
USA	61	37	54	
United Kingdom	17	2		1
Yugoslavia			2	1
Zaire			2	
Zambia			4	
Zimbabwe	1	2	29	
TOTAL	213	104	331	17

TABLE 2

DISTRIBUTION OF TRAINING MANUALS

Country	Training Manuals/ with Training Courses	Training Manual/ no Training Courses
Belize	1	
Botswana	1	
Burundi	2	
Burkina Faso	1	
Cape Verde	1	
Cameroon	1	
Chad	1	
Egypt	1	
Guatemala	3	
Haiti	1	
Honduras	2	
Indonesia	1	
Jamaica	1	
Mali	1	
Mexico	2	
Morocco	2	
Nepal	1	
Pakistan	279	900
Panama	1	
Rawanda	2	
Sudan	1	
Turkey	1	
USA	14	
Venezuela	1	
Zaire	2	
Zimbabwe	1	
TOTAL	325	900

TABLE 3

DISTRIBUTION OF POSTHARVEST DOCUMENTATION SERVICE DOCUMENT REQUESTS

Country	Category				
	Biological	Economic	Engineering	Nutrition	General
Africa					
Benin	7				
Cameroon	13	44	7	3	7
Ethiopia	18	20	25	25	2
Gambia		5			1
Ghana	77	38	52	34	9
Guinea-Bissau		5			1
Ivory Coast	4	5	6	2	1
Kenya	22	7	9	1	2
Malawi	21	9	21	13	2
Nigeria	338	309	713	310	41
Senegal	5	1	25	3	9
Sudan	38	15	40	24	3
Tanzania	47	25	59	30	4
Uganda	15	12	19	4	
Uruguay	4	4	18	1	3
Zambia	15	24	26	13	8
Zimbabwe	57	27	48	16	16
Asia					
Bangladesh	1	14	17	7	
China	4	6	10	19	2
Fiji	3		1	1	
India	221	170	266	166	24
Indonesia	40	37	69	41	3
Malaysia	18	14	78	19	7
Myanmar	31	15	29	27	3
Nepal	26	28	57	14	5
Pakistan	81	18	76	22	12
Philippines	96	72	220	104	32
Sri Lanka	12	4	21	3	
Taiwan	8				
Thailand	39	18	96	39	10
Western Samoa		2			
Near East					
Cyprus	6	2	5		
Egypt	5	5	11	3	
Israel	29	8	35	1	4
Morocco	38	97	89	13	14
Tunisia	18	31	34	11	3
Yemen	1		1		

TABLE 3 (Continued)

DISTRIBUTION OF POSTHARVEST DOCUMENTATION SERVICE DOCUMENT REQUESTS

Country	Category				
	Biological	Economic	Engineering	Nutrition	General
Latin America and Caribbean					
Argentina	22	4	20	10	1
Belize	2	26			2
Brazil	104	55	185	39	8
Chile	13	4	17		
Colombia	48	46	92	67	5
Costa Rica	40	14	120	12	5
Cuba	15	2	38	14	2
Ecuador	11	2	12	16	3
Guatemala	7	2	2	2	1
Haiti		1	3	3	3
Honduras	23	18	32	8	5
Jamaica	21	21	43	34	3
Mexico	214	97	261	120	15
Paraguay	1		4	2	1
Peru	2	11	24	30	4
Venezuela	3	6	12	12	1
Europe					
Belgium	5	3			1
France	4		2	1	
Germany	15	6	10	2	4
Netherlands	2		6	5	
Poland		1			
Turkey	6	35	48	13	2
United Kingdom	25	3	33	8	1
North America					
Canada	13		10	3	1
USA	120	63	81	33	35
Australia					
Australia	1			1	1
TOTAL	1,955	1,511	3,238	1,404	332

SECTION III

IMPACT STATEMENT

FFGI attempts to assess the impact of its activities. However, it is often difficult to evaluate the exact results in well defined or quantitative terms. Many times, evaluations cannot be conducted to assess the results of the transfer of research findings, technical assistance, provisions of information, or training because funding to conduct an evaluation process is not available.

Postharvest Grain Systems

In FY 1991, PHDS responded to 8,832 requests from 65 countries for documents and database searches. The dramatic increase in requests during FY 1991 may be attributed to the success of the bi-monthly "Documents by Mail" flyer, introduced this year as a smaller, selective version of the previous "Acquisitions List" which was distributed semiannually.

The number of requests is nearly equal to FY 1988, FY 1989, and FY 1990 combined. It is obvious that there is a great need for information sources arising in developing countries or that the need has always existed but could not be satisfied by previous methods. PHDS has developed a process with which to inform those who are in need, and the response has been overwhelming.

Results of research conducted in development and application of a computerized system for feasible agribusiness development for microcomputer application have been published in Special Report Nos. 13, 14, 15, 17, 20, 20 Revised, 23, 24, 25, 26, 27, 30, 31, and 32. While these reports have been widely distributed, they are now being used as supplements to training manuals. Thus, the impact of this research is being furthered by a different method of distributing the results of research.

Grain Storage and Marketing Short Course (GSMSC)

GSMSC was presented to 12 participants from eight countries. A written evaluation was completed by participants at the end of the course. As in past years, the participants were generally very satisfied with the training they had received, and 10 of 12 participants in the 1991 course indicated they would recommend this course to others with similar interests and responsibilities. The course is evaluated based on a numerical scale from 1 to 5, with 1 being the lowest score and 5 being the highest. The overall rating of the course was 3.7. The course objectives were evaluated on their importance and how well they were achieved. For the storage group, the objectives were scored 4.2 for importance and 3.9 for achievement. For the marketing group, the objectives had a score of 4.3 for their importance and 3.6 for achievement. Instructional methods used in the course received a score of 3.9, and the course materials a 4.2 score. Satisfaction with field trips was rated at 4.6 with relevancy of visits given a 3.5 score. Total course administration and logistics received a 4.3 score.

Students who have completed their academic training and received degrees included F. Anjum, Ph.D. in Grain Science. This individual returned to his position with

the University of Faisalabad in Pakistan as associate professor in cereal chemistry. He has established a quality control laboratory and is working with the flour milling industry in improving the quality of milled products.

Food Aid Managers Short Course (FAMSC), Grain and Grain Products

FAMSC, Grain and Grain Products was presented to 26 participants from AID/Washington, AID field missions, private voluntary organizations (PVO), World Food Program (WFP), and United States Department of Agriculture (USDA). A written evaluation was completed by participants at the end of the course. The course is evaluated based on a numerical scale from 1 to 5, with 1 being the lowest score and 5 being the highest. The overall rating of the course was 3.8. The course content was rate at 3.8 for importance and 3.2 for achievement of valuable information gained. Satisfaction with field trips was rated at 3.7 with relevancy of visits given a 3.5 score. Twenty-four out of 25 participants would recommend this course to other individuals with similar backgrounds and interests.

Storage Technology Development and Transfer (STDT)

The indicators for impact in this project are as follows:

IMPROVEMENT OF PUBLIC-SECTOR STORAGE PRACTICES

In-country training: 1991 -- trained 484 persons in bulk handling and improved storage practices. 1988-1990 -- trained 1,485 persons in bulk handling and improved storage practices.

External training: 1988-1991 -- 54 persons, short-term, including research personnel, training in bulk handling and improved storage practices. 1988-1991 -- 3 persons received graduate degrees in area of postharvest grain systems.

Economic research: Economic analysis of wheat grades and buying standards, and economic analysis of storage policies (studies were incorporated into policy benchmarks by the Ministry of Agriculture, Food, and Cooperatives (MINFA)).

Publications: Grain Storage Reference Manual, 1989, English and Urdu; Important Pests of Stored Grain, 1991, Urdu; Pest Control in Stored Wheat, 1991, Urdu; and Integrated Pest Management in Hexagonal Bins, 1991, English.

In addition to copies of these manuals supplied to each individual who participated in a training course, over 1,000 copies have been distributed to the Pakistan Agricultural Storage and Services Corporation (PASSCO), the Punjab Provincial Food Department (PPFD), and the private sector for use by their employees.

MECHANIZATION OF STORAGE AND DISTRIBUTION

Collection and storage of wheat in bulk: 1990 -- 11,700 tons, 1991 -- 6,800 tons (PASSCO and PPFD unable to meet purchase quotas of 20,000 tons), 1991 -- modification of conventional bagged-grain warehouse for bulk storage of wheat (capacity increase from 1,100 tons to 1,600 tons per warehouse), 1991 --

development of mobile bulk wheat loading equipment for bulk procurement operations, 1991 -- completion of rehabilitation of 110,000 tons bulk storage silos according to designs and specifications provided in 1989 and 1990, 1991 -- installation of silo aeration controllers for improvement in wheat quality preservation program, and 1991 -- Bulk Wheat Handling and Storage Conference furthered the concept of handling and storing wheat in bulk.

STRENGTHENING GRAIN STORAGE RESEARCH

1987-1989:	Provision of major research equipment for Grain Storage Research Laboratory (GSRL), Karachi
1988-1990	Conduct of grain quality surveys and development of wheat grades and standards
1988-1989	Conduct of large scale bagged storage research
1990-1991	Development of low-cost, simplified technique for screening insect resistance to control measures
1991	Research presentations at Bulk Wheat Handling and Storage Conference

INVOLVEMENT OF PRIVATE SECTOR

1990-1991	Delivery of wheat in bulk to flour mills
1989-1991	Seminars for flour milling industry
1990	Partial design and economic analysis of port grain handling facility
1991	Mechanization of two private-sector bagged-grain warehouses for handling of wheat in bulk
1991	Fumigation demonstrations in private-sector wheat and rice warehouses

ECONOMIC POTENTIALS

Reduction of storage and handling losses

- 1% reduction on 15 million tons = US$ 17.1 million at current support prices
- 1% reduction on 5 million tons in government storage + US$6.8 million at current support prices
- Improved storage practices can save a minimum of Rs 4 or US$ 0.16 per ton on chemicals for insect control. This is equal to US$ 400,000 on 2.5 millions tons in public-sector storage.
- A minimum of 1% improvement in wheat milled product yields are possible through better cleaning and utilization of wheat by-products. At current wholesale flour, atta, and animal feed prices, this adds US$1.50 per ton value of wheat milled, plus increasing supply of atta and animal feeds by approximately 70,000 tons annually for commercially milled wheat.

Bulk Storage and Handling

- Storage expansion by modification of bagged-grain warehouse to bulk storage costs about US$10 per ton of capacity in existing storage complexes, including building modification and bulk handling equipment. Construction of new bagged-grain warehouses is minimum of US$50 per ton capacity plus land and infrastructure.

- Complete bulk handling chain can save minimum of US$4 per ton from producer through flour mill. This is equal to US$20 million on 5 million tons of wheat being handled annually by the public sector, plus an equivalent or greater amount in the private sector.
- Adding 100,000 tons capacity storage through bulk handling could cost about US$1,000,000. New construction plus land and infrastructure would cost minimum US$10,000,000.
- Over 200,000 tons capacity of sparingly used hexagonal bins can be made useable and more productive through mechanization at cost of about US$4 per ton capacity.
- Rehabilitating two existing silos with 110,000 tons capacity at cost of less than US$1,000,000 can replace potential new construction at cost of over US$15,000,000. Rehabilitation opens the way for privatization of the grain trade.
- Bulk wheat delivery to flour mills saved flour mills Rs 85 to Rs 95 per ton. At 150 ton per day intake a flour mill could save up to US$150,000 per year.

RESEARCH AND OTHER BENEFITS NOT QUANTIFIABLE AT PRESENT TIME

Quality improvement in stored wheat and rice, with corresponding health and nutritional benefits for consumers.

Development of manufacturing capability in grain handling equipment.

Ability to monitor insect resistance and adjust storage protection practices quickly.

Public Sector Component/Toledo Agricultural Marketing Project (PS/TAMP)

A heat recovery system was constructed and installed at the rice mill complex. Assistance was provided in the installation and use of the heat recovery system. The heat recovery system was connected from the generator radiator to the aeration fan of the nearest flat-bottomed steel storage bin. The system was tested. Approximately 30,000 pounds of rough rice at an initial moisture content of 20% was evenly spread into the 24-foot diameter bin and the aeration system was started. A 21-degree Fahrenheit temperature rise with respect to ambient air temperature was obtained and the drying air temperature at this point was measured at 108 degrees Fahrenheit. The drying was stopped after 15 hours of fan operation and the final moisture content of the rough rice was 13% at the bottom of the bin and 14% at the top of the bin. This type of slow, steady drying process is ideal for minimizing grain breakage during hulling and milling processes. Rough rice drying costs should be substantially reduced because the radiator heat from the generator is a no-cost heat source.

Since being installed, the heat recovery system has been used continuously to dry rough rice. Approximately 35,000 pounds of rough rice have been dried in each batch in the bin. About 5.5% moisture has been taken out of the rough rice over a 18-hour drying period.

Agroindustrial Project Analysis Short Course (APASC)

APASC was presented to 13 participants from 11 countries. A written evaluation was completed by participants at the end of the course. The course is evaluated based on a numerical scale from 1 to 5, with 1 being the lowest score and 5 being the highest. The overall rating of the course was 4.0. The course objectives were evaluated on achievement and were rated at 4.3. Instructional methods used in the course received a score of 4.2 and the course materials a 4.0 score. Satisfaction with field trips was rated at 4.5 with relevancy of visits given a 4.1 score. Course administration and logistics received a score of 3.6. Twelve of the 13 participants in the course indicated they would recommend this course to others with similar interests and responsibilities.

Pakistani Flour Mill Executive Training Program

At the end of the program, the participants were asked to fill out an evaluation covering all aspects of the program. The course is evaluated based on a numerical scale from 1 to 5, with 1 being the lowest and 5 being the highest. The overall rating of the course was 4.0. The course content was rated at 4.2. Value of field trips was rated at 3.8 with relevancy of visits given a 3.9 score. Both participants indicated they would recommend this type of program to others with similar backgrounds and interest.

APPENDIX I

COOPERATIVE AGREEMENT DAN-4144-A-00-5095-00
COOPERATIVE AGREEMENT DAN-4144-A-00-1020-00
POSTHARVEST GRAIN SYSTEMS

Project Description

The goal of the project activities is to increase the availability of cereal and legume grain supplies in developing countries through the application of (1) improved technical, marketing, and management procedures which are cost-effective, and (2) policy initiatives which increase efficiency and productivity. The end result will be the improvement of human nutrition through increased quantity and quality of grain supplies.

The general areas of activity are to (1) conduct applied research activities related to postharvest grain systems and agribusiness in developing countries, (2) provide opportunities for graduate students from developing countries to participate in such research activities, (3) provide technical advice and assistance on postharvest grain systems and agribusiness development, (4) publish, collect, and distribute materials on technical, marketing, and management processes in postharvest grain systems and related agribusiness operations, (5) provide academic and short-term training at KSU and overseas, and (6) continue existing relationships with developing country and other national and international organizations involved in postharvest grain systems.

Staff Utilization

The time spent by FFGI staff members in project activities is summarized below.

Activity Category	Person-Days
Research	295.5
Technical Assistance	0.0
Technology Transfer	800.0
Training	288.5
Networking activities	22.0
Administrative	336.6
TOTAL	1,742.0

Project Activities

Research. Research activities under this Cooperative Agreement were carried out in two basic areas: grain storage and handling, and marketing.

Current Research

Design, construction, and testing of a natural convection grain dryer -- Study the performance of natural convection grain dryers built in 1984-85 at the

PREVIOUS PAGE BLANK

Universidad Nacional Agraria de la Selva (UNAS) and Tulumayo Research Station, Tingo Maria, Peru.

Effectiveness of chlorpyriphos-methyl as a grain protectant under varied conditions of storage -- Determine the effect of high treatment temperatures on the efficacy of chlorpyriphos-methyl as a grain protectant against Rhyzopertha dominica and Tribolium castaneum.

Naturally-occurring pesticides, Phase 3 -- Conduct an in-depth study of Artemesia ludoviciana (white sagebrush) as a source of stored-grain protection.

Three-roller cereal mill and milling using triangular roll configuration -- Design, construct, and test a new type of roller mill for processing grain. The objective is to test the feasibility of reducing the initial investment as well as operating and maintenance costs of milling.

Effect of rice storage conditions on milling -- Determine the effect of various short-term storage conditions and related factors on the quality of milled rice.

Field infestation of grains by stored-product insects -- Conduct field and laboratory studies to determine whether selected stored-product insects are capable of infesting wheat in the field during head development or while stored unthreshed.

Development and application of a computerized system for feasible agribusiness development for microcomputer application -- Adapt the programs of feasibility analysis, master projection analysis, proforma financial analysis, and linear transportation analysis to microcomputers with appropriate user manuals and case studies for application to developing-country conditions.

Analysis of food grain security programs in developing countries -- Establish guidelines for constructing systems which assist in planning, implementing, and maintaining stabilized trade and security reserves for food grains.

Quantitative analysis to support developing-country grain policies and programs -- Assist policy-makers and implementing agencies in developing countries to formulate and carry out public intervention programs to achieve more effective national and international systems for food grain production, distribution, and utilization.

Improvement of grain marketing systems in developing countries -- Identify and evaluate domestic grain marketing systems in developing countries; determine the nature, patterns, magnitudes, and causes of losses and inefficiencies under various systems of postharvest technology; isolate and measure factors that explain the choice of marketing channels and procedures in grain postharvest systems; and define domestic policy implications of the findings.

Completed Research

Bibliography of plant materials for stored-product insect control -- research completed, results published in Research Report No. 29, Kansas State University, Food and Feed Grains Institute

Update of annotated bibliography on Prostephanus truncatus, the larger grain borer -- results published in Research Report No. 24, Kansas State University, Food and Feed Grains Institute

Factors affecting the storage of grain sorghum -- results published in the Journal of the Kansas Entomological Society

Comparison of losses in three types of storage in Honduras -- results published in Research Report No. 31, Kansas State University, Food and Feed Grains Institute

Evaluation of methoprene as a stored-grain protectant -- results not yet published

Grain postharvest loss assessment and reduction project -- results published in Research Report Nos. 28 and 30, Kansas State University, Food and Feed Grains Institute

Aeration of rough rice under humid tropical conditions -- results published in Journal of Cereal Chemistry.

Early detection of insect pests in stored grain and estimation of stored-product insect population size -- results published in the Journal of Kansas Entomology Society and the Journal of Economic Entomology

Underground storage of grain -- results published as Ph.D. Thesis

Naturally-occurring pesticides -- results not yet published

Effect of fine material in grain on drying and airflow -- results published as report of Kansas Agricultural Experiment Station, Kansas State University

Varietal resistance in Peruvian maize cultivars to stored-grain weevils -- results published as Ph.D. Thesis, in the Annual Entomological Society of America, the Journal of Kansas Entomology Society, and Turrialba

Grain storage facility design: concrete vs. steel -- results published in Research Report No. 32, Kansas State University, Food and Feed Grains Institute

Effect of fines on static pressure during natural air drying of corn -- results being prepared for publication

Moisture sorption and quality loss in bagged grain stored under tropical conditions -- results published in Research Report No. 34, Kansas State University, Food and Feed Grains Institute

Computer simulation model for grain processing systems -- results presented as papers at the meetings of the American Association of Cereal Chemists and the American Society of Agricultural Engineers

Design, construction, and testing of a natural convection grain dryer -- results presented in Research Report No. 33, Kansas State University, Food and Feed Grains Institute

Analysis of grain particle separation -- results published in Journal of Cereal Chemistry

Development and application of a computerized system for feasible agribusiness development for microcomputer application -- results published in Special Report Nos. 13, 14, 15, 17, 20, 20 Revised, 23, 24, 25, 26, 27, 30, 31, and 32, Kansas State University, Food and Feed Grains Institute

Quantitative analysis to support development-country grain policies and programs -- Results published in Research Report No. 27 and Special Report Nos. 21, 28, and 28A, Kansas State University, Food and Feed Grains Institute

Technology Transfer. Technology transfer includes activities in the areas of publishing and disseminating reports and instructional materials, demonstration of research results, PHDS, and information requests.

Reports and instructional materials

In FY 1991, FFGI published the following reports.

Lea, J., C. Hugo, K. Kebatti, K. Dungey, and M. Baalman. May 1991. "Glossary of Terms - English, Spanish, French - Marketing, Volume II", Special Report No. 29

Phillips, R. February 1991. "Economic Impact Analysis for Agroindustrial Development", Special Report No. 30, Kansas State University, Food and Feed Grains Institute

Phillips, R. March 1991. "Programma Para el Analisis de Factibilidad Economica Para uso en Microcomputadores con MS-DOS", Supplement to Special Report No. 23, Special Report No. 31, Kansas State University, Food and Feed Grains Institute

Additional publications authored by FFGI staff are as follows:

Anderson, K., B. Schurle, C. Rees, and J. Pedersen. 1990. "An Economic Analysis of Producer's Decisions Regarding Insect Control in Stored Grain", North Central Journal of Agricultural Economics 12(1):23-24

Chung, D. 1990. "Evaluation of Imported Feed Grains Handling and Distribution Systems in Korea", Korea Feed Association

Chung, D., and J. Lee. 1991. "Principles of Parameters for Grain Cleaning and Separation", Uniformity by 2000, Proceedings of International Conference of Maize and Soybean Quality, 103-123

Chung, D., and K. Park. 1990. "Importance of Feed Quality for Livestock Production", Korea Journal of Vet. Res., Vol. 3, No. 2, 5-18

Haque, E. "Theory of Size Reduction and Application to Roller Mill Design and Operation", Cereal Foods World

Haque, E. "Theory of Size Reduction and Application to Roller Mill Design and Operation", paper presented at the first engineering symposium of the American Association of Cereal Chemists Annual Meeting, October 16, 1990, in Dallas, TX

Haque, E. "A Modular On- and Off-Farm Grain Dryer for Developing Countries", paper presented at the American Society of Agricultural Engineers Winter Meeting 1990, December 18-21, 1990, in Chicago, IL

Reed, C., K. Anderson, J. Brockschmidt, V. Wright, and J. Pedersen. 1990. "Cost and Effectiveness of Chemical Insect Control Measures in Farm-Stored Kansas Wheat", Journal of the Kansas Entomological Society 63(3):351-360

Reed, C., V. Wright, T. Mize, J. Pedersen. 1991. "Pitfall Traps and Grain Samples as Indicators of Insects in Farm-Stored Wheat", Journal of Economic Entomology 83(4):1381-1387

Song, A., D. Chung, and R. Nassar. 1990. "A Stochastic Compartmental Model Simulating a Grain Cleaning Process, Transactions of ASAE, Vol. 33, No. 3, 877-844

Song, A., D. Chung, C. Spillman, and S. Eckhoff. 1990. "Physical Properties of Various Fractions of Corn Samples", Cereal Chemistry, Vol. 67, No. 4, 322-326.

Publications and theses authored by FFGI staff-supported graduate students are as follows:

Cassama, M. 1991. "Farm Level Grain Storage in Guinea-Bissau", Masters Report, Kansas State University, Manhattan, KS

Hooshmand, H. 1991. "Effect on Gamma Irradiation on Mycotoxin Degradation and Protein Quality of Grains with Different Moisture Content", M.S. Thesis, Kansas State University, Manhattan, KS

Ullah, N. 1990. "White Sagebrush, Artemesia ludoviciana Nutt. (Asteraceae) Flower Extract as a Protectant for Wheat Against Stored-Product Insects", Ph.D. Dissertation, Kansas State University, Manhattan, KS

Wongo, L. Factors of Resistance in Sorghum Against Sitotroga cerealella (Oliv.) and Sitophilus oryzae (L.), Insect Sci. Applic., Vol. II, No. 2, pp 179-188, 1990

Report Distribution

FFGI distributed 213 technical assistance reports, 104 research reports, 331 special reports, and 17 working papers in response to requests for such publications. A listing by country of the reports distributed is shown in Table 1.

Presentation of Research Results

Ekramul Haque presented a paper entitled "Theory of Size Reduction and Application to Roller Mill Design and Operation" at the first engineering symposium of the American Association of Cereal Chemists Annual Meeting, October 16, 1990, in Dallas, TX.

Ekramul Haque presented a paper entitled "A Modular On- and Off-Farm Grain Dryer for Developing Countries" at the American Society of Agricultural Engineers Winter Meeting 1990, December 18-21, 1990, in Chicago, IL.

Postharvest Documentation Service (PHDS)

PHDS is a computerized information retrieval system created in 1978 to centralize a collection of documents pertaining to postharvest systems of cereals, grain legumes, and oilseeds; and to distribute copies of these documents upon request. To aid in the dissemination of information on postharvest grain systems, FFGI provides access to PHDS to researchers, government agencies, and private institutions in developed and developing countries. Services available from PHDS include a bi-monthly "Documents By Mail" flyer containing new document titles in storage, computerized subject searches, and document copies.

In FY 1991, PHDS increased its acquisitions by 1,367 documents to bring the total number of documents in the collection to 19,909. The total number of clients is 1,488, an increase of 185 from FY 1990. PHDS responded to 8,832 requests in FY 1991, bringing the total number to 45,879 since PHDS began its operations. Table 2 summarizes PHDS' activities from FY 1986 to FY 1991.

The dramatic increase in requests during FY 1991 may be attributed to the success of the bi-monthly "Documents by Mail" flyer, introduced this year as a smaller, selective version of the previous "Acquisitions List" which was distributed semiannually.

Table 3 summarizes the document requests fulfilled by PHDS during FY 1991. Documents and searches for information were provided to individuals and institutions in 65 different countries. The number of requests as well as the distribution of requests indicates the need for information by researchers, extension personnel, project managers, and administrators in developing countries.

PHDS continues to explore opportunities for acquiring from, and sharing with, other institutions computerized postharvest reference materials. Donna Schenck-Hamlin traveled September 23-30, 1990, to EAP in Zamarano, Honduras, to collaborate with EAP and PIP in developing a proposal for cooperative data transfer between these three organizations.

PHDS has initiated a new database service for NCGA. This is described in Appendix X. A preliminary proposal has also been submitted to the Stored Product Insects Research and Development Laboratory in Savannah, Georgia, for cataloging their 17,000 document reprint collection of stored-product pest control materials. A request for a similar proposal has been received from an entomological research center of Agriculture Canada located in Winnepeg.

Postharvest Newsletter

FFGI published October 1990 and April 1991 issues of the Postharvest Newsletter. This newsletter is directed towards maintaining contact with past academic and short course graduates for the purpose of providing such individuals with a means by which to keep updated on current actions in the world postharvest grains agribusiness sector.

Training. Training activities are divided into two basic areas: (1) staff support of academic degree training in four disciplines, and (2) the annual GSMSC. Details concerning trainees and countries represented are shown in Table 4.

The four academic disciplines are agricultural economics, agricultural engineering, entomology, and grain science. Students can work toward M.S. and Ph.D. degrees in these fields. FFGI staff advise and assist students sponsored by other national and international organizations who are working on degrees in fields related to postharvest storage,handling, and marketing practices. In FY 1991, staff members assisted 11 such students from nine countries.

Students who have completed their academic training and received degrees include F. Anjum, Ph.D. in Grain Science; O. Negrini, M.S. in Agricultural Engineering; and K. Mulenga, M.S. in Agricultural Economics.

Anjum returned to his position with the University of Faisalabad in Pakistan as associate professor in cereal chemistry. He has established a quality control laboratory and is working with the flour milling industry in improving the quality of milled products. Negrini returned to his position with the Consejo Naccional de Produccion in Costa Rica.

GSMSC was held at KSU from June 3 - July 19, 1991. The course was attended by 12 participants from eight countries.

Networking.

Group for Assistance on Systems Relating to Grain After-harvest (GASGA)

FFGI has been a member of GASGA since 1974. This group, which includes the member nations of West Germany, France, Canada, Great Britain, Australia, the Netherlands, the United States, and FAO, attempts to reduce food losses and increase the quantity and quality of food available to people in developing countries.

John Pedersen attended the 23rd Annual GASGA Executive Meeting June 10-14, 1991, in Bulawayo, Zimbabwe. The executive meeting was hosted by the International Development Research Center (IDRC) in conjunction with IDRC's regional office in Nairobi, Kenya.

Representatives from the following GASGA members were present at the annual meeting: Natural Resources Institute (NRI), United Kingdom; Centre de Cooperation-Internationale en Recherche Agronomique pour le Developpement (CEEMAT/CIRAD), France; IDRC, Canada; Australian Center for International

Agricultural Research (ACIAR), Australia; FAO, Rome; Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ), Germany; and FFGI, United States.

The annual meeting was held in Bulawayo, Zimbabwe, to facilitate focus of the Executive Seminar "Consultation on the Sorghum and Millet Food Systems in Sub-Saharan Africa." In addition to nine GASGA representatives, 27 representatives from several of the South African Development Coordination Conference (SADCC) and other African countries (Swaziland, Malawi, Zimbabwe, Zambia, Botswana, Lesotho, Tanzania, Kenya) participated in the "consultation." GASGA members visited the SADCC/ICRISAT Matopos Research Station near Bulawayo on June 14, 1991.

Seed Technology Laboratory, Mississippi State University (STL/MSU)

Each year, for the past several years, STL and FFGI have exchanged faculty for lectures during their respective short courses. John Pedersen traveled to Mississippi State, MS, to lecture at the Seed Improvement Training Course conducted by STL. Travel dates were June 17-19, 1991.

Activities involved lectures covering grain and seed infesting insects, insect biology and identification, rodent and bird biology and identification, and integrated pest management in seed storage. Outline manuals were prepared and distributed to the course participants.

Escuela Agrícola Panamericana (EAP)

Cornelius Hugo traveled to Honduras June 26 - July 6, and November 23 - December 1, 1990, to assist EAP in preparing a training proposal in the proper format to present to IDB.

TABLE 1

DISTRIBUTION OF FFGI REPORTS

Country	Technical Assistance Reports	Research Reports	Special Reports	Working Papers
Argentina			1	
Australia		1		
Belize		2	4	1
Benin		3		
Botswana		1		
Brazil	4	2	2	1
Burundi			2	
Cameroon	1		4	
Canada			2	
China			2	
Colombia	1			
Ecuador	1		1	
Egypt			2	
El Salvador			7	
Ethiopia	1			
Gambia			1	
Ghana	1	1	1	
Guinea-Bissau	2		2	1
Guyuana			1	
Haiti	1		1	
Honduras	4	8	6	1
Hungary			2	
India		1		
Indonesia		2	118	
Japan		1		
Jordan		1		
Kenya	8		5	1
Mali			1	
Mexico	7	1	6	2
Morocco	67	17	21	2
Mozambique	1			
Myanmar			2	
Nepal	1	2	3	
Nigeria	12	6	7	1
Pakistan	1	1	3	
Panama		2		
Paraquay			3	1
Philippines			1	
Poland			4	2
Rwanda		4	9	1
Sudan	1			

TABLE 1 (Continued)

DISTRIBUTION OF FFGI REPORTS

Country	Technical Assistance Reports	Research Reports	Special Reports	Working Papers
Tanzania	4		3	
Tunisia	7	7	3	1
Turkey			10	
Uganda	3		1	
USA	61	37	54	
United Kingdom	17	2		1
Yugoslavia			2	1
Zaire			2	
Zambia			4	
Zimbabwe	1	2	29	
TOTAL	213	104	331	17

TABLE 2

POSTHARVEST DOCUMENTATION SERVICE

Service	FY 1986	FY 1987	FY 1988	FY 1989	FY 1990	FY 1991
Acquisitions						
Annual	1,635	785	4,207	2,625	1,835	1,367
Cumulative	9,090	9,875	14,082	16,707	18,542	19,909
Clients						
Annual	226	144	438	-5	41	185
Cumulative	685	829	1,267	1,262	1,303	1,488
Requests						
Annual	5,443	2,947	4,562	2,826	2,942	8,832
Cumulative	23,936	26,883	31,445	34,271	37,047	45,879

TABLE 3

DISTRIBUTION OF POSTHARVEST DOCUMENTATION SERVICE DOCUMENT REQUESTS

	Category				
Country	Biological	Economic	Engineering	Nutrition	General
Africa					
Benin	7				
Cameroon	13	44	7	3	7
Ethiopia	18	20	25	25	2
Gambia		5			1
Ghana	77	38	52	34	9
Guinea-Bissau		5			1
Ivory Coast	4	5	6	2	1
Kenya	22	7	9	1	2
Malawi	21	9	21	13	2
Nigeria	338	309	713	310	41
Senegal	5	1	25	3	9
Sudan	38	15	40	24	3
Tanzania	47	25	59	30	4
Uganda	15	12	19	4	
Uruguay	4	4	18	1	3
Zambia	15	24	26	13	8
Zimbabwe	57	27	48	16	16
Asia					
Bangladesh	1	14	17	7	
China	4	6	10	19	2
Fiji	3		1	1	
India	221	170	266	166	24
Indonesia	40	37	69	41	3
Malaysia	18	14	78	19	7
Myanmar	31	15	29	27	3
Nepal	26	28	57	14	5
Pakistan	81	18	76	22	12
Philippines	96	72	220	104	32
Sri Lanka	12	4	21	3	
Taiwan	8				
Thailand	39	18	96	39	10
Western Samoa		2			
Near East					
Cyprus	6	2	5		
Egypt	5	5	11	3	
Israel	29	8	35	1	4
Morocco	38	97	89	13	14
Tunisia	18	31	34	11	3
Yemen	1		1		

TABLE 3 (Continued)

DISTRIBUTION OF POSTHARVEST DOCUMENTATION SERVICE DOCUMENT REQUESTS

	Category				
Country	Biological	Economic	Engineering	Nutrition	General
Latin America and Caribbean					
Argentina	22	4	20	10	1
Belize	2	26			2
Brazil	104	55	185	39	8
Chile	13	4	17		
Colombia	48	46	92	67	5
Costa Rica	40	14	120	12	5
Cuba	15	2	38	14	2
Ecuador	11	2	12	16	3
Guatemala	7	2	2	2	1
Haiti		1	3	3	3
Honduras	23	18	32	8	5
Jamaica	21	21	43	34	3
Mexico	214	97	261	120	15
Paraquay	1		4	2	1
Peru	2	11	24	30	4
Venezuela	3	6	12	12	1
Europe					
Belgium	5	3			1
France	4		2	1	
Germany	15	6	10	2	4
Netherlands	2		6	5	
Poland		1			
Turkey	6	35	48	13	2
United Kingdom	25	3	33	8	1
North America					
Canada	13		10	3	1
USA	120	63	81	33	35
Australia					
Australia	1			1	1
TOTAL*	1,955	1,511	3,238	1,404	332

* Does not include searches

TABLE 4

TRAINING

Country	Name	Subject
Academic		
Costa Rica	E. Arce-Diaz	Agricultural Economics
	W. Barantes	
Honduras	A. Reyes	
	R. Ingle	
Korea	Y. Kwon	
Pakistan	H. Shah	
Zambia	K. Mulenga	
China	Y. Wang	Agricultural Engineering
Costa Rica	O. Negrini	
Indonesia	P. Guritno	Grain Science
Pakistan	F. Anjum	
GSMSC		
Botswana	L. Modidi	
Burkina Faso	K. Kabore	
Guatemala	J. Ruiz	
Morocco	A. Ait El Cadi	
	R. El Mezroui	
Mexico	E. Herrera	
	C. Livas-Hernandez	
	J. Zuniga	
Nicaragua	E. Vanegas	
	G. Perez	
Panama	A. Gonzales	
Venezuela	E. Guarecuco	

APPENDIX II

BASIC ORDERING AGREEMENT DAN-4144-B-00-6002-00
POSTHARVEST GRAIN SYSTEMS

Project Description

This is a companion agreement to the Cooperative Agreement described in Appendix I. This agreement provides a mechanism by which AID missions in developing countries can contract directly for services of FFGI.

Staff Utilization

The utilization of FFGI staff members' time during this period is summarized below.

Activity Category	Person-Days	Percent
Research		
Technical Assistance		
Technology Transfer		
Training	122.0	
Networking Activities		
Administrative		
TOTAL	122.0	

Project Activities

Food Aid Managers Short Course (FAMSC), Grain and Grain Products

FAMSC, Grains and Grain Products, was presented at KSU August 13 -20, 1990. This two-week course was conducted under Delivery Order No. 7 from the Bureau of Food for Peace and Voluntary Action (FVA), AID.

The course was attended by 26 participants from AID/Washington, AID field missions, private voluntary organizations (PVOs), and the World Food Programme (WFP). A list of participants and their organizations is set forth in Table 1.

The course content contained the following areas: introduction, properties of grains, inspection system and practices, grain storage and handling facilities, grain quality preservation, commodity processing systems (wheat milling, corn milling and processing, extrusion of grain products, rice processing, pulse processing, vegetable oil processing, flour blends and quality control), economics of grain processing, commodity transportation, commodity and freight purchases, grain marketing in recipient countries, and a monitoring actions summary. Field trips were conducted to the Kansas Grain Inspection Service, Butler Manufacturing Company, Kansas City Board of Trade, Cereal Food Processors, and the ADM Milling Company. A course manual was prepared and distributed to all participants.

At the end of the course, all participants were asked to fill out an evaluation covering all aspects of the course. The course was evaluated on a numerical scale from 1 to 5, with 1 being the lowest score and 5 being the highest. In addition, participants were encouraged to make comments. The results of the evaluation are summarized as follows:

The overall rating of the course was 3.8. The course content was rated 3.8 for importance and 3.2 for achievement of valuable information gained. Satisfaction with field trips was rated at 3.7 with relevancy of visits given a 3.5 score. Twenty-four out of 25 participants completing the questionnaires would recommend this course to other individuals with similar backgrounds and interests.

TABLE 1

FOOD AID MANAGERS TRAINING COURSE,
GRAINS AND GRAIN PRODUCTS PARTICIPANTS

AID Missions

Cheryl Anderson, USAID/Kinshasa
Martial Bailey, USAID/Port-au-Prince
Jose Barber, USAID/Praia
William Barclay, USAID/Khartoum
Juan Castillo, USAID/Tegucigalpa
Dale Humphrey, USAID/Guatemala City
John Huxtable, USAID/Islamabad
Tim O'Connor, USAID/Kingston
Steve Szadek, USAID/Belize City
Moussa Simaga, USAID/Bamako

AID Washington

Sylvia Graves, Office of Food for Peace
Ricki Gold, Office of Food for Peace
Joe Langlois, Office of Food for Peace
Jane Stanley, Office of Food for Peace
Sheldon Schwartz, Office of Food for Peace
Todd Kemp, Bureau of Food for Peace and Voluntary Action

PVOs

John Marks, Save the Children Federation
Katharina Puffenberger, Africare
Kenneth Wood, Feed the Children
Sister Ann Duggan, Catholic Relief Services
William Jensen, Adventist Development and Relief Agency
Stan Schirm, Food for the Hungry
Borys Chinchilla, CARE/Guatemala

WFP

A. Gotzmann, Chief - Training and Staff Development Unit
J. Roy, Assistnat Project Officer/Chad

USDA

Ernie Coggins, Foreign Agricultural Service

APPENDIX III

CONTRACT 391-0491-C-00-6080-00
STORAGE TECHNOLOGY DEVELOPMENT AND TRANSFER

Project Description

This contract between USAID/Islamabad and FFGI at KSU had for its goal to improve the capacity of the Government of Pakistan (GOP) to manage the national food security system effectively and efficiently. The activities ultimately enhanced the capabilities of the public-sector agencies and private-sector firms to store food grains over extended periods of time.

The purposes of the STDT project are to (1) 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) 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) provide training to enhance the skills of researchers and those personnel responsible for training programs.

Staff Utilization

Two FFGI staff members, Richard Maxon, agricultural economist, and Ulysses Acasio, agricultural engineer, are stationed in Islamabad and Lahore, Pakistan, respectively, as long-term advisors to the STDT project. Richard Maxon is Chief-of-Party and Ulysses Acasio is Storage and Training Advisor. All other FFGI staff members associated with the project conduct short-term consultancies under the direction of the chief-of-party.

The time spent by FFGI staff members in project activities are summarized below.

Activity Category	Person-Days
Research	
Technical Assistance	586.0
Technology Transfer	
Training	
Networking	
Administrative	297.0
TOTAL	883.0

Project Activities

Insect Resistance Research. Insect resistance research at LTC was expanded. An environmental chamber was fabricated using locally available materials. Insect resistance studies were conducted in the environmental chambers. Results indicated a wide variation in levels of resistance with specific locations. Highest levels occur in godowns where fumigation is regularly - but incorrectly - done. Lowest resistance levels were found in private-sector godowns where chemical control measures have never been used. Research results were presented at the Bulk Wheat Handling and Storage Conference.

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Arrangements were made to conduct insect resistance surveys with the Tropical Agricultural Research Institute (TARI) of Karachi (formerly PMRI). The survey of insect resistance covered areas in Sindh, Balochistan, and the Northwest Frontier Province (NWFP), which are beyond the scope of present STDT project activities. When combined with STDT project resistance studies, a national picture of insect resistance levels in wheat storage will be available.

Financial support was offered to the GSRL/TARI, Karachi, for conduct of additional field work. However, administrative indecision within GSRL and PARC prevented any survey work from being undertaken. A new chairman of PARC was appointed late in the reporting period. However, funds for research with GSRL lapsed with the termination of the Food Security Management (FSM) project.

Fumigation Programs. Both PASSCO and PPFD requested STDT project assistance in conducting fumigations, and used these activities as additional training and demonstrations for field staff. The STDT project staff assisted in these fumigation programs and collected data for research information.

Excellent results were achieved at the Okara bulkhead. Eight days of monitoring indicated gas concentration had been maintained at the required 200 ppm at all levels for the eight days. The fumigant was applied by locally manufactured probes. The grain itself held the gas. This demonstrates why previous methods of applying fumigants around the edges and on top of the grain is totally ineffective. It is possible that it is the amount of foreign material in the wheat that contributes to its gas holding ability. This implication will be subjected to further research.

In hexbin fumigation, good results were also obtained from probing fumigants into the hexbins. Time required for probing fumigants was less than 15 minutes per bin. Fumigant gas does not penetrate the grain when applied to the top, as is the current practice. When fumigant is probed into the grain, any escaping gas fumigates the overhead airspace sufficiently to kill insects residing in this space.

PPFD decided to fumigate 50,000 tons of wheat using the polyethylene enclosure and phosphine fumigation (PEPF) technique developed by the STDT project. The assistance of LTC was requested in setting up the fumigation program. The LTC staff conducted five training sessions/demonstrations at Multan, Muzaffar Garh, Sahiwal, Vehari, and Khanewal for the food department personnel. Total attendance was 122 persons.

Bulk Wheat Handling and Storage Research Program. A two-day conference was held in Lahore to evaluate the results of bulk wheat handling during the 1990 procurement season and to plan for actions during the 1991 procurement season. The first day consisted of a meeting between the STDT project staff and consultants. The STDT project staff and the PASSCO managers and personnel responsible for bulk wheat handling during the 1990 procurement season met the second day. A final session on the second day included the PASSCO managing director and his staff, PASSCO director, PASSCO deputy director, secretary of PPFD, PPFD staff, and USAID/Pakistan personnel.

The STDT project and PASSCO were able to resolve several small but vital issues regarding placement and responsibilities of the STDT project and the PASSCO personnel to be involved in bulk wheat handling during the 1991 procurement season.

PASSCO's proposed plan for bulk collection of wheat during the 1991 season was presented. While PASSCO's managing director expressed some reservations about the size of the scope of activities, he agreed the bulk handling project should be expanded to the maximum extent.

PPFD expressed the desire to be included in the 1991 bulk wheat handling and storage research program. The PPFD deputy secretary explained that PPFD is probably the more logical organization to initiate bulk handling of wheat since several districts from which it procures are self-sufficient in wheat. Wheat is procured, stored, and delivered to mills in the same area. Therefore, the same equipment could be used for collection and delivery with fewer problems in management of a complete bulk wheat handling system. The STDT project staff and PPFD agreed to investigate the possibility of starting a bulk handling system in the Faisalabad district.

A field inspection of sites recommended by PPFD and PASSCO was completed November 4-6, 1990. Locations surveyed included Faisalabad, Jhang, Musa Virk, and Chichawatni. This planning exercise was to optimize the use of the STDT project, PASSCO, and the PPFD bulk handling equipment and personnel, and to obtain the maximum data for comparison of bulk and bag handling costs in a variety of storage and distribution situations. After the field inspection, detailed plans were made for distribution of the bulk handling equipment, personnel requirements, and training for the 1991 season.

Movement of Wheat in Bulk from Multan Silo Complex to Flour Mills

Grain handling equipment was shifted to Multan preparatory to rehabilitation of the Multan silo complex. In late December 1990, experimental deliveries of wheat to flour mills were begun in Multan. The bulk deliveries continued through January. Deliveries were then made in Multan. A total of 1,200 T wheat was delivered in bulk at these locations. The flour millers report saving about Rs 10 per ton on bulk deliveries over their receipt of wheat in bags.

A second trial of bulk wheat delivery was conducted at Okara February 26 through March 13. Wheat was delivered in bulk from hexbins at Okara to an Okara flour mill. A total of 1,100 T wheat was delivered in bulk from the Okara hexbin to the flour mill.

A third trial of bulk wheat delivery was conducted at Lahore March 19 through March 30. Wheat was delivered in bulk from the Lahore Badami Bagh hexbins to a flour mill in Lahore. A total of 628 mt of wheat was delivered in bulk to the flour mill. Also during the trial, incoming bagged wheat was unloaded into the hexbins using bulk handling equipment. Officials from MINFA as well as PPFD visited and reviewed the operations.

Bulk Wheat Handling Equipment Modification and Development

Parts were fabricated for mounting a grain pump on a tractor. The mounted grain pump will be used for picking up bulk wheat from public markets and large volume producers. The pump was mounted and partially tested. Initial results were very encouraging. This concept eliminates the need for a portable generator to operate the grain pump.

Work was continued in modifying a TracMasster grain mover for mounting on a four-wheel drive loader tractor. Once completed, the grain mover will be more maneuverable than the original design. This capability is very critical when working with open bulkhead storage facilities.

Another conceptual design has been developed for testing. This is a grain sweeper pump in which a special sweeper head is adapted to the standard grain pump. This proposed design will allow a grain pump used in unloading a godown or an open bulkhead to be pushed up to the pile of grain and the grain will be augered into the pump.

Operations and Maintenance Manual

An operations and maintenance manual for bulk wheat handling equipment, in English and Urdu, was prepared and distributed to PASSCO, PPFD, and the private sector.

Conduct Second Phase of the Bulk Wheat Handling and Storage Research Program

Extensive planning and preparations were made for the 1991 procurement season with PASSCO and PPFD. Equipment allocations were made and four STDT teams were organized to assist in the procurement at Depalpur, Okara, Sahiwal, and Chichawatni. Training for the cooperator's personnel was held in Depalpur on April 11. Total attendance at the training sessions was 100.

Total bulk procurement up to June 30 was less than the goal of 20,000 T at the four locations. Last minute changes in government were primarily responsible for the decrease in procurement. In late April, the support price of Rs 108 was increased to Rs 112 per pound (40 kg) or Rs 2,800 T. Simultaneously, the release price was increased to Rs 3,100 T plus Rs 275 for the bags. The gap between procurement and release price prompted flour millers to actively procure wheat in competition with the government agencies. In addition, the total wheat harvest was less than anticipated in many areas, driving the price to above official procurement prices. The harvest season was delayed due to weather and the procurement season was extended into July.

<u>Development of Bulk Handling Systems for Bagged-Grain Warehouses</u>. The use of two 35-foot grain pump systems to load and unload bagged-grain warehouses with bulk wheat were tested. The grain pump carriages were modified so as to make them maneuverable within the warehouse. Various combinations of equipment are being tested for moving grain from the storage pile to the conveyors.

PASSCO gave permission to test the use of roof hatches as a means of loading bulk wheat into PASSCO bagged-grain warehouses. Installation of ten roof hatches in

a PASSCO godown at Manga Mandi was completed during March 1991. Additional roof hatches were ordered for mechanization of a second PASSCO godown.

A single 65-foot Masster Mover unit can be used to load a warehouse utilizing roof hatches. It is calculated that 10 roof hatches will permit loading 1,600 T of wheat into the warehouse without the use of bagwalls or mechanical spreading devices. Technical assistance was provided for the arrangement of equipment for grain retrieval. The primary equipment used was a 35' grain pump plus a bin sweep auger. While bin sweeps are normally used in silos, the available technical assistance provided the expertise to allow the use of sweeps to unload flat storage. The loading and unloading of a godown using the roof hatches and sweep auger were successfully demonstrated during the Bulk Handling and Storage Conference on June 19.

Silo Rehabilitation. Plans and arrangements were made for the rehabilitation of the Chichawatni and Multan silo complexes. Extensive video tapes were taken of the silo areas to be rehabilitated. This is to provide a "before and after" record of the project. The video tape can also be used to show contractors precisely what is required, and placement of new equipment.

The civil works at the Chichawatni and Multan silo complexes were awarded. A meeting was held with the contractor during November to go over details of each activity. The silo rehabilitation work was to be completed by June 30, 1991. Extensive short-term technical assistance was provided to the managers of the Chichawatni silo for equipment installation, development of an operational plan, and provision of practical operating suggestions for grain storage and equipment usage. During this assistance, a state-of-the-art aeration controller was provided by the STDT project. The aeration controller will calculate the best time and length of time the aeration fans should operate to achieve optimum storage conditions. At the same time, the aeration controller reduces fan operating time and storage expenses. This is the most difficult aspect of silo management in which to train personnel.

Training in aeration skills is very difficult in Pakistan, as the concepts of bulk handling and aeration are just being introduced. Aeration controllers have the potential for overcoming the lack of experience in bulk handling. The private sector has also shown great interest in acquiring aeration controllers for rice drying and storage.

The FFGI staff made several trips to the Chichawatni and Multan silo sites to advise on unexpected problems that occurred during the rehabilitation. The STDT project provided some additional materials for the rehabilitation that either did not arrive with the rehabilitation equipment or that needed some modifications for proper installation.

Hexbin Modernization. Because the order for additional equipment for hexbins was apparently misplaced, it was decided to locally fabricate certain equipment items in order to have them available for the 1991 season. Designs and specifications for the equipment were prepared. By adjusting to the circumstances, this presented an opportunity to further extend the bulk handling of grains concept through the introduction of manufacturing needed equipment by the Pakistani private-sector firms.

Training. A summary of STDT training activities to date is provided in Table 1.

Non-Degree Academic Training Program

The STDT project provided assistance in the conduct of the non-degree academic training program by Quaid-I-Azam (QAU). The primary focus of this activity is the training and skill enhancement of the staff of the East Wing/Ministry of Food and Agriculture (EW/MINFA) and related federal and provincial organizations.

Twenty participants were selected to participate in the training program, 13 from EW/MINFA and seven from other agencies and locations throughout Pakistan. The courses offered in Term 1 included microeconomic analysis, macroeconomic analysis, mathematics for economists, statistics for behavioral sciences, agricultural production economics, agricultural policy, applied research methodology, agricultural product marketing, computer operations, and writing skills. Training equipment, participant textbooks, and reference texts were supplied by the STDT project.

A short-term consultancy by Donald Erickson and Patrick Gormely in July assisted in structuring a two-term training program for September-December (Term 1) and January-April (Term 2) with participant research studies being completed in May 1991.

Donald Erickson and Andrew Barkley arrived in mid-September to assist in the teaching program, develop standardized testing and grading procedures, provide oversight of teaching and quality control of the training program, supervise participant evaluations, examine research opportunities for participants, and develop and ensure participant evaluation of the training program. They completed the first term of the training program in mid-December.

Patrick Gormely and Stephen Duncan arrived in Pakistan on January 7 to begin the second term of the non-degree training program. They were evacuated from Pakistan on January 10 due to the Gulf Crisis.

The QAU personnel assumed their teaching assignments while the evacuation was in force. Patrick Gormely returned on April 19 and was joined by Donald Erickson on April 26. The planned academic courses were completed. Each participant also developed a policy analysis report under the guidance of Patrick Gormely and Donald Erickson. The papers served both to analyze a policy issue of interest and further develop the students' capabilities.

Student evaluations and rankings by the consultants provided information to EW on the analytical capacity of the participants. The top ranked participants may also be considered for external training. The teaching term was completed and certificates awarded on June 30.

Grain Handling, Drying, Storage, and Protection Short Courses

LTC conducted three 6-day training courses in grain handling, drying, storage, and protection for operating personnel at Peshawar September 15 - October 2, 1990. Fifty-three persons attended from NWFP/PFD and PASSCO.

Flour Milling Technical Seminars

LTC planned 4 two-day technical seminars in cooperation with the Pakistan Flour Mills Association. The initial planning for the flour mill seminars began in August. Much of the planning was overtaken by two events, the national elections and the suspension of future USAID to Pakistan. Flour milling in Pakistan is highly politicized. The milling industry is split over government wheat pricing and distribution policies. The election exacerbated the situation. The Pakistan Flour Milling Association called a meeting four days before the training was to begin. At the meeting, the Association refused to officially sanction the meetings. The NWFP Flour Milling Association canceled its participation.

The Sindh Circle of the Flour Milling Association and the Islamabad-Rawalpindi branches of the Association decided to proceed with the training program. A training program was held in Karachi at two flour mills on November 29 - December 2. Forty-three persons attended the two-day technical presentations. An evening meeting with officials of the Sindh Food Department attracted about 140 persons. The highlight of the evening meeting was a very spirited debate between the mill owners and Sindh officials on current wheat distribution policies, and the potential for privatizing the wheat trade.

A training program was held in Islamabad on December 5-6. Sixty-four persons attended the two-day technical presentations.

PPFP Fumigation Program Demonstrations and Training

The LTC staff in conjunction with the Master Trainers conducted five training sessions/demonstrations at Multan, Muzaffar, Garh, Sahiwal, Vehari, and Khanewal for 122 PPFD personnel in connection with the PPFD fumigation program for 50,000 mt of wheat.

Bulk Wheat Handling Equipment Training

The LTC staff conducted a training program for 100 PASSCO and PPFD personnel in bulk wheat handling equipment operations. The training program was held in Depalpur on April 11.

Bulk Wheat Handling and Storage Conference

A Bulk Wheat Handling and Storage Conference was conducted at Lahore June 17-19, 1991. An insect resistance to pesticides seminar was conducted on June 17 as a part of the conference. The sessions were well attended by private-sector chemical manufacturers and distributors, as well as by university and government research personnel.

A major point developed during the conference was that due to rising levels of insect resistance, the official labels for application of fumigants and contact sprays on the chemical containers are no longer valid for obtaining insect control. The conference passed resolutions requesting the government to study the issue, as changing the labels requires complete re-registration of the product - a laborious and time-consuming process. These recommendations are now

being circulated among the insecticide and fumigant producers and applicators for comment before formally presenting them to the government.

The bulk wheat handling portion of the program indicated that bulk handling is feasible for Pakistan and that indigenous developed solutions are possible. Bulk wheat handling will require new administrative methods, as well as a reorientation of the PFD and PASSCO personnel. The official conference recommendations on bulk handling will be forwarded to the government with the pesticide recommendations. The conference was attended by approximately 100 persons.

The conference was originally scheduled to be conducted in March or April but was delayed because of the evacuation of U.S. personnel earlier in the year. The seminar timing was not the most appropriate but was held at this time because the FSM project was to terminate on June 30, 1991. PASSCO and PFDs were in their procurement campaigns, and the national and provincial budget sessions prevented some officials from attending. It was fortunate, however, that the timing permitted NRI of Great Britain to participate. NRI has been cooperating with PARC and the STDT project in conduct of grain storage research in Pakistan.

Flour Milling Technology Seminar

An audio-visual presentation was made to the USAID staff and related AID project personnel on May 2, 1991. The subject was a new flour milling technology developed by the Department of Grain Science and Industry, KSU, and manufactured by Kice Industries, Wichita, Kansas.

External Conferences

Ulysses Acasio and Richard Maxon attended the 13th ASEAN Technical Seminar on Grain Postharvest Technology in Bandar Seri Bagawan, Brunei Darussalam, September 4 - 7. They jointly presented an STDT project paper entitled "Bulk Handling and Storage of Grain: A Pakistan Experience". Dr. Acasio prepared several transparencies with a CAD computer program that were particularly impressive to the audience. Several slides of the bulk handling collection processes at Depalpur were shown. At the closing ceremony, a citation was awarded to them for an outstanding conference paper having scientific merit and potential application to the ASEAN region.

External Training

Tariq Sadiq and Mohammad Shabbir, executive managers of flour mills in Islamabad and Rawalpindi, attended a special flour milling executive training program at KSU June 28-August 10.

<u>Assistance to Private Sector</u>. Assistance provided to the private sector was as follows.

Fumigation Demonstration

A fumigation demonstration was conducted in a private-sector flour mill godown in Islamabad from October 18 - 26. The wheat was badly infested and the opportunity was used to make a video tape for training for the technical seminars

for flour millers as well as future training programs. The mill operator provided the materials used in the demonstration.

Port Qasim Grain Terminal

A private firm has prepared a proposal for construction and management of a bulk grain terminal at Port Qasim. At the request of MINFA, the STDT project prepared a briefing paper on the case for a modern grain import/export facility at Port Qasim. The STDT project, again at the request of MINFA, prepared an analysis of the guarantee request for the import/export facility at Port Qasim.

Assistance in Mechanization of a Private-Sector Warehouse

Several consultations were held with the owner/builder and contractors of a private-sector warehouse. The key mechanical components were delivered to the site. There was a delay in receiving some components ordered due to a transportation strike. Currently, work on the mechanization is proceeding, but completion is unlikely before March 1991.

Rice Fumigation

Two rice mills in the Lahore area came to the STDT project for technical assistance. Both mills had rice exports rejected because of improper fumigation. In both instances, a commercial fumigant applicator had fumigated the export stocks according to the prescribed standards. The STDT project staff investigated the situation and arranged for a demonstration of the PEPF technique at a rice mill.

The major problem is that the level of insect resistance to fumigants has increased so that fumigation to the legally prescribed standard is no longer effective. This subject was discussed at length during the Bulk Wheat Handling and Storage Conference.

Fumigant manufacturers and applicators have contracted the STDT project staff for advice on fumigation methodology.

Assist the Private Sector in Mechanization of Flour Mill Godowns

The STDT project consultants assisted a private-sector flour mill in installing the grain loop components provided by the STDT project in a new wheat storage warehouse. In addition, technical assistance was provided for the design of the mechanization of a second godown as well as supervision of equipment installation. The flour mill is now fabricating an elevator and other equipment to complete the mechanization process.

Other Activities. FFGI and the STDT project staff reviewed all aspects of project activities for Frank Mertens, Office of Agriculture, Bureau of Science and Technology, AID, Washington, D.C. during his visit to Pakistan September 28 - October 3.

FFGI and the STDT project staff reviewed all aspects of project activities for Marc Johnson, Head, Department of Agricultural Economics, KSU, during his visit to Pakistan October 14-16.

World Bank Project Evaluation Team

The STDT project assisted a World Bank team preparing a final evaluation report on IDA credit 1157-Pak ($39.7 million for construction of grain storage, grain storage research, and training for the period 1981-1990). The World Bank team was in Pakistan during April and May.

The bulk wheat handling and storage research program was designed to incorporate the facilities and equipment provided by World Bank into a complete bulk handling chain. The World Bank team inspected progress of the bulk wheat handling and storage research program in integration of facilities provided by World Bank into a bulk wheat handling system. The World Bank team was impressed with the progress made by the STDT project in developing bulk handling systems and development of storage management techniques for the open bulkheads.

FSM Project Evaluation

The STDT project assisted a project evaluation team during May and June in the evaluation of the FSM project. The evaluation of the STDT project was most favorable. The major concern of the evaluation team was the development of plans for institutionalizing the results of the STDT project activities when the STDT project concluded in October 1992.

Project Reports

Acasio, U., R. Maxon, A. Javed, S. Khan. Operation and Maintenance Manual for Bulk Handling Equipment, training manual in English and Urdu, Lahore Training Center

Ahmed, H., M. Ahmad, T. Mahmood, and M. Ahmed. Integrated Pest Management in Hexagonal Bins, STDT Project Report No. 5, Kansas State University, Food and Feed Grains Institute

Ahmed, H., and S. Khan. Stacking in Godown, training manual in Urdu, Lahore Training Center

Ahmed, H., and S. Khan. Pest Control in Stored Produce, training manual in Urdu, Lahore Training Center

Ahmed, H., and S. Khan. Principal Stored-Grain Insects, training manual in Urdu, Lahore Training Center

Ahmed, H., and S. Khan. Inspection, Housekeeping, and Godown Management, training manual in Urdu, Lahore Training Center

Lahore Training Center staff. Important Pests of Stored Grain, training manual in Urdu, Lahore Training Center

Lahore Training Center staff. Pest Control in Stored Wheat, training manual in Urdu, Lahore Training Center

Maxon, R., and U. Acasio. Bulk Handling and Storage of Grain: A Pakistan Experience, paper presented at the 13th ASEAN Technical Seminar on Grain Postharvest Technology, Bandar Seri Bagawan, Brunei Darussalam, September 4-7

Montemayor, M. Estimated Cost of Bulk Handling of Wheat at PASSCO Storage Complex, Depalpur, Consultants Report, STDT Project

Montemayor, M. Performance of Bulk Handling Equipment at PASSCO Storage Complex, Depalpur, Consultants Report, STDT Project

The STDT Project distributed in excess of 300 copies each of the following reports to PASSCO, PPFD, and the private sector: Integrated Pest Management in Hexagonal Bins, Important Pests of Stored Grain, and Pest Control in Stored Wheat.

FFGI Staff and Consultant Utilization

In addition to the two long-term advisors, the following short-term assignments were undertaken by FFGI staff and consultants. Their activities are as follows.

Donald Erickson and Patrick Gormely - July 14 - 28, Pakistan

The objectives of the short-term consultancy were to confer with counterpart faculty of QAU on the following items: (1) Assignment of teaching responsibilities and strategies, (2) definition of course sequences, (3) agreement on texts, reference materials, and similar items for the first term, (4) development of the pre-tests for participants, and (5) other administrative and logistical arrangements as necessary.

Donald Erickson and Andrew Barkley - September 15 - December 15, Pakistan

The objectives of the short-term consultancy were to (1) assist in the teaching program, (2) develop standardized testing and grading procedures, (3) provide oversight of teaching and quality control of the training program, (4) supervise participant evaluations, (5) examine research opportunities for participants, and (6) develop and ensure participant evaluation of the training program.

Marilou Montemayor - July and August, Pakistan

Marilou Montemayor, local consultant employed under subcontract to evaluate the physical performance of the bulk handling equipment used in Depalpur, analyzed data collected in May and June and prepared reports on performance and costs.

Muhammad Asif Javed - November and December, Pakistan

Muhammad Asif Javed, local consultant employed under subcontract to supervise the fabrication of bulk wheat handling equipment and the repair and maintenance requirements of existing equipment for LTC.

Patrick Gormely - April 19 - May 28, Pakistan
Donald Erickson - April 26 - June 7, Pakistan

The objectives of the short-term consultancies were to (1) assist with teaching for the non-degree academic training program, (2) provide oversight of teaching and quality control of the training program, (3) assist and provide guidance to training program participants in the development of their research reports, and to assure completion of the non-degree academic training program.

Gary Gilbert - March 18 - April 5, Pakistan

While the chief-of-party and grain storage advisor were on evacuation, Mr. Gilbert was approved as a local consultant by the project officer to (1) assist in identifying technology appropriate for conversion of godowns to bulk storage, (2) prepare manuals for operating portable equipment under Pakistani conditions, and (3) develop materials on grain cleaning and utilization of grain cleaning.

Gary Gilbert - May 5 - June 30, Pakistan

Objectives of the short-term consultancy were to (1) assist with mechanization of bulk procurement, (2) develop methodology for loading and retrieval of wheat from converted godowns, and (3) develop a management system for the Chichawatni and Multan silos.

Roe Borsdorf - June 7 - 28, Pakistan

Objectives of the TDY were to (1) negotiate a STDT project contract extension with USAID, (2) close financial records of the STDT project under the FSM project, and (3) assist with the Bulk Wheat Handling and Storage Conference.

Arif Javed - January and February, Pakistan

Arif Javed, local consultant employed under subcontract terms of reference was to (1) serve as liaison between PASSCO and the STDT project in design and local procurement of bulk handling equipment, and (2) assist with field work in the bulk wheat handling and storage research program during the absence of the storage advisor.

Hofiz Ahmed - January - June, Pakistan

Hofiz Ahmed, a local consultant, was employed under subcontract to (1) advise on conduct of research in grain protection in bulk storage, (2) conduct insect resistance studies, (3) prepare research reports, and (4) assist in organizing a conference on insect resistance.

Project Management

Project activities are managed by Richard Maxon, Chief-of-Party, a FFGI staff member stationed in Islamabad. FFGI maintains a project office in Islamabad. This project office is staffed by Pakistani employees of FFGI as per contract regulations. These employees and their responsibilities are as follows.

Asim Raza, Administrative Officer
Kausar Saba, Secretary
Mohammad Qureshi, Driver
Mohammad Basharat, Driver

Training and research activities are directed by Ulysses Acasio, Long-Term Advisor for Storage and Training, a FFGI employee stationed in Lahore. FFGI maintains a training center in Lahore. This training center is staffed by Pakistani employees of FFGI as per contract regulations. These employees and their responsibilities are as follows.

Shamsher Haider, Senior Program Specialist (Training)
Jude Dias, Elec/Mech Instructor, Maintenance Specialist
Tina Khan, Secretary
Khadin Hussain, Driver
Khalid Mahmood, Driver
Yaqoob Gill, Driver
Zafir Baig, Data Entry Clerk
Arif Javed, Mechanical and Maintenance Specialist
Christofer, Mechanic

The training center also utilizes contract personnel. These personnel and their responsibilities are as follows.

Marilou Montemayor, Bulk Wheat Handling and Storage Research Analyst
Hafiz Ahmed, Research Leader
Arif Javed, Equipment Fabrication, Repair, and Maintenance
Fayyaz Ahmed, Laboratory/Field Assistant
Mohammad Aslam, Laboratory/Field Assistant
M. Khan, Laboratory/Field Assistant
A. Gunni, Laboratory/Field Assistant
M. Yar, Laboratory/Field Assistant
M. Iqbal, Laboratory/Field Assistant

TABLE 1

SUMMARY OF STDT PROJECT TRAINING ACTIVITIES TO DATE

Invitational Study Tours

Postharvest Technology in Agriculture
Umar Khan Balock, PARC

Bulk Grain Handling and Storage Facilities Management
Mohammad Tariq Janjuah, MINFA
Muhammid Rashid Sheikh, MINFA
S. Anwar Haider, Sind Food Department
Shaukat Gul, NWFP Food Department
Muhammad Taj, PASSCO
Haji Muhammad Kahn, PASSCO
Naiz Mohammad Khan, Balochistan Food Department
Zia Ul Huq, Punjab Food Department
M. Gulzar Qazi, USAID
Muhammad Akram, PASSCO
Muhammad Bashir Agmad, Ministry of Finance
Salahuddin Soliman, MINFA
C. Shah Muhammad, PASSCO
Muhammad Ayub Shah, MINFA
Yousaf Pathan, Balochistan Food Department
Shoukat Ali Chaughtai, USAID
Thomas Olson, USAID

Postharvest Literature Documentation
Shaheen Majid, NARC Library

Postharvest Research Procedures
Ahmed Mubarik, PMRI

External Short Courses

GSMSC, KSU
1987
M. Rafiq Khan, University of Agriculture, Faisalabad
Maken Sikander Hayat, MINFA
Mukhtar Ali Baig, PASSCO
Abdul Latif Dasti, Punjab Food Department
Sohrab Khan Kalwar, Sind Food Department
1988
Ghulam Rasul, Ayub Agricultural Research Institute, Faisalabad
Irshad Ahmed Junejo, Sind Food Department
Ghulam Ally Memon, Sind Food Department
1989
Iqbal Ahmed Baluch, private farmer
Nasrullah Khan Malik, MINFA
Abdul Hameed Chaudhry, Punjab Seed Corporation
Shahabuddin, MINFA

TABLE 1 (Continued)

SUMMARY OF STDT PROJECT TRAINING ACTIVITIES TO DATE

1990
Tariq Mahmood, PMRI
Sajjad Ahmed, PMRI
Sirajuddin Ahmed, MINFA
Aklaq Ahmed, PMRI

Operations of Varian Chromatograph, Zug Switzerland
Shahida Parveen, PMRI

Grain Storage Management Short Course, Kansas State University
1990
M. Abbas, NWFP Food Department
M. Azhar, Punjab Food Department
M. Kassi, PASSCO
C. Iqbal, PASSCO
A. Shah, PASSCO
S. Taireja, MINFA
M. Hussain, Punjab Seed Corporation
M. Khattak, MINFA
M. Alam, Punjab Cotton Research Institute
A. Qadir, Cereal Crop Research Institute

U.S. Grain Marketing System, IGP, KSU
1990
T. Naximi, PASSCO
M. Bashir, MINFA

Flour Milling Executive Training Program, KSU
1990
Tariq Sadiq, Sinhala Flour and General Mills Ltd, Islamabad
Mohammad Shabbir, Rawalpindi Flour and General Mills Ltd, Rawalpindi

Total of 31 individuals, external short courses

External Conferences
Sirajudden Ahmed, MINFA - 10th ASEAN Seminar on Grain Postharvest Technology
Hafiz Ahmed, PMRI - 11th ASEAN Conference on Postharvest Technology

Total of 2 individuals, external conferences

Academic Training
N. Ullah, PMRI, Ph.D., Grain Science, KSU
Faqir Mohammad Anjum, Ayub Research Institute, Ph.D., Grain Science, KSU
Abdul Hamid, Punjab Agricultural Department, M.S., Agricultural Engineering, KSU

Total of 3 individuals, academic training

Total of 36 individuals, external training programs

In-Country Short Courses, Conferences, Seminars, and Workshops

Statistical Analysis for Microcomputer Course - ADC/FSM
Jamshed Khan, PMRI
Aklaq Ahmed, PMRI

STDT/LTC - Master Trainers Course
Nazar Muhammad Khan, Balochistan Food Department
Akhtar Muhammad Khan, Balochistan Food Department
Muhammad Paryal Channa, PASSCO
Abdul Latif Menon, Sind Food Department
Haibat Khan Rind, Sind Food Department
Khushi Muhammad, PASSCO
Shamsher Haider Khan, PASSCO
Abdul Khaliq, PASSCO
Mohammad Ibrahim Dasti, Punjab Food Department
Zia Ahmed Malik, Punjab Food Department
Riaz-ul-Haq Chaudry, Punjab Food Department
Rana Abbas Ahmed, Punjab Food Department
Arjumand Khan, NWFP Food Department
Tariq Javed, NWFP Food Department
Mohammad Taj, PASSCO
Asghar Ali Bajwa, PASSCO
Badaruddin Shaikh, Sind Food Department
Mohammad Afzal, private sector

Total of 18 individuals

STDT/LTC - PASSCO and PFD Storage Operations Personnel
PASSCO - 261 operational personnel
Punjab Food Department - 109 operational personnel
Sind Food Department - 102 operational personnel
Balochistan Food Department - 72 operational and 42 management personnel
Directorate General Food, Karachi - 18 operational personnel
Central Testing Laboratory, Karachi - 6 operational personnel
Pakistan Flour Millers Association - 3 operational personnel
Sind Food Department - 17 operational personnel
DG Food MINFA - 17 operational personnel
Central Testing Laboratory - 6 operational personnel
Unity Flour Mills (private sector) - 1 operational personnel
Indus Flour Mills (private sector) - 1 operational personnel
Rasool Flour Mills (private sector) - 1 operational personnel
NWFP Food Department - 48 operational personnel

Total of 697 individuals

National Seminar and Workshop on Wheat Procurement and Storage Policies, 1989
80 participants - MINFA, PFDs, private sector, PARC

Flour Milling Seminars/Workshops, 1989
Islamabad - 110 participants for seminars, 75 participants for workshops
Lahore - 100 participants for seminars, 60 participants for workshops
Karachi - 275 participants for seminars, 40 participants for workshops

Flour Milling Seminars/Workshops, 1990
Islamabad - 64 participants for seminars
Karachi - 43 participants for seminars

Total of 767 individuals

STDT/LTC - Bulk Wheat Handling and Storage Research Program Equipment Operations
PASSCO - 9 operational personnel (March 1990)
PASSCO - 26 operational personnel (March 1990)

Total of 35 individuals

PASSCO/STDT/LTC Bulk Wheat Handling and Storage Research Program Equipment Demonstration, 1990
MINFA, PFDs, PASSCO, USAID, private sector - 110

Corn Drying and Feed Mill Operations, Gijuranwala, 1990
Private sector - 10

Non-Degree Academic Training Program, 1990/91
Shah Mahmood, EW/MINFA
Ahmad Salman, SIND Department of Agriculture
M. Baqir Mufti, Punjab Department of Agriculture
Muhammad Aslam, EW/MINFA
M. Ajmal Baig, PIDE
Abdul Shakoor Sabri, EW/MINFA
Ijaz Hussain, Punjab Department of Agriculture
Mohammad Yousaf Haleem, EW/MINFA
Abdul Majeed, EW/MINFA
Mubasher Ahmad, EW/MINFA
Sajjad Hussain Malik, EW/MINFA
Mohammad Ramzan, EW/MINFA
Mohammad Younas, EW/MINFA
Mohammad Mawaz, EW/MINFA
M. Aijaz, Sind Department of Agriculture
Abjul Qaddus Paracha, EW/MINFA
Mohammad Wasil, EW/MINFA
Salim Akhtar, EW/MINFA
Abdul Rehman Jami, Punjab Department of Agriculture
S. Yar Mohammad Shah, University Tandojam SIND Agriculture

Total of 20 individuals

Fumigation and Pest Management Training, 1991
Punjab Food Department - 122

Bulk Equipment Operations and Maintenance, 1991
PFD and PASSCO - 100

Bulk Wheat Handling and Storage Conference, 1991
MINFA-PARC - 14
Food Departments - 15
PASSCO - 16
University researchers - 10
Private Sector (ag. chemicals, flour, rice milling) - 24
USAID - 7
STDT/FSM Project - 12
NRI - Great Britain - 1

Total of 98 individuals

Other Short Course Activities
Integrated Pest Management Training Course, FAO/PARC, 1989 - 23 participants
Training Session on Wheat and Rice Grading, CIMMYT/HIID/APC, 1990 - 26 participants

Total of 49 individuals

Total of 2,065 individuals, in-country training activities

Total of individuals in all training programs to date - 2,122

APPENDIX IV

CONTRACT 505-0016-C-00-9097-00
PUBLIC-SECTOR COMPONENT
TOLEDO AGRICULTURAL MARKETING PROJECT

Project Description

This contract between the USAID Mission to Belize (USAID/Belize City) and FFGI at KSU has for its goal to upgrade the existing BMB rice mill and storage complex at Big Falls, Toledo District; to improve product throughput, reduce losses, and improve quality as an integral part of the implementation of the Government of Belize (GOB)/USAID program to restructure the BMB into a price stabilization entity for basic grains.

The tasks of FFGI under the PS/TAMP are to (1) assist the GOB in restructuring the BMB into an entity concerned with commodity price stabilization for basic grains, (2) purchase and replace some parts that need to be changed in some machinery in the BMB Big Falls Rice Mill and Grain Complex located at Big Falls, Toledo District, and (3) assist the Ministry of Agriculture (MOA) in developing and carrying out the training programs in agricultural sciences as provided for in the project.

Staff Utilization

Time spent by FFGI staff members in project activities is summarized below.

Activity Category	Person-days
Research	
Technical Assistance	233.0
Technology Transfer	
Training	
Networking	
Administrative	
TOTAL	233.0

Project Activities

Price stabilization program. In May 1990, the Belize Prime Minister's Cabinet approved and initiated a grain price stabilization program through an upward adjustment of the wholesale and retail prices of local milled rice. Initially, only rice will be included in a price stabilization program. The Ministry of Agriculture and Fisheries, with BMB as implementing agency, was given exclusive rights to importing milled rice into Belize. The GOB issued statutory regulations concerning the price stabilization program in October 1990.

Implementation

With the upward adjustment of the wholesale and retail prices of local milled rice, it was possible for BMB to set a target band price for rough rice; the floor price and ceiling price for the 1990/91 crop, starting in August 1990. The floor price is 25 cents per pound of paddy, given the paddy has a moisture content of 13-14% and a foreign matter content of less than 4%. For paddy with higher moisture content and/or higher foreign matter content, the paddy prices are discounted using four criteria.

The first criterion is discounting the actual weight of water and the foreign matter in the paddy. The second criterion is based on BMB's paddy drying costs and an incentive given to get paddy producers to bring in the paddy at approximately 16-17% moisture. The rice for paddy brought in above 17% moisture is discounted much greater than for paddy brought in at less than 17% moisture. The third criterion is based on the cost of taking out the foreign matter from the paddy. Those cleaning costs increase uniformly with higher foreign matter content. The fourth criterion is based on the cost of general administration at the BMB. For a paddy with higher moisture content, the cost of general administration increases uniformly.

During September through November, BMB selected agents to sell the BMB domestic milled rice or imported rice on consignment. During September through March 1990, an educational campaign was conducted which was directed to informing rice producers, millers, wholesalers, retailers, and consumers of the rice price stabilization program through meetings, agricultural extension agents, local newspaper and radio announcements, and a BMB newsletter.

The rice price stabilization program began operating in October 1990, when local milled rice began to be sold on the domestic retail market. The ceiling price on local milled rice for the 1990/91 crop year was set by the GOB at 65 cents/pound (wholesale) and 69 cents/pound (retail). Based on BMB's consumer rice quality survey, it was determined that a retail price for milled rice above 69 cents/pound would likely impact the poor adversely by requiring the poor to spend a disproportionate amount of their income on a staple commodity like rice.

A program of continually monitoring the quality of rough rice and milled rice was implemented by the BMB. Representative samples of each truckload of milled rice was taken and tested. A history of the drying and storage techniques used on each truckload of milled rice was also provided in the quality test. The results of the quality test indicated that there was a significant improvement in the quality of current milled rice as compared to that milled and sold during the past two crop years.

Surveys

The database for the domestic and international rice markets has been expanded. Information on the domestic rice marketing system was collected through the following surveys: Consumer Rice Quality Survey, the Toledo Paddy Producers Production Survey, and the Milled Rice Demand Survey of especially wholesales and retailers.

In January, a meeting of rice millers in Belize was held at the BMB offices in Belize City. At the meeting, the rice millers agreed to provide BMB, beginning with the 1991/92 crop year monthly reports as to the amount of rice milled and sold and the amount of rough rice remaining to be milled.

Economic Models

Economic models for analyzing the quantity of rice demanded in Belize, the ceiling price, and the floor price were developed. However, with extensive monthly data not readily available for most independent variables, the models were designed incorporating these constraints.

Support

A research economist was hired by the BMB. His job responsibilities are to (1) manage a database system that includes both domestic and international commodity market information, (2) supervise all market survey activities and all data gathering and entry on the computer, (3) analyze commodity market supply and demand relationships and provide timely forecasts on commodity prices, qualities, and volume to the BMB management, Policy Unit, and Agricultural Extension Service of MOA, producers, producer organization, commodity wholesalers, and consumers; and (4) to coordinate with the BMB management staff all activities under the Grain Price Stabilization Program. The research economist will be responsible for identifying and recommending the target band for each commodity that needs to be bought or sold in the market, stored, exported, or imported.

A statistical clerk was hired by the BMB. He will be responsible for day-to-day operations concerning the statistical database system at BMB.

<u>BMB Big Falls Rice Mill Complex Renovation.</u> A decision was made by MOA to procure a new rice mill, storage bins, and miscellaneous tools and equipment.

Tools and miscellaneous equipment for repair and maintenance at the rice mill complex were supplied by the project. The new rice mill and storage bins were to be procured by BMB with funds allocated by MOA.

Assistance in the mill procurement process was provided in the areas of specifications, contract terms, and sources of procurement for electrical items and storage bins. Assistance was also provided in planning for the earthwork, foundation work, procurement, erection, and start-up of the new storage bins to be procured for the rice mill complex. A working document entitled "Project Planning: Operation and Maintenance Improvement, and Personnel Training for BMB Rice Complex" was prepared and given to BMB, as a guide for installation of new equipment and continuous improvement of the complex.

Current Mill Improvement

A heat recovery system was constructed and installed at the rice mill complex. Assistance was provided in the installation and use of the heat recovery system. The heat recovery system was connected from the generator radiator to the aeration fan of the nearest flat-bottomed steel storage bin. The system was tested. Approximately 30,000 pounds of rough rice at an initial moisture content

of 20% was evenly spread into the 24-foot diameter bin and the aeration system was started. A 21-degree Fahrenheit temperature rise with respect to ambient air temperature was obtained and the drying air temperature at this point was measured at 108 degrees Fahrenheit. The drying was stopped after 15 hours of fan operation and the final moisture content of the rough rice was 13% at the bottom of the bin and 14% at the top of the bin. This type of slow, steady drying process is ideal for minimizing grain breakage during hulling and milling processes. Rough rice drying costs should be substantially reduced because the radiator heat from the generator is a no-cost heat source.

Since being installed, the heat recovery system has been used continuously to dry rough rice. Approximately 35,000 pounds of rough rice have been dried in each batch in the bin. About 5.5% moisture has been taken out of the rough rice over a 18-hour drying period.

Coordination with Private Sector Component of TAMP. Contact with the private-sector component of TAMP was maintained through a series of meetings which discussed market development problems in Toledo: how and when IFAD's/Multipurpose Service Center's (MSC) would be functioning, the mechanics of how BMB and IFAD would coordinate grain buying activities at the MSC's, the need for training Agricultural Extension officers in identifying paddy problems that cause rice to break when milled, and privatization of the MSC's and the role of the Federation of Cooperatives in Toledo.

As a result of this collaboration, a position paper on privatization of MSC's, depots, and the rice mill complex was prepared. This position paper was presented to the Ministry of Agriculture and Fisheries.

Training. Training activities under the project involved academic, in-country, and external training.

Academic

Long-term training for Mr. Galbert Palacio, Assistant Stock and Ledger Clerk at BMB was initiated in August. He will study for an Associate's Degree in Business at a Community College in the U.S.

In-Country

In July, a Paddy Pricing/Purchasing workshop for paddy producers in Toledo was held in Punta Gorda. The workshop was sponsored by BMB and PS/TAMP. Over 140 paddy producers (milpa and mechanized) attended along with officials and technical people from MOA and the IFAD/Toledo Small Farmers Development Project (TSFDP) project. The workshop served to update the participants on the general policies (pricing and purchasing) of BMB during the 1990/91 crop year. The workshop resulted in the producers having a more thorough understanding of BMB's policies and costs. It also gave the participants more confidence in the way BMB was handling the pricing and purchasing of their paddy, and the processing, storing, and merchandising of the rice.

In October, a two-day training program was presented for five personnel from the TAMP/Volunteers in Technical Assistance (VITA) private-sector project and the

Department of Agriculture of Toledo District. The training consisted of fundamentals of grain storage, including concepts of moisture, moisture measurement, importance of moisture for grain storage and processing, drying, cleaning; air properties, and relative humidity measurement, moisture migration, aeration, and processing. A grain drying demonstration was conducted by using the natural convection grain dryer that was constructed in November 1989. The trainees were: Norman Budna, Marketing Manager, TAMP/VITA; Elswith Bowen, Extension Agent, Toledo DAO; Sharon Tillet, Extension Agent, Toledo District Agricultural Officer (DAO); Wallace Mahler, Extension Agent, Toledo DAO; and Nonato Cantu, Extension Agent, Toledo DAO. In conjunction with this training program, training was provided to five farmers in the construction and operation of the natural convection grain dryer and drying procedures.

On-the-job training was provided by the long-term advisor to Ephraim Novello, BMB Research Economist, and Emiliano Sosa, Statistical Clerk. In addition, these individuals were provided training through a 6-week course in Beginning Computer Training Course and Advanced Computer Training Course, respectively, at the Glessima Research Services in Belize City. The long-term advisor provided training in DOS, Lotus 1-2-3, DBase 3, and WordPerfect computer software programs.

The project also sponsored short course training for four BMB employees at the Belize Institute of Management in Belize City. These employees are: Mirla Trujeque, Senior Secretary; Lourdes Geldago, Secretary; Egbert Jacobs, Jr., Assistant Branch Manager; and Phillip Gonzalez, Assistant Warehouse Manager.

Reports. The following publications were produced as a result of project activities.

Neils, K., and F. Gorrez. 1991. "Strategy for Privatization of the Marketing Centers and the Marketing Board's Big Falls Rice Complex in Toledo (Belize)", Kansas State University, Food and Feed Grains Institute

FFGI Staff and Consultant Support. In addition to the long-term advisor, short-term assignments were undertaken by FFGI staff to assist with project activities. The staff members and their activities are as follows.

Ekramul Haque, Agricultural Engineer

The objectives of the short-term consultancy were to (1) conduct on-the-job training for BMB supervisory and operating personnel, (2) assist paddy producers in proper usage of the natural convection grain dryer, (3) review and evaluate the work of the local civil engineer responsible for developing the specifications for earthwork required for the foundations for the additional storage bins, (4) review the contract for procurement of the new mill and the contract or erection of the mill and develop a work plan, (5) assist local private-sector rice millers in selecting essential machinery and equipment for improving the quality of milled rice, and (6) develop a plan, including a timetable and equipment and labor requirements for upgrading BMB's paddy grading activities. The dates of the consultancy were September 17 - October 11, 1990.

Project Management

Project activities were managed by Kenneth Neils, Long-Term Advisor, an FFGI staff member stationed in Belize City with offices at BMB.

APPENDIX V

CONTRACT 53-319R-9-023
AGROINDUSTRIAL PROJECT ANALYSIS SHORT COURSE

Project Description

This contract between OICD/ITD, USDA, and FFGI at KSU is for the presentation of a six-week APASC.

The objective of the short course is to train developing-country participants in a practical analysis of small- and medium-scale agroindustrial or agribusiness projects within a marketing, procurement, and processing systems framework. Participants will develop knowledge and skills to (1) identify critical marketing, production, procurement, processing, and distribution components in agroindustrial projects, (2) identify data collection and analysis needs for each component, (3) calculate financial and economic impacts, (4) determine internal rates of return on investment, and (5) identify socioeconomic and institutional factors that affect agroindustrial projects.

Staff Utilization

Time spent by FFGI staff members in presenting the short course is summarized below.

Activity category	Person-Days
Research	
Technical Assistance	
Technology Transfer	
Training	165.5
Networking	
Administrative	9.0
TOTAL	174.5

Project Activities

The 1990 APASC was presented July 2 - August 10, 1990. The course was attended by 13 participants from 11 countries. A list of participants and their countries is presented in Table 1.

Course Content. Participants received instruction in the areas of definition of agroindustrial projects; role of agroindustrial projects in economic development; role and value of a systems approach in project analysis; role of the analyst; definition of the steps in project analysis; market analysis; analysis of procurement and processing operations; determination of information needs; methods of information collection including interviews, technical analysis, economic analysis, and financial analysis; calculation of internal rates of returns and return on investment; sensitivity analysis; identification of socioeconomic and institutional issues; methods and formats to present the

project analysis; introduction to microcomputers, introduction to word processors and line editors; introduction to spreadsheets; FFGI budgeting software operation; FFGI feasibility software use; and use of FFGI financial statements software.

In order to enhance the practical orientation of the course, one-day field trips were taken to a variety of agribusiness industries. Visits were made to a farm machinery equipment manufacturer, a county development corporation, a commercial cattle feedlot, an alfalfa dehydrating plant, a meat processing facility, a vegetable crop farm, a food processor, a large regional bank, a large egg processing facility, a fish processing plant, and a snack food manufacturer.

Basic reference materials were made available to the participants to use upon return to their countries. Each participant received a manual that contained the outlines of the lectures and laboratory exercises as well as extensive supplemental materials designed to be used as reference sources. Lecturers also distributed handouts covering published information not included in the manuals. Reference books were also made available for purchase.

Evaluations. Weekly evaluations were conducted throughout the course. At the end of the course, all participants completed an evaluation covering all aspects of the course. The course evaluation was based on a scale of 1 to 5, with 1 being the lowest score and 5 being the highest. The overall rating of the course was 4.0. The course objectives were evaluated on achievement and were rated at 4.3. Instructional methods used in the course received a score of 4.2 and the course materials a score of 4.0. Satisfaction of the field trips was rated at 4.5 with relevancy of visits given a 4.1 score. Course administration and logistics received a score of 3.6. Twelve of the 13 respondents indicated they would recommend this course to others with similar backgrounds.

1991 course. Preparations were made for conduct of the course in 1991. The time period for the course was June 17 to July 26. However, the course was canceled due to the low number of participants enrolled.

TABLE 1

AGROINDUSTRIAL PROJECT ANALYSIS SHORT COURSE PARTICIPANTS

Country	Name
Burundi	P. Camirirwa
	R. Ntareme
Cameroon	N. Joseph
Egypt	A. Mostafa
Honduras	G. d'Estephan
Indonesia	T. Napitupul
Nepal	T. Shrestha
Pakistan	H. Shah
Rwanda	S. Mugesera
	A. Uwizeye
Turkey	Y. Koca
Zimbabwe	A. Rukovo
Zaire	T. Mulubay

APPENDIX VI

PURCHASE ORDER PAKISTAN PARTICIPANT TRAINING PROGRAM - 2
PAKISTANI FLOUR MILL EXECUTIVE TRAINING PROGRAM

Project Description

The purpose of this purchase order is to provide a Flour Mill Executive Training Program for two Pakistan flour mill executives during the period July 7 - August 11, 1990.

Staff Utilization

The time spent by FFGI staff members in presenting this short course is summarized below.

Activity category	Person-Days
Research	
Technical Assistance	
Technology Transfer	
Training	15.0
Networking	
Administrative	
TOTAL	15.0

Project Activities

The training program participants were: Sheikh Mohammed Shabbir, Chief Executive Officer, Rawalpindi Flour and General Mills Ltd., Peshawar Road, Rawalpindi, Pakistan; and Sheikh Tariq Sadiq, Executive Director, Sinhala Flour and General Mills Ltd., I/9 Industrial Area, Islamabad, Pakistan.

Course Content. The training program included attendance in a two-week IGP Flour Milling Short Course. The remaining three weeks of the program provided training in grain quality preservation, grain storage and handling, and flour quality control. A series of field trips to private-sector milling operations, storage and handling facilities, and related businesses were conducted. A complete program schedule is detailed in Table 1.

Final Evaluation. At the end of the program, the participants were asked to fill out an evaluation covering all aspects of the program. The course was evaluated based on a numerical scale from 1 to 5, with 1 being the lowest and 5 being the highest. In addition participants were encouraged to make comments. The results of this year's evaluation are briefly summarized as follows:

The overall rating of the course was 4.0. The course content was rated at 4.2. Value of field trips was rated at 3.8 with relevancy of visits given a 3.9 score. Both participants indicated they would recommend this type of program to others with similar backgrounds and interest.

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TABLE 1

TRAINING PROGRAM
July 7 - August 11, 1990

July 9-20	IGP Flour Milling Short Course
July 23	Wheat Structure and Micro-environment in Mass
	Grain Moisture and Equilibrium
	Grain Moisture Laboratory
	Grain Sampling; Classification
	Grain Inspection Practice
July 24	Grain Handling Equipment
	Grain Cleaning Equipment
	Handling Equipment Maintenance and Practice
	Insects and Mold Pests
	Pest and Damage Laboratory
July 25	Integrated Pest Management
	Facility Inspection and Housekeeping
	Physical, Mechanical, & Chemical Methods of Pest Control
	Visit Kansas Grain Inspection Service Laboratory
July 26	Pest Control Laboratory
	Visit Land O' Lakes Feed Mill
July 27	Visit Union Equity Elevator
	Visit Hutchinson Wil-Rich Manufacturing Company
	Visit Gilmore-Tatge Manufacturing Company
July 30	Visit Butler Manufacturing Company
July 31	Visit Kansas City Board of Trade
	Visit American Italian Pasta
	Visit ADM Flour Mill
August 1	Visit General Mills
August 2	Analytical Laboratory Analysis
	Physical Testing Equipment
	Testing Equipment Laboratory
August 3	Baking Tests and Testing Laboratory
August 6	Visit Bunge Elevator
	Visit Research Products, Inc.
August 7	Visit Creason, Inc.
	Visit Trammel Corporation
	Visit flour mill
	Visit Greenway Electric Contractors
August 8	Visit Kice Engineering
	Visit Witt, Inc.
	Visit Moore Equipment
August 9	Review of Raw Material Quality Maintenance
	Review of Cleaning and Handling Equipment
	Review of Quality Control in Processing
	Review of Quality Control Laboratory Procedures

APPENDIX VII

CONTRACT 657-0510-C-00-0096-00
CASHEW MARKET STUDY (GUINEA-BISSAU)

Project Description

The purpose of this contract was to conduct a cashew market study with the objectives of providing a better understanding of the Government of Guinea-Bissau (GOGB) cashew policies and intervention programs and the structure, conduct, and performance of the domestic cashew market. A secondary purpose was to provide a better understanding of the world cashew market for domestic policy and private-sector development purposes.

Staff Utilization

The time spent by FFGI staff members in conduct of this activity is summarized below.

Activity category	Person-Days
Research	
Technical Assistance	34.0
Technology Transfer	
Training	
Networking	
Administrative	
TOTAL	34.0

Project Activities

The study was composed of (1) an analysis of the cashew production/processing phase in Guinea-Bissau, (2) an analysis of the cashew marketing/export phase within the country, and (3) an analysis of the international cashew trade.

During June 1990, J.D. Lea, agricultural economist, in collaboration with Carlos Cardoso, Instituto Nacional de Estudos e Pesquisa, Guinea-Bissau (INEP), conducted interviews with approximately 60 public- and private-sector individuals involved in the marketing of cashew products in Guinea-Bissau. The team also conducted field trips to cashew plantations in the major cashew producing areas of Guinea-Bissau.

A spreadsheet model of an ideal cashew nut marketing firm was developed. The spreadsheet was arranged to calculate the gross profit of the cashew exporting enterprise, using assumptions relative to cashew and rice prices, exchange rates, and interest rates. The model was demonstrated by using suggested changes in the basic assumptions and observing the effect on gross profit.

Further analysis of the cashew production, processing, marketing, and export system of Guinea-Bissau was conducted at KSU by J.D. Lea and Cornelius Hugo. An analysis of the international cashew trade was also conducted. Technical Assistance Report Number 119, "A Review of the Cashew Sub-Sector in Guinea-Bissau" was published. The report was translated into Portuguese and published as Technical Assistance Report Number 119A".

APPENDIX VIII

CONTRACT NCBA - 1
TECHNICAL ASSISTANCE FOR AN ASSESSMENT OF PROPOSED PLAN TO PRIVATIZE THE BASIC GRAIN AND EDIBLE BEAN MARKET IN EL SALVADOR

Project Description

Provide technical assistance to assess the feasibility of a proposed plan to privatize El Salvador's basic grain and edible bean markets. The assessment will be conducted from two perspectives: (1) economic and (2) technical.

Staff Utilization

The utilization of FFGI staff members time in the conduct of this activity is summarized below.

Activity category	Person-Days
Research	
Technical Assistance	
Technology Transfer	81.5
Training	
Networking	
Administrative	
TOTAL	81.5

Project Activities

At the request of USAID/San Salvador and the Government of El Salvador (GOES), Cornelius Hugo traveled to San Salvador to provide the requested technical assistance. The travel dates were September 5 - October 31, 1990.

Scope of Work

As team leader and grain marketing specialist for a three-member team, Cornelius Hugo's scope of work was as follows:

- Assess the feasibility of the proposed grain trade at the national level

- Prepare, in collaboration with the agricultural engineer and grain elevator manager, a detailed plan for the transition phase of the privatization process, assuming it is found to be feasible.

- Prepare, in collaboration with the agricultural engineer and grain elevator manager, an economic analysis of a sample viable independent grain firm. Provide advice on how this representative analysis can be applied to the analysis of other independent firms to be created.

- Be responsible for coordinating and overseeing the work of all team members as well as synthesizing the material produced into concise and coherent draft and final reports.

Objective

The objectives of this technical assistance assignment were to: (1) appraise the technical and economic feasibility of a proposed plant to reactivate, within the context of a market oriented food system, the grain handling and storage facilities now being managed by two public-sector institutions, the Instituto Regulador de Abastecimiento (IRA) and the Banco de Fomento Agropecuario (BFA); and (2) develop a transition plan to rehabilitate the grain handling and storage facilities, reactivate them, and bring about the transfer of the facilities and associated marketing functions to the private sector.

The work was initiated with a review of relevant background literature and studies in San Salvador. Afterwards, the team spent three weeks in the field undertaking a technical inspection of all IRA and BFA facilities. The team also conducted interviews with as many participants as possible of the basic grains food system in El Salvador, including grain producers, land laborers, itinerant trucker-merchants, larger grain merchants, grain wholesalers and retailers, managers of bonded warehouses, animal feed manufacturers, rice millers, corn processors, the port authority of Acajutla, employees and representatives of different government ministries and departments, bank managers, lawyers, representatives of private firms engaged in millwright work, electro-mechanical engineering firms, truck scales service firms, and civil construction firms.

The results of the technical inspection of the facilities and proposed transition plan were presented to representatives of the government and USAID/San Salvador, one week prior to departure. Constructive comments and other feedback were analyzed and incorporated where appropriate.

During the assignment in El Salvador, the team worked as closely as possible with personnel of the Programa de Banda de Precios (MAG-MEC), the Oficina Coordinadora de Proyectos con Fondos Externos (OCOPROY), the Oficina Sectorial de Planificacion (OSPA), IRA, and BFA representatives.

Report

A final draft of a report was left with USAID/San Salvador prior to the team's departure on October 31, 1990. A Spanish version of the report was submitted 45 days later. The title of the report is "Reactivating El Salvador's Public Grain Handling and Storage Facilities within the Private Sector".

APPENDIX IX

CONTRACT RHONE-POULENC - 1
FIELD TRIALS OF IPRODIONE ON STORED CORN IN KANSAS

Project Description

Research on a commercial brand of Iprodione known as Rovral for the storage of high-moisture corn. The research encompasses large-scale trials of Rovral in stored corn and the effect of formulation and time of treatment on efficacy of Rovral.

Staff Utilization

The utilization of FFGI staff members' time during this period is detailed below.

Activity Category	Person-Days
Research	28.5
Technical Assistance	
Technology Transfer	
Training	
Networking	
Administration	
TOTAL	28.5

Project Activities

Research was conducted to test whether a specific time delay between harvest and the application of Rovral affected the fungicide's ability to control molds in corn. Results of the research was analyzed, and report prepared for the sponsor of this research program.

APPENDIX X

CONTRACT NCGA - 1
DATABASE OF FUNDED RESEARCH ON CORN QUALITY AND UTILIZATION

Project Description

To develop and maintain a database of corn utilization research for NCGA. The purpose of the database is to centralize project information on corn utilization and quality research.

Staff Utilization

The utilization of FFGI staff members' time during this period is summarized below.

Activity Category	Person-Days
Research	
Technical Assistance	
Technology Transfer	224.0
Training	
Networking	
Administrative	
TOTAL	224.0

Project Activity

During 1991, all retrospective project information from NCGA and its associated State Corn Growers Associations was collected and cataloged into CURD. Over 700 documents were collected that provide directory access to investigators, descriptions of the scope and approach to the work, and lists of sponsors of the research.

In addition, international project information from several countries has been collected. Corn utilization research described in the database includes work on biodegradable plastic products, test of ethanol in commercial vehicles, development of deicers from cornstarch, and coal desulfurization. Project dealing with corn quality as it pertains to end uses are also included.

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APPENDIX XI

CONTRACT 675-0510-C-00-0173-00
POLICY SEMINAR SERIES (GUINEA-BISSAU)

Project Description

The purpose of the project was to present a seminar series on the Policy Analysis Matrix (PAM) methodology for analyzing agricultural policy, and present the results of a study on the cashew industry in Guinea-Bissau.

Staff Utilization

The utilization of FFGI staff members' time during the conduct of this project is summarized below.

Activity Category	Person-Days
Research	
Technical Assistance	69.0
Technology Transfer	
Training	
Networking	
Administrative	
TOTAL	69.0

Project Activities

J.D. Lea, agricultural economist, and Roger Fox, consultant, traveled to Bissau, Guinea-Bissau October 20 through November 11, to conduct a PAM seminar series and present the results of the cashew market study.

PAM Seminar Series. The seminar series was conducted October 29 through November 1. The program for the seminar series was divided into six parts: (1) strategy for implementation of PAM, (2) selection of a commodity and determination of alternative systems, (3) data requirements and specifications, (4) personnel requirements for use of PAM, (5) demonstration of PAM, and (6) seminar conclusions and summary. Twenty-three individuals participated in the seminar. A list of participants and their organizations is set forth in Table 1.

Cashew Market Study Presentation. This presentation was devoted to a summary of the study results and a question and answer session. About 40 people from the public and private sector attended.

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TABLE 1

POLICY SEMINAR SERIES LIST OF PARTICIPANTS

Ministry of International Cooperation
- Henrique Horta dos Santos
- José Carlos Casimiro
- Anita Gomes
- Daniel A. Martins Lopes

Ministry of Commerce and Tourism
- Pedro Augusto Gomes Barbosa
- Dra. Udé Mané Camará

Ministry of Rural Development and Agriculture
- Nelson Gomes Dias
- Mamadú Mané
- Cesaltina R. Silva
- Antonio Mendes

Secretary of State for Plan
- Cherno Abdulai Baldé
- Justino Fernandes

Ministry of Economy and Finance
- Carlos Andrade
- Wilson Cruz
- Carlos Pinto Pereira

INEP
- Faustino Imbali
- Manuel Massim
- Ana Maria Delgado

Central Bank
- Aguinaldo Embaló
- Adriáo Spencer L. Carvalho

National Credit Bank
- Carlos Luis Pinto
- Humberto José de Silva
- Eduardo A. Araujo

APPENDIX XII

COOPERATIVE AGREEMENT DAN-4144-A-00-5095-00
TECHNICAL ASSISTANCE FOR PROJECT PAPER PREPARATION (GUINEA-BISSAU)

Project Description

The purpose of this cooperative agreement with the Office of the AID Representative (OAR)/Bissau is to assist in a project design and develop a project paper. The goal of the project will be to reinforce a supportive environment for the growth of the agricultural private sector. The purpose of the project will be to strengthen the capability of GOGB to develop and implement agricultural and food security policies that support rational resource utilization in a market-directed economy.

Staff Utilization

Time spent by FFGI staff members' time on this project is summarized below.

Activity Category	Person-Days
Research	
Technical Assistance	68.0
Technology Transfer	
Training	
Networking	
Administrative	
TOTAL	68.0

Project Activities

J.D. Lea, agricultural economist, and Mark Langworthy, consultant, traveled to Bissau, Guinea-Bissau, November 11 through December 10, 1990, to provide assistance in project design and preparation of a project paper.

Because of the departure of the past AID representative and the arrival of the a new AID representative, the activities under this project were changed by request of the new AID representative. The team was directed to focus on describing the situation through institutional analyses. After many discussions, OAR/Bissau decided to redesign the project. Originally, the project was to be composed of two components: a component to strengthen the legal system and a component to strengthen the agricultural policy-making process. OAR/Bissau decided to split the project into two and concentrate initially on developing a project paper and implementing a project for the legal component. The team was asked to strengthen the existing information relating to the development of a project paper for the agricultural policy project. At the end of the consultancy, the Program Development Officer (PDO) received draft copies of an outline of the team's proposal for a project to strengthen agricultural policy analysis and implementation, an institutional analysis of the relevant institutional participants in the agricultural policy-making process, an institutional analysis

of the relevant institutions involved in the collection of agricultural statistics, and a list of recommended technical assistance activities which could be implemented prior to the development of the final project paper.

APPENDIX XIII

PURCHASE ORDER 657-0510-0-00-1042-00
CILSS STUDY REVIEW/STUDY RECOMMENDATION (GUINEA-BISSAU)

Project Description

The purpose of the purchase order from OAR/Bissau was to provide assistance to review the recently published CILSS (IRAM) report on history, current status, and future of the agricultural sector in Guinea-Bissau.

Staff Utilization

Time spent by FFGI staff members on this project is summarized below.

Activity Category	Person-Days
Research	
Technical Assistance	22.0
Technology Transfer	
Training	
Networking	
Administrative	
TOTAL	22.0

Project Activities

J.D. Lea traveled to Bissau, Guinea-Bissau April 20 - May 4, 1991, to conduct the assistance requested in the purchase order.

The assistance involved: (1) a critical review of the recently published CILSS (IRAM) report on history, current status, and future of the agricultural sector in Guinea-Bissau, (2) discussions with CILSS, GOGB, other donors, and USAID staff as to next steps to be taken to develop a cereals (agricultural) policy for Guinea-Bissau, and (3) provide detailed scopes of work and budgets for the specific research topics to be undertaken by OAR/Bissau. A four-page critique of the CILSS report, and a 20-page report on specific research topics to be undertaken was provided to OAR/Bissau.

APPENDIX XIV

CONTRACT ADRA-1
ASSISTANCE FOR FOOD HANDLING AND STORAGE WORKSHOP (ADRA)

Project Description

The purpose of this contract was to provide assistance to ADRA in the conduct of a Food Handling and Storage Workshop to be conducted in La Paz, Bolivia.

Staff Utilization

Time spent by FFGI staff member on this project is summarized below.

Activity Category	Person-Days
Research	
Technical Assistance	
Technology Transfer	
Training	10.0
Networking	
Administrative	
TOTAL	10.0

Project Activities

In addition to providing assistance in the design of the Food Handling and Storage Workshop, Carl Reed traveled to La Paz, Bolivia, May 24-31, to assist in the presentation of the workshop sponsored by ADRA for participants from PVO's. The 44 participants who attended the workshop were from the following organizations: ADRA/Bolivia, ADRA/Nicaragua, and ADRA/Peru, Catholic Relief Services/Bolivia, Save the Children/Bolivia, and Feed the Hungry/Bolivia.

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APPENDIX XV

CONTRACT PA-1
TECHNICAL ASSISTANCE TO THE INSTITUTE OF NUTRITION
FOR CENTRAL AMERICA AND PANAMA (INCAP)

Project Description

Provide technical assistance to INCAP to diagnose and evaluate problems in the processing, handling, storage, marketing, and quality assurance of basic grains, sub-products, and derivatives for the Central American subregion. In particular, assistance to INCAP in the design of methodologies for country studies which will assess the grain management issues described, review country study data, assist with analysis of data, and participate in a final workshop where conclusions from the studies will be drawn.

Staff Utilization

The utilization of FFGI staff members' time during this period is summarized below.

Activity Category	Person-Days
Research	
Technical Assistance	
Technology Transfer	
Training	
Networking	
Administrative	
TOTAL	

Project Activity

No project activity took place in FY 1991.

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