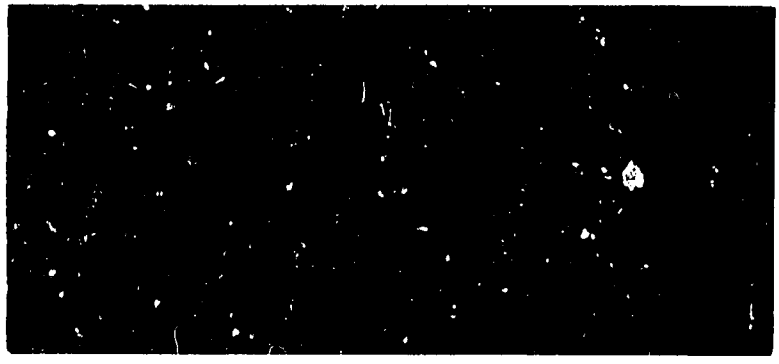
IMPROVEMENT OF POSTHARVEST GRAIN SYSTEMS

Grain Storage, Processing and Marketing



KSU
KANSAS STATE UNIVERSITY

FOOD & FEED GRAIN INSTITUTE
MANHATTAN, KANSAS 66506

ANNUAL REPORT
1981-1982

ANNUAL REPORT

Review of Activities
July 1, 1981 through June 30, 1982

Prepared for the

AGENCY FOR INTERNATIONAL DEVELOPMENT
UNITED STATES DEPARTMENT OF STATE

AID/DSAN-CA-0256
Improvement of Postharvest Grain Systems

at the

FOOD AND FEED GRAIN INSTITUTE
KANSAS STATE UNIVERSITY
MANHATTAN, KANSAS 66506

Dr. Charles W. Deyoe, Director

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ANNUAL REPORT

IMPROVEMENT OF POSTHARVEST GRAIN SYSTEMS

AID/DSAN-CA-0256
FOOD AND FEED GRAIN INSTITUTE
KANSAS STATE UNIVERSITY, MANHATTAN, KANSAS

In June 1967, an agreement was entered into between Kansas State University and the Agency for International Development under which Kansas State University agreed to provide technical assistance to the Agency for International Development and its missions in developing countries in the solution of problems involving the drying, storage, handling and transportation of grain or grain products under the Contract, AID/csd-1588, entitled "Technical Assistance in Food Grain Drying, Storage, Handling and Transportation."

In September 1974, Kansas State University and the Agency for International Development agreed to a new Contract, AID/ta-C-1162, entitled "Technical Assistance in Grain Storage, Processing, and Marketing and Agribusiness Development."

In October 1980, Kansas State University and the Agency for International Development developed a Cooperative Agreement, AID/DSAN-CA-0256, entitled "Improvement of Postharvest Grain Systems." The FY 1982 activities were conducted under this agreement.

Specific activities under this agreement will include, but are not limited to, the following:

1. Development of increased technical capabilities for advising and implementing improved postharvest systems in developing countries including: harvesting technology, storage, processing, marketing, and agribusiness development.

2. Operation and expansion of information services including: Postharvest Documentation Service (PHDS), information and training materials, and technical information requests.

3. Training programs including: in-country workshops and seminars, AID Grain Storage and Marketing Short Course, academic programs at KSU, and special programs.

4. In-country technical assistance including: short-term assistance, long-term assistance and follow-up and evaluation.

5. Group for Assistance on Systems relating to Grain After-harvest (GASGA) representation (acting as AID's representative) when requested.

6. Cooperation with a Tropical Institution (The University of Costa Rica) which will include: cooperation in planning and conducting adaptive research on problems associated with tropical postharvest grain systems; the interchange of information and research data between the Food and Feed Grain Institute,

Kansas State University and the University of Costa Rica; and reciprocal training of students from the University of Costa Rica and Kansas State University.

A more detailed statement of the specific objectives can be found in the agreement document.

IMPACT STATEMENT

The needs for the activities undertaken under the Cooperative Agreement AID/DSAN-CA-0256 have continued to increase during this fiscal year. The positive impact of these activities, though difficult to "measure" and assess, is evident by the increased numbers of (1) in-country short courses undertaken which will benefit the small farmers, government institutions as well as the private sector, (2) requests for in-country training of supervisory storage personnel in methods of teaching their own employees and (3) an increased activity for technical assistance requests.

A total of four in-country short courses were undertaken, two of which were conducted to "train trainers" in all aspects of grain conditioning, storage and preservation. The impact of this type of in-country training is the institutionalization of this important aspect, namely training, within the country thus reducing the need for constant short-term assistance whenever personnel changes or problems are encountered.

The training and, thus, impact of such activity was provided at farm level itself by the initial training of Peace Corps volunteers at KSU and subsequent followup and intensification in the field in Tanzania. Subsequently these volunteers proceeded to work on improving local farm level storage in their original areas within the country.

A total of nine (9) technical assistance requests were undertaken. These requests have been increasingly oriented toward improving institutions which, through their mandates, impact directly on all farmers and consumers. These institutions are responsible for, among other social goals, carrying out minimum grain and legumes price support programs for farmers as well as guaranteeing sufficient supplies for consumers at reasonable prices. Increasing recognition of such diagonally opposed social goals has led to more technical assistance requests aimed at improving the effectiveness and efficiency of these institutions.

REVIEW OF ACTIVITIES
July 1, 1981 through June 30, 1982

The following review summarizes KSU's activities during the fiscal year under Cooperative Agreement AID/DSAN-CA-0256 entitled "Improvement of Postharvest Grain Systems," which provided technical assistance in grain storage, processing, and marketing and agribusiness development in developing countries.

This report is organized under the following major areas:

I. Assistance to USAID Missions and Host Countries
II. Informational Services
III. Training
IV. Laboratory and Developmental Services
V. Other Activities
VI. Current List of Publications.

I. TECHNICAL ASSISTANCE EFFORT

Technical Services Performed

AFRICA - Rwanda/Kenya - December 1981

Nature of Activity Upon request of USAID/Kigali, Ms. Maria Regina Sartori, grain storage specialist, traveled to Kigali to participate with James Graham, FSM II Project Design Officer; Dirk Dijkerman, agricultural economist; and Diana Putman, sociologist in developing a project paper on grain storage and marketing. The travel in Rwanda began December 3 and ended on December 21, 1981.

Ms. Sartori then traveled to Nairobi, Kenya to work with Mr. Graham and Mr. Calvin Martin, senior agricultural advisor to USAID/Nairobi. This travel began December 21 and ended on December 25, 1981.

Objective The objective of the project is to assist the Rwandan Government to determine the feasibility of long-term storage of dry beans by providing a technical and sociological base of research on the effects of storage on dry-bean cookability and consumer acceptability.

Summary of Activities During the week December 6-12, meetings were held with the Project Coordinator, the team members, Local Crop Storage and GRENARWA personnel. A visit was made to Institute of Agronomic Sciences of Rwanda (ISAR), meetings were held with ISAR researchers, and examination of dry bean storage condition was made in five GRENARWA warehouses located in different areas of the country. A Catholic Relief Service (CRS) silo in Kanama was also visited. At all locations, temperature and moisture content of the stored beans were measured and samples taken for more detailed analysis.

A good chemical control of insects was observed in all the storage units visited. In spite of the absence of visible live or dead insects, the high level of insect-damaged beans observed in almost all the samples indicates a severe insect control problem at the producer level. Moisture content of all the samples was too high for safe storage during extended periods of time. With adequate sun drying, the moisture content could be properly lowered. Presently, however, any

drying would have to be done at the producer level. At 11% moisture content, the beans could be safely stored in CRS or LCS type of silo for at least 12 months, provided the structure is properly water-proofed. However, at the ambient relative humidities occurring in Rwanda, beans packed in the jute or polypropylene woven bags currently being used by GRENARWA would uptake moisture from the environment. From the five GRENARWA warehouses visited, the one in which the temperature of the beans was more favorable for long time storage was Kora. Coincidently, we were also informed that beans stored in this warehouse remain acceptable for a longer period of time.

Based on those observations and in collected meteorological data, during the second week (December 14-19), three experiments were planned. In the first one, a selected mixture of Rwandan beans will be dried to moisture contents of 11, 13, and 15%, packed in moisture-proof bags and taken to Kora warehouse to be stored for a maximum period of 24 months. Technical assistance was previewed for the development of a simple bean drier. Samples will be taken at 2-month intervals and submitted to cookability and consumer acceptability tests, among others. If upon trial the proposed solution is found technically and economically feasible, other warehouses could, in the future, be constructed more to the south, in the north-south direction, where high altitude regions with climatic conditions similar to Kora occur, forming a distribution network.

In a second experiment, a simple method for reducing the cooking time and increasing marketability of already hard-to-cook beans will be investigated and, in a third experiment, we will focus on the possibility of using periods of relatively low temperatures to cool bulk stored beans by means of forced aeration using the absolute moisture of air criteria (instead of relative humidity). If successful, this approach will make feasible long term storage of grains in a wider area of the country.

During the second week, the technical analysis was written in which the creation of a quality control laboratory at the GRENARWA/OPROVIA headquarters in Kigali was recommended. Lists with necessary equipment, required personnel and recommended activities were included. The Local Crop Storage Research Program was reviewed and a joint research program LCS/FSM-II was proposed. Recommendations were made as far as who or which institution should be involved in each research theme. A short analysis of the ISAR situation was also made.

During December 19-24, the written material was reviewed and the meteorological data and the list of equipment for the quality control laboratory was written in final form.

At the AID headquarters in Nairobi, a briefing with Mr. Graham and an in-depth technical discussion with Dr. Martin about the experiments planned were held. A visit was also made to FAIF Export to get information about properties of the polypropylene woven bags, lined with polyethylene, that will be used on the first experiment. Some additional information will be forwarded to the Grain Science Department, KSU, by the manager, Mr. Baba.

Reporting and Distribution A trip report was filed with the Project Manager, AID/Washington, D. C. An in-depth report was submitted to Farm Storage Management II (FSM-11) Project Design Officer, Mr. James Graham, USAID/Kigali.

AFRICA - Botswana - January/February 1982

Nature of Activity At the request of the Government of Botswana and USAID/Gaborone, Dr. Cornelius Hugo, agricultural economist, traveled to Botswana from January 29 through February 10, 1982. Dr. Hugo was requested to assess training needs in grain storage management for the Government of Botswana.

Objective The main objective of this travel was to determine training needs and logistical support available as well as establishing costs and other requirements for in-country training.

Summary of Activities After arrival in Gaborone on Sunday, January 31, Dr. Hugo began a series of meetings as follows:

- Meeting with USAID/Gaborone personnel to discuss the proposed grain preservation and storage management short course. Work plan and logistical support for the week were established.

- Meeting with Botswana Agricultural Marketing Board (BAMB) regarding short course. Relevant questions addressed included (1) proposed participants, their educational and job backgrounds; (2) time frame to set up the short course; (3) location where course is to be given; and (4) content of short course. Later, a tour of the local BAMB storage facilities was conducted for Dr. Hugo.

- The Institute for Development Management (IDM) was tentatively chosen for the site for the short course. This is a very modern facility with excellent classrooms, teaching equipment, and dormitories. Dormitory accommodations were established for 18 participants with a possible maximum of 20. Relevant costs of renting the necessary space and equipment were obtained and a tour of the facilities was taken.

- Meeting at BAMB-necessary teaching equipment and demonstration material to be supplied by BAMB was reviewed; site selection was also concurred with. Tentative dates of March 15 through March 26, 1982 were established for the course to be given, however, potential conflict with their annual physical inventory taking was expressed. Short course content was finalized; number of participants established at 20 which would allow all depot managers to participate plus some extra space for other interested persons. Report writing was done on such topics as facilities and equipment table, teaching and demonstration equipment and supply table, short course content, budgeted KSU dollar cost contribution and budgeted USAID/Gaborone cost contribution.

- A trip was taken to visit BAMB storage facilities at Mahalapye, Palapye, and Serowe. These facilities (like all others) consist of galvanized steel warehouses for bag storage. In Mahalapye, BAMB has one out of four British-supplied temporary storage facilities.

- A trip was taken to visit BAMB storage facilities at Mosopa, Kanye, and Phitshane. At Kanye, BAMB has the other three temporary storage facilities supplied by the British.

With the exception of the facility in Serowe, all others had enormous amounts of grain, pulses, and oilseeds stored outside under tarpaulins. Insect, rodent, and bird activities were observed in all places, both inside and outside the storage facilities. No integrated pest management and sanitation program could be observed. Fumigation and insecticide application is done at irregular intervals

whenever it is needed. Fumigation material consists of Detia pellets or sachels. Insecticide material consists of Marcapto 100. Only one depot manager could explain his fumigation dosage calculation. Insecticide applicators are motorized. Disposal of fumigant residues (sachels and canisters) is done in a haphazard way by throwing them away within the compound. None of the depot managers (this includes all BAMB depot managers) has ever received training in grain preservation and storage management.

Grain stacking is not uniform and stacks, though variable in size, are extraordinarily big. Varieties are not necessarily segregated and different sacks containing different sorghum varieties may be contained in the same stack. Pallets (not used consistently) consist of tree trunks. With the exception of the warehouse at Mahalapye, the tree trunks are not used in such a manner as to prevent breaking them due to weight of load, or sacks of grain sagging all the way to the ground between tree trunks. Damaged grain (molds) due to rainfall was observed at all facilities. Spilled grain, quite a lot at some places, was also observed.

When grain is received (in bags), it is sampled, graded, and stored. Though actual receiving activities could not be observed, apparently sampling techniques are not "scientific", moisture is not measured (one depot manager had never been instructed in the use of the Marconi unit). With the exception of one depot manager, none would suggest moisture content. Apparently grain is delivered fairly dry and loses moisture while in storage and grading is done by observation. Two (2) kgs are docked per bag to cover 1) moisture loss while in storage, 2) impurities, and 3) the bag.

The only bulk storage facility, located at Phitshane, consists of five (5) bins of 5,000 mt each, a 30,000 kg Avery truck scale, dump pit, leg elevator, chain conveyors, cleaner, automatic weight scale (Avery) and automatic fumigant dispenser. Aeration fans and thermocouples are not part of the equipment.

Also, this facility contains a sorghum mill consisting of two (2) bran removers and one (1) mill. The flour is distributed and sold in urban centers.

- Meeting with Mr. Peter Mulligan, Director/BAMB with Mr. Flynn Fuller, AID Agricultural Technical Officer assisting Hugo in briefing Mulligan on proposed short course. Common agreement was obtained regarding participants, their numbers, course content, and site. However, the proposed March 15-26 time frame was not acceptable on the grounds of physical inventory being taken in March. Due to the expected "bad" harvest (he doesn't expect to buy grain before June), Mr. Mulligan suggested April 12-23 as the best time, give or take a week before or after the 12th and 23rd, respectively. Less desirable options, but also possible, include the months of May or August.

- Meeting with USAID/Gaberone personnel and discussion of possible new time frames for proposed short course. Due to constraints at KSU (other FFGI activities), USAID/Gaborone (local funding for course is available only through August 31, 1982), and space allocation problems at IDM, it was decided to search for multiple options in terms of time and location. KSU was called and news regarding time frame difficulties relayed; suggested consultation with Dr. Pedersen during weekend or following Monday.

- Meeting at BAMB to obtain from Mr. Mulligan the preferred time frames regarding short course. The month of April was considered to be most suitable (prefer-

ably the second, third and fourth weeks). Though April 9 and 12 are holidays, we were assured that the short course could be given during those days. The month of August is least desirable but if nothing else could be made available, Mr. Mulligan would agree to such a time frame.

- Meeting at IDM to establish option for facility space (classroom, room and board) for the months of April and August. Decided to wait for Mr. Dikeledi's arrival from Swaziland to discuss options.

- Meeting at BAC--their facilities, though more than adequate, are not available for the relevant time frames required by the short course.

- Meeting at Rural Training Center whose facilities can be available April 5-16, 1982. Fees were established; teaching equipment, classroom and dormitory facilities were reviewed; facilities booked on a tentative basis.

- Meeting at IDM with Frank Dikeledi, IDM Administration Officer who was helpful on usage of IDM facilities. Classroom space is available for whole month of April, however, room and board space is very limited for the week starting 12 April and for the week starting 19 April. Mr. Dikeledi would see if we could be accommodated during those two weeks. May 24-August 20, 1982 would find no space problems since IDM has full use of University facilities.

- Meeting with USAID/Gaborone personnel for briefing on events. It was decided that time options should be discussed with KSU personnel and a final decision on time frame made. Call received by Dr. Julian confirming availability of Dr. Pedersen from April 5-14, 1982. It was decided to firm up April 5-14, 1982 as the time frame for short course. First draft of report was finished.

Reporting and Distribution A rough draft of proposed short course was left with the USAID/Gaborone Mission. A trip report was filed with Project Manager, AID/Washington.

AFRICA - Botswana - March/April 1982

Nature of Activity As followup to arrangements made by Dr. Hugo in February, a three-man team consisting of Dr. Cornelius Hugo, agricultural economist; Dr. John Pedersen, storage entomologist; and Mr. Carl Reed, grain storage specialist traveled to Botswana March 28 through April 18, 1982 to conduct the Grain Preservation and Warehouse Management Short Course. A more in-depth report of this training is written up in Section IIIE--Training.

AFRICA - Upper Volta - May/June 1982

Nature of Activity As followup to technical assistance given by Drs. Robert Julian and Dansou Kossou in May 1981, a four-member team traveled to Ouagadougou to conduct a training course on Grain Preservation and Storage Management. Members of the team included Dr. Valerie Wright, Dr. Dansou Kossou, Dr. Fred Teague and Ms. Kathy Foster. An in-depth report of the training is located in Section IIIE--Training.

AFRICA - Tanzania - May/June 1982

Nature of Activity Upon completion of her portion of the training program in Upper Volta, Dr. Valerie Wright, grain storage entomologist, traveled to

Tanzania May 22, 1982 at the request of Peace Corps through AID/Washington to conduct a training needs assessment.

Objectives There were two objectives to this travel: (a) to conduct a Peace Corps in-service training (IST) needs assessment for grain storage volunteers and (b) an evaluation of a Seminar on Greater Grain Borer.

Summary of Activities In Dar es Salaam, Dr. Wright visited with Peace Corps Director, Jacques Wilmore and 12 of the 17 volunteers in the grain storage program. Individual programs, problems and needs were discussed and a group concensus taken on content of the upcoming August program. The group discussed possible improvements in KSU training.

Visited villages (Morogoro, Iringa, Mafinga, Njombe, Nzega) to observe storage structures and practices. Discussed possible involvement of Peace Corps Volunteers (PCV's) in technical training of extension personnel, in data gathering and monitoring for researchers, such as SIDA or TSPC scientists, working on GGB. A letter was sent to each PCV outlining preparations needed and expectations for IST. A training proposal is in preparation.

Seminar on the Control of the Greater Grain Borer, Prostephanus truncatus was held in Nzega from May 31 through June 5, 1982. Participants were invited by region, with areas outside the greater grain borer infestation also represented. The majority of participants were produce inspectors, extension workers and staff. The Ilonga research station, TPRI, the Ministry of Agriculture and Industry were also represented. Eight Peace Corps Volunteers attended. The list of participants (about 70) had not been typed by Friday. It was suggested to Mr. Mushi, principle lecturer and organizer, that copies of the list and other pertinent information be given to the FAO exploratory mission. Local arrangements were made by the Nzega DADO, Mr. Mwilima, in a detailed and efficient manner. The lectures were given by Mr. Mushi and Mr. Mndolwa, both entomologists. The schedule covered general aspects of grain storage with emphasis in each topic on Prostephanus truncatus. One morning was spent on identification of various stored-grain insects. Specimens were available including Rhyzopertha dominica (LGB), Prostephanus truncatus (GGB) and Xynoxylon ruficorne, another bostrichid pest of dried cassava. Some people expressed disappointment that the entire seminar was not on GGB. Because of the range in backgrounds of the participants, the lectures could not assume everyone understood the principles of grain storage. Because of the usual difficulties with transport and condition of the roads, field trips were lengthy. Mr. Mwilima and Peace Corps Volunteer Regan arranged visits to villages to observe good grain storage practices as well as Prostephanus infestation. At the villages, last year's harvest was gone and the new harvest was coming in to dry. We could find no evidence of field infestation but a healthy reservoir of GGB was found in dried cassava. The badly infested cassava was being discarded into the yard, next to the newly harvested corn. Dr. Wright's recommendation was that this cassava trash be burned. A general discussion began on Thursday afternoon that would lead to recommendations for the Ministry of Agriculture concerning the current insect problem and the reorganization of the produce inspection system, especially the chain of command. There is an urgent need for training produce inspectors, old and new. The discussion was completed on Saturday after Dr. Wright's departure. A questionnaire, designed to define the limits of GGB infestation was to be handed out Saturday for completion and return at a later date.

The Peace Corps Volunteer in Nzega has been heavily involved in distribution of Actellic to the villages and demonstration of its use. Allocations of Actellic have been limited but the main problem seems to be distribution (transportation). The insecticide is purchased from TWIGA. In some cases it is given to the farmer, but in most cases it is sold. In Nzega the price was the same as transportation costs (T. Sh. 18.50/kilo). In other areas the extension agents sell for whatever price the market will bear. The paper bags labelled "TWIGA" often break when handled. In Sikonge other pesticides, including DDT, were being sold to farmers for GGB control.

Reporting and Distribution A handwritten report with the same information as above was left with Jacques Wilmore. A trip report was filed with the Project Director, AID/Washington.

ASIA - Philippines - October 1981

Nature of Activity Upon request of GASGA (Group for Assistance on Systems relating to Grains After-harvest), Dr. Paul A. Seib, professor in grain science traveled to Manila from October 9 through October 18 to attend meetings and present a paper. The GTZ, Eschborn, Germany sponsored this Seminar.

A detailed report of this travel is located in Section IV-D Other U. S. and Foreign Technical Assistance Programs.

ASIA - Nepal - November 1981

Nature of Activity As followup on Dr. Robert Julian's training needs assessment in May 1981 and at the request of the Agricultural Inputs Corporation (Government of Nepal) through USAID/Kathmandu, Dr. John Pedersen, storage entomologist, and Dr. Cornelius Hugo, agricultural economist (inventory management), traveled to Nepal November 5 through November 24, 1981.

A more detailed report of this training is given in Section III-E Training.

ASIA - Philippines - November/December 1981

Nature of Activity At the request of Dr. Dante de Padua of SEARCA, Dr. Valerie Wright traveled to Manila to assist in the Asian Postharvest Regional Training Course. The travel began November 13 and ended December 4, 1981. A more detailed report of this training is given in Section III-E Training.

ASIA - Thailand/Burma/Korea - January 1982

Nature of Activity Following a request from SEARCA, Dr. Do Sup Chung, agricultural engineer, traveled to Chiang Mai to present papers at the 1982 Grains Postharvest Workshop. He was also requested to travel to Rangoon, Burma and Bangkok, Thailand to discuss postharvest grain programs by USAID/Thailand. Final TDY was to Seoul, Korea to follow up on cooperative programs between FFGI and Korea Research and Engineering Institute. The travel covered the period January 12 through 30, 1982.

Objectives In Thailand, to present papers (abstracts follow) and to discuss postharvest grain programs with officials of USAID/Thailand who also aided Dr. Chung in obtaining a visa to Burma so that he could discuss postharvest

grain programs with country officials there also.

ABSTRACT

Mathematical Model for Selecting a Grain Dryer

A mathematical model for selecting a grain dryer was developed. In the process of modeling, more than 100 dryer specifications from 22 manufacturers and dealers in the U.S.A. were examined. Then, thermal efficiencies and optimum dryer capacities were analyzed for five different drying systems.

This paper was authored by Dr. Do Sup Chung and Dong Il Chang.

ABSTRACT

Evaluation of Carbon-Dioxide Evolution as a Measure of Fungal Deterioration of Rice

The method of Steel, Saul and Hukill, Trans. ASAE, 12(5), 1969, was used to follow the deterioration of rough rice at four storage temperatures (18°C, 24°C, 30°C and 35°C) and three moisture levels. Dry matter loss (DML) was followed by evolution of carbon dioxide, and the decline in the grade or milling yield of rice was examined at various levels of DML. Other methods were also used to measure the degree of fungal invasion in rice, including plate count, ergosterol, free fatty acid, inorganic phosphorus, and decrease in non-reducing sugars.

This paper was authored by M. Naewbanj, P. A. Seib, R. Burroughs, L. Seitz and D. S. Chung.

Reporting and Distribution Copies of the papers presented at the Workshop were distributed to attendees; an oral report of the TDY was presented to the FFGI Director and Coordinator.

LATIN AMERICA - Trinidad - July 1981

Nature of Activity At the request of Project Manager Robert Morris, Dr. Robert Julian, coordinator, and Dr. Ronald Echandi, consultant, traveled to Port of Spain, Trinidad to attend the Commonwealth Secretariat Workshop on Postharvest Losses in the Caribbean. The travel covered the period July 18 through 24, 1981.

An in-depth report of this activity is located in Section IV of this report.

LATIN AMERICA - Costa Rica - August 1981

Nature of Activity At the request of CIGRAS through AID/Washington, five FFGI staff members traveled to San Jose to assist in developing cooperative projects with the University of Costa Rica. Drs. John Pedersen, grain storage entomologist; Cornelius Hugo, agricultural economist; Harvey Kiser, economist/transportation; Do Sup Chung, agricultural engineer and Robert Julian, coordinator traveled from August 22-30, 1981.

Objective The main objective was to plan the conduct of "An Analysis of the Postharvest Losses and Marketing Systems for Grains and Pulses" in cooperation with CIGRAS of the University of Costa Rica.

Summary of Activities Team members met with Drs. Ronald Echandi and Miguel Mora, CIGRAS; Larry Laird, Food and Agriculture Officer/USAID; Sr. Erhardt Rupprecht, Sub-Jefe, Steve Haynes and Francisco Rodriguez of Oficina Desarrollo Rural/AID; Willy Loria, Ingeniero, Vice Minister and Dr. Herman Fonseca, Minister of the Ministry of Agriculture (MAG); Lic. Carlos Carbollo, Oficina Ejecutura Proyecto 027/MAG; Alberto Vargas, Ingenicro, Direccion Superior de Investigacion/ MAG; Dr. Oscar Echandi, Direccion Superior Agropecuario/MAG; Dr. E. T. York, Jefe/ Comision Presidencial en Desarrollo Agricola para America Central y el Caribe; Dr. Hugh Popenoe, University of Florida, Gainesville; Sr. Fernando Arias/CITA; Sr. Gussie Daniels, Oficina de Programas. Dr. Robert Morris (Project Officer for AID contract with FFGI), AID/ST/AGR/AP, Washington, D. C. also attended these meetings with the FFGI staff.

The team participated and cooperated with Drs. Ronald Echandi and Miguel Mora to develop a plan and implementation procedures to conduct an analysis of post-harvest losses and the marketing systems for Costa Rican grains and pulses. Dr. Morris participated in the development of the project plan.

Various sections of the plan are: purpose, objectives, background, justification, scope of work, budget and the time frame for the first 3 years.

During the week, the team met with persons above in private conferences and at a luncheon. The purpose of the analysis being developed was explained to these persons.

USAID/Costa Rica was interested in the project proposal for Costa Rica funding, but funds at the time were not available. It was thought that possibly funds would become available as early as January 1982.

Dr. Ronald Echandi will continue to look for implementation funding from other sources such as the Government of Costa Rica, Ministry of Agriculture USAID loan funds.

Reporting and Distribution A draft proposal was presented to USAID/Costa Rica and CIGRAS with copies to team members. A trip report was filed with the Project Manager, AID/Washington.

LATIN AMERICA - Bolivia - August/September 1981

Nature of Activity Following a request by USAID/Bolivia for technical assistance on an assessment of wheat collection centers, a five-man team consisting of Drs. Cornelius Hugo and Roe Borsdorf, agricultural economists; Dr. Elmer Heyne, agronomist; Dr. Wilfred Pine, consultant and Mr. Carl Stevens, engineer, traveled to La Paz. Dr. Hugo began travel from Costa Rica where he was on a previous TDY. All members' travel began August 30 and the travel ended September 30, 1981.

Objectives The objectives were outlined in a Work Plan (Scope of Work) with two sections, General Study and Specific to Wheat Collection Centers. The General Study included the following: visit experiment stations and wheat production areas/reveiw technical reports, assess the potential comparative ad-

vantage for wheat production in Bolivia; determine priority of the set of technical, economic, policy and government program conditions needed in order to achieve the potentials and comparative advantage for wheat production; determine the long-run comparative advantage/disadvantage for domestic and import wheat in supplying project demand for wheat products in urban/rural areas; evaluate the number, location, size, design, function, and operation of the existing and planned Collection Centers as marketing channels for (a) wheat only, (b) all basic grains available in the service area, and (c) basic grains plus potatoes and other staple foods produced in the service area; develop a set of crucial policies and programs to which the Bolivian Government must be committed in order to insure achievement of the stated goals under the PL 480 Title III Wheat Collection Centers Project together with a set of specific recommendations to insure that such policies and programs can be implemented successfully; develop a series of recommended priority actions which would tend to stimulate an increase in GOB domestic wheat production, this should include consideration of GOB Wheat Import Policy; for each of the recommended priority programs, develop outline work plans, including participation by the PL 480 Executive Secretariat, other Bolivian Government agencies, the private sector, international agencies (CIMMYT, FAO, BID, etc.) USAID and others.

Specific to Wheat Collection Centers: determine practical effects of new GOB price policies in at least three wheat centers, Yamparaez, Cliza, and Totora; analyze the implications of the price structure for at least two alternative scenarios--free market level assuming no political constraints, and most practical level assuming government politically motivated controls, alternatively, suggest a range of price policies and their advantages/disadvantages; assess possibilities of project success based on various price levels as recommended above; review GOB agreements with Miller's Association and GOB wheat import policy/suggest alternative policies; review storage and marketing procedures established in centers/recommend necessary corrective actions, must include suggestions on current GOB practices on payments to individual farmers; review project sites for adequacy of staffing/suggest equipment needed in centers/review assignments of trucks; review locations of Centers for possible re-location or closing of centers in unsuitable areas; suggest alternative uses for Centers during periods of non-availability of wheat; and recommend the most appropriate GOB administrative structure for successful project implementation.

Summary of Activities In relationship to the Scope of Work, two teams consisting of Hugo/Stevens and Pine/Heyne undertook field trips to investigate and review areas related to their specific assigned responsibilities. Hugo/Stevens team looked at the Wheat Purchasing Centers and related marketing issues. Locations visited were: Cochabamba, Tarija, Sucre and Santa Cruz. Pine/Heyne team reviewed agronomic and technical problems related to wheat production in Bolivia. Locations visited were: Potosi, Chinola Station, Santa Cruz and Cochabamba. Dr. Borsdorf remained in La Paz and reviewed previous documentation prepared by USAID contractors and GOB on wheat production, consumption, marketing, policies and related institutional questions.

On September 12, Pine/Heyne/Stevens departed as scheduled after debriefing with team leader who obtained their personal comments and feelings about the study. Hugo and Borsdorf remained to collect additional data and other information.

The team had excellent support from their assigned counterparts, Guzman (Ministerio de Asuntos Campesions--MACA), Acebey (Department of Planning), Daza

(Wheat Marketing Division), Sanjinez (Secretaria PL 480, Title III) and Torrico (USAID/Bolivia).

Final debriefing was held with the new Subsecretary of the Ministry of Industry, Commerce and Tourism (MICT), the Director of the Department of Interior Commerce, and the head of the Wheat Marketing Division and USAID/Bolivia.

Reporting and Distribution Draft copies of report were left with Ken Johnson, USAID/Bolivia. A trip report was filed with Project Manager, AID/Washington. Report 84 entitled "Wheat Production and Associated Marketing Problems in Bolivia" will be issued under the series Improvement of Postharvest Grain Systems in the near future.

LATIN AMERICA - Haiti - December 1981

Nature of Activity Dr. Richard Phillips, agricultural economist, and Dr. Dansou Kossou, grain storage specialist/interpreter, traveled to Port au Prince December 5 through 20, 1981 to assist in a food sector strategy review. Drs. Phillips and Kossou were part of a 14-member team following up on a request from USAID/Port au Prince and AID/Washington for technical assistance.

Objectives A multi-disciplinary team of experts were to formulate options and recommendations for a food and agriculture development strategy for the U.S. economic assistance program in Haiti. The strategy was to focus on the next 5 years, 1982-86, but to also consider the longer-run implications for U.S. assistance and Haitian food and agriculture development prospects to the year 2000.

Summary of Activities Dr. Phillips served as food security advisor and Dr. Kossou as grain postharvest advisor on the team. A final report was developed and chapters in the final report to which the Food and Feed Grain Institute team members made major contributions are:

II. Agricultural Production and Marketing, Section 2.2 Agricultural Marketing, and

VI. The Role of PL 480 Food AID Programs, all sections.

Major summary recommendations include:

1. Efforts to reduce the substantial in-field and postharvest grain losses through (a) extension of the existing research results of the Vertebrate Pest Control in Haiti and (b) efforts to support FAO farm storage activities (page 11).

2. Continued use of PL 480 Title I programs for milling wheat, rice, soybeans and feed grains (page 23).

3. Serious consideration of a PL 480 Title III program in magnitude reaching $34.8 million for the above four commodities over the next three years (page 24).

4. Redirect Title II programs toward those in greatest nutritional need, through the GOH Rural Health Delivery System and through Maternal-Child Health (MCH) efforts in PVO and private centers (page 25).

Reporting and Distribution The total team report is published under the title, "Food and Agriculture Sector Strategy--Final Report" by the U. S. Agency for International Development, February 1982. Copies have been forwarded to USAID/Port au Prince and AID/Washington.

B. Follow up on Previous Overseas Requests

AFRICA - Botswana

Nature of Activity As a result of a request in April 1978 for technical assistance to evaluate grain storage activities of Botswana's Agricultural Marketing Board (BAMB), Dr. Dale Anderson and Mr. Don Jack traveled to Gaberone June 12-16, 1978.

Dr. Cornelius Hugo traveled to Botswana to assess training needs and logistics in January/February 1982.

The training course, "Grain Preservation and Warehouse Management Short Course" was conducted in Gaberone March 28-April 18, 1982. The team consisted of Dr. Cornelius Hugo, agricultural economist; Dr. John Pedersen, entomologist; and Mr. Carl Reed, grain storage specialist. An in-depth report of this training is located in Section III Training.

AFRICA - Upper Volta

Nature of Activity A request for technical assistance in writing a project development paper for USAID/Ouagadougou was followed up by Dr. Dale Anderson and Frank Bolduc. The travel was from May 17-June 20, 1979. The paper was a study of grain storage facilities and marketing policies as requested by OFNACER (Upper Volta National Cereals Office), a parastatal grain marketing board.

In May 1981, Drs. Robert Julian and Dansou Kossou conducted a training needs assessment at the request of GOUV through USAID/Ouagadougou.

As followup to the above technical assistance, a four-member team traveled to Upper Volta to conduct a training course on Grain Preservation and Storage Management. The training covered the period April 29-June 10, 1982. An in-depth report of this training can be found in Section IIIE--Training.

AFRICA - Tanzania

Nature of Activity As followup to a request from Peace Corps through AID/Washington, Dr. Valerie Wright traveled to Dar es Salaam to conduct an in-service Seminar on Greater Grain Borer. The travel covered the period May 22-June 5, 1982. Dr. Wright had assisted in the Peace Corps Volunteers training held on the KSU campus in September/October 1981. A summary of the PCV training is located in Section IIIC--Training.

A summary of the Tanzania TDY in May/June is located within this section.

ASIA - Nepal

Nature of Activity At the request of AIC through USAID/Kathmandu, Dr. Robert Julian traveled to Nepal in May 1981 to conduct a training needs assessment.

As followup to the above TDY, Drs. John Pedersen and Cornelius Hugo traveled to Nepal November 5-24, 1981 to conduct the Grain and Seed Storage Management Short Course. This training is covered more in depth in Section IIIE--Training of this report.

LATIN AMERICA - Bolivia

Nature of Activity In July 1979, Dr. Dale Eustace and Carl Reed traveled to Bolivia at the request of USAID/La Paz to evaluate milling and storage capacity at government mills.

In January 1980, Dr. Robert Julian and Cornelius Hugo traveled to La Paz to conduct (pre-plan) technical assistance for a Flour Milling Short Course. Due to in-country problems, this course was never conducted.

In August/September 1981, a five-man team traveled to Bolivia to give technical assistance on an assessment of wheat collection centers at the request of USAID/La Paz. An in-depth report of this TDY is located in this section.

LATIN AMERICA - Costa Rica

Nature of Activity At the request of the University of Costa Rica (CIGRAS) through AID/Washington, Dr. Robert Julian traveled to San Jose January 18-30, 1981 to discuss postharvest development.

Following a request from CARE through University of Costa Rica and AID/Washington, Dr. Ekramul Haque traveled February 17-28, 1981 to San Jose to develop a proposal on low-cost grain dryers for small farms.

At the request of CIGRAS through AID/Washington, five FFGI members traveled to San Jose from August 22-30, 1981 to assist in developing cooperative projects with the UCR. An in-depth report of this technical assistance can be found in an earlier portion of this section.

C. Potential Areas for Technical Assistance

1. AFRICA

a. Tanzania - An In-Service Training Program for Peace Corps Volunteers has been tentatively scheduled for August 1982 as a followup to the training needs assessment conducted by Dr. Valerie Wright in May/June 1982.

2. LATIN AMERICA

a. Bolivia - As a followup to technical assistance in August/September 1981 by a five-man team from FFGI, additional technical assistance or a training program may be required to carry out recommendations of the team.

b. Costa Rica - Additional technical assistance may be requested by CIGRAS (University of Costa Rica) in order to continue the development of cooperative programs. This would be followup on technical assistance by a five-member FFGI team and Dr. Robert Morris' TDY in August 1981.

D. Long-term Technical Assistance in Philippines

Mr. Norman Teter, agricultural engineer, continues to serve as a team member of the multi-national postharvest technical group. He is headquartered at the South-East Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), University of Philippines, Los Baños. The team works throughout the South-East Asian area identifying postharvest technology problems. Mr. Teter is serving in the Philippines under Cooperative Agreement AID/DSAN-CA-0256.

Included in the activities of Mr. Teter are the following:

- Met with representatives of NFA, NAPHIRE, PHRTC, FTI, UPLB and Dr. Ulysses Acasio, CLSU to work on the situation analysis of the fruits and vegetables and fish post-harvest industry.

- Kuala Lumpur, Malaysia--National Paddy and Rice Authority (L.P.N.) discussions with van Ruiten, Teter and Semple included:

    1. progress made in the preparation of the 5-week specialized training course on newly acquired rice processing facilities.

    2. progress made in the drafting of a grain test laboratory for LPN's Training Center at Anak Bukit.

    3. progress made in the drafting of a series of 2-week training course to be conducted through the LPN's new Anak Bukit training center.

    4. technical matters regarding the LPN operation and recorded constraints.

    5. the ongoing research program on aerated bulk silos for paddy storage.

    6. introduction of new member of the Technical Team, Mr. Robert L. Semple, Entomologist (Australia).

- Kuala Lumpur/SERDANG--purpose of meetings included the following:

    1. To introduce Mr. Robert L. Semple, Entomologist (Australia), to officials of MARDI.

    2. To exchange software programming on the TI-59 computerized calculator with MARDI research officials.

    3. To discuss the ongoing research project on the storage of paddy in aerated bulk silos, jointly implemented by MARDI and the LPN and for which Technical Team, through Mr. N. C. Teter, drafted the methodology and acts as consultants.

- Kuala Lumpur/Ministry of Agriculture, MARDI, LPN--to hold initial discussions on the determination of the objectives and organization of the 1982 Exchange Programme to be conducted early 1982 in Malaysia.

- Kuala Lumpur/ASEAN Food Handling Bureau--to follow-up our funds-raising letter addressed to Mr. David Lyons, Australian Liaison Officer, regarding the 1982 Post-Harvest Workshop implementation.

• Santiago, Isabela and three areas of Carroguis, Aglipay and Medalla in Quirino, Philippines--to attempt to pin-point researchable areas of the peanut post-harvest systems. Many production problems are evident:

1. climate
2. leaf spot--$CuSO_4$ spray needed
3. seed viability
4. suitable soils
5. varietal improvement.

Some post-harvest problems evident are:

1. lack of controlled drying
2. high labor requirements in picking
3. lack of moisture meters
4. lack of trading standards
5. inadequate sizing for efficient shelling
6. lack of seed storage.

• Cauayan, Cagayan Valley Development Cooperative (CAVADECO), Isabela, Philippines--to help in the installation of dryers for the rice and feed mill grain supplies. This is a new, integrated cooperative center containing:

1. a machine shop and garage for equipment maintenance
2. a 6 t/hr feed and pelleting mill with associated 504 sq. meters of feedstuff storage and 216 sq. meters of feed storage and distribution
3. a Felsons Rice Mill having a capacity of 10 t in 8 hrs of operation
4. a slaughter plant and cold storage for swine, cattle and poultry
5. a broiler test farm to verify feed formulation. The manure will pass through a digester to produce gas for fuel for the slaughter plant.

• Malaybalay, Bukidnon, Philippines (Aglayan)--to assist in the improvement of corn.

• Singapore--to work on future work plan at IDRC and attend Policy Advisory Board Meeting.

• Indonesia (Provinces of Riau, West Sumatra and Jambi on the island of Sumatra. The purpose of travel is to join, on invitation of BULOG, an inter-agency study group, to transmigration areas in Sumatra having as aimed to:

1. Study the development of transmigration projects with special reference to applied postharvest processing and marketing systems.

2. Identify constraints and possible solutions in respect to the implementation of postharvest technology on primary and secondary food crops.

3. Specify recommendations for an action programme to be addressed to: The Director General for Transmigration, The Minister for Cooperatives, the Chairman of BULOG, and the Director-General for Food Crops of the Ministry of Agriculture.

- Tambun, Kabupaten Bekasi, West Java--for the purpose of supporting the introduction of a 2-week training course in Post-Harvest Technology of Secondary Food Crops, especially maize, peanuts, soyabeans and mungo beans. The course was conducted at the BULOG National Food Technology Training and Research Center in Tambun near Jakarta from September 14-25, 1981.

- Misamis, Bukidnon, Philippines--To obtain background on the corn handling system needs.

II. INFORMATIONAL SERVICES

As a part of the technical assistance provided under Cooperative Agreement AID/DSAN-CA-0256, project staff members reply to numerous requests for information on specific items. Some requests come directly through or from USAID Missions in host countries. Other requests come directly to staff members at Kansas State University, either as a result of assistance we have provided under USAID sponsorship or through personal professional contacts. In many cases, the requests for information can be answered by sending reports or other printed materials prepared under the agreement.

A. Post-Harvest Documentation Service (PHDS)

In its fourth year of operation, the PHDS is definitely accomplishing its prime objective of providing information to developing countries on postharvest cereal grains and legumes systems. PHDS currently serves over 200 international clientele and has more than doubled its information output each operating year as follows:

Year	Document Requests	Search Requests
1979	181	5
1980	563	28
1981	1,240	75
1982	4,441	179

Total acquisitions to date are 3,345. Approximately 50 to 100 documents are added to the database each month. These acquisitions are obtained from the following sources: USDA Technical Information Systems--Current Awareness Literature Service (CALS) (batch searches of bibliographical databases), Group for Assistance on Systems relating to Grains After-Harvest (exchange documents with eight international organizations), journals (over 200 journals provide articles of interest to PHDS but only 3 are carefully scanned each month)--Journal of Stored Products Research/Tropical Stored Products Information/Tropical Storage Abstracts, U.S. Agricultural Experiment Stations and Cooperative Extension Services, miscellaneous national and international organizations, PHDS clients, Food and Feed Grain Institute Staff, and Postharvest Institute of Perishables Information Center, Idaho. Information on automated searches/document copies requested during the fiscal year follows:

DEVELOPING COUNTRIES/FFGI STAFF

Automated searches	176
Paper copies	3,843
Microfiche copies	525

DEVELOPED COUNTRIES

Automated searches	3
Paper copies	73
Microfiche copies	0

Fiscal year 1982 was marked by the need to increase staff, facilities, and budget to meet the tremendous increase in informational requests which resulted from the advertising efforts undertaken between 1979 and 1981. A half-time research assistant was hired, a large storage/workroom was added to existing PHDS facilities, and the budget was expanded.

The need to evaluate PHDS' services also arose during this time and, therefore, a client usage survey was developed and sent to 241 PHDS clients. Response to the survey was unusually high--an estimated 43% of those surveyed responded to the questionnaire. This response, coupled with the fact that the majority of respondants wished to continue using PHDS' services, seems to indicate the high interest developing country researchers have in obtaining postharvest literature.

In four years PHDS has developed into a reliable, inexpensive, and quick source of postharvest information for developing country researchers. It is one of the few information services available to this clientele that offers both bibliographies as well as copies of the publications listed within the bibliographies. PHDS is becoming more widely known each day as evidenced by an ever-increasing number of inquiries about PHDS' services.

B. Technical Information Requests

Cameroon - Centre de Nutrition requested examples of questionnaires used in loss assessment and information on questionnaire development.

El Salvador - CEGRAS requested technical information on psychrometric chart.

Gambia - Dr. Robert Ryder requested information on aflatoxin and collection of survey samples.

India - Punjab Agricultural University requested information on postharvest technology programs at Kansas State University.

Mexico - SITA requested extensive information on stored-grain insects.

Rome - FAO requested information on modified convectional dryer for developing countries.

Morocco - Mr. Jazouana Brahim and Mr. Benlahboub J. Hassane requested information on PHDS services.

India - requested information on training programs.

Turkey - requested information on Food and Feed Grain Institute activities.

Somalia - requested information on courses offered in postharvest technology.

Upper Volta - requested information on training programs.

Mexico - CENICCANDSA request for information on research in grain storage and handling activities under FFGI.

Germany - GTZ requested information on straw as an alternative fuel for grain drying.

Cameroon - Mr. Lazare Illogo-requested information on control of cowpea weevils.

Cameroon - AID mission-requested information on grain storage rodent protection.

USA - AID/Washington-requested literature on Prostephanus truncatus.

-----Phillips Petroleum Company-requested information on grain handling and marketing for export market development.

-----Dr. Lina Ilag, Indiana - requested information to set up a postharvest pathology course.

-----AID/Washington-requested a listing of rice handling and processing equipment manufacturers in foreign countries.

-----Dry Peas and Lentil Council, Idaho - requested information on possible overseas storage projects.

-----Davies International, Colorado - requested information on postharvest grain losses (worldwide).

-----Cooperative League of the USA, Washington, D. C. - requested slides on soybean storage and postharvest technology.

-----AID/Washington, D. C. - requested slides depicting postharvest losses.

-----Meals for Millions, California - requested resource material on grain storage.

C. Visitors under USAID Sponsorship and Others

1. AFRICA

a. Tanzania (August 1981)
Three staff members visited with Dr. A. N. Mphuru and discussed PHDS services, post-production system/loss assessment and upcoming Peace Corps Volunteer training.

b. Nigeria (August 1981)
A staff member visited with Dr. S. A. Bida, Mr. A. M. Adetiro and Mr. O. Okusanya and explained PHDS services.

c. Tunisia (September 1981)
Hadef Hafaiedh, INRAT library, visited with staff member and received information on PHDS services.

d. Upper Volta (May 1982)
Dr. Alfred Sawadogo, Director of OFNACER, discussed PHDS services, FFGI activities and grain storage problems with three staff members.

e. Botswana (June 1982)
Three staff members visited with Mr. Peter Mulligan, Head of Agricultural Marketing Board regarding marketing and grain storage handling which included a tour of facilities and field trips.

2. ASIA

a. Philippines (July 1981)
M. Sison, National Grains Authority met with staff member and discussed PHDS services.

b. Korea (August 1981)
Korean Wheat Team (6 members) discussed FFGI activities with staff member.

c. Korea (August 1981)
Staff member visited with S. S. Kim and Y. I. Han, Korea Silo Company, observed storage and handling facilities and discussed FFGI activities.

d. Korea (March 1982)
Mr. Kong, Director of Operations, Korea Silo Company, visited with staff member regarding FFGI activities.

e. India (April 1982)
Staff member visited with Dr. V. R. Muthuveerappan and Mr. Major G. Ambalavanan, Annamalia University, observed and discussed post-harvest grains programs of FFGI.

3. LATIN AMERICA

a. Nicaragua (July 1981)
Two staff members visited with Dr. David Santamaria and discussed PHDS services and FFGI activities.

b. Mexico (September 1981)
Alejandro Rivas Vidal met with two staff members and discussed grain storage and handling facilities.

c. Paraguay (May 1982)
Mr. Julio Gil Turnes, Coordinator of Agricultural Education and Ing. Agr. Nicasio Romero, Director of Agricultural Education Project met with staff member and discussed FFGI activities.

4. MIDDLE EAST

a. Israel (March 1982)
Dr. Moshe Calderon, stored-product entomologist, visited with staff member and discussed stored-product entomology and international work in this field.

5. EUROPE

a. England (September 1981)
Staff member discussed grain storage and mold related problems with Dr. John Lacy, Rothamsted, England.

b. England (October 1981)
Robin Wilkin, stored product entomologist, Ministry of Agriculture Fisheries and Food, Slough, worked with staff members for a month. He studied storage mites, gave seminars, and observed our storage systems (farm to export).

6. NEW ZEALAND (July 1981)
Twenty-eight farmers met with staff members to discuss and observe postharvest rural grain storage and handling in Kansas and Food and Feed Grain Institute activities.

7. AUSTRALIA (May 1982)
Mr. Kevin Walsh, Australian Wheat Board, New South Wales, observed and discussed "Postharvest Technology" problems and programs with four staff members including grain storage and associated problems, PHDS services and Food and Feed Grain Institute activities.

9. UNITED STATES
Dr. Robert Skiles, Postharvest Institute for Perishables, University of Idaho, visited with staff members and discussed PHDS services and Food and Feed Grain Institute activities (September 1981).

Pat McCracken and Grace Haskins, GAO Review Team, Washington, D. C. met with seven staff members and discussed activities of the Food and Feed Grain Institute (September/October 1981).

Dr. Merle Esmay, Agricultural Engineer, Michigan State University, visited staff member, observed and discussed Food and Feed Grain Institute activities (March 1982).

A staff member visited with Dr. Joe Clayton, Department of Food Engineering, University of Massachusetts and discussed Food and Feed Grain Institute activities (March 1982).

Dr. Verma, Agricultural Engineer, Louisiana State University, visited with staff member and discussed FFGI activities (June 1982).

D. Requests for Institute Reports Prepared under this Agreement

Included are Technical Assistance Reports (TR), Research Reports (RR), and Special Reports (SR).

Location	Number of Requestors	TR	RR	SR
AFRICA				
Benin	1	0	1	0
Botswana	2	2	0	0
Cameroon	1	0	5	2
Gambia	1	1	0	0
Ghana	1	3	1	0
Guinea	1	8	7	3
Kenya	2	2	0	0
Liberia	1	9	6	2
Morocco	2	6	2	3
Nigeria	6	3	13	4
Rwanda	2	16	7	7
Senegal	4	3	3	3
Sierra Leone	2	1	2	1
Sudan	1	0	2	0
Tanzania	2	1	2	1
Togo	1	2	7	1
Uganda	1	1	0	0
ASIA				
Bangladesh	3	5	1	2
Burma	2	4	11	0
India	5	9	0	1
Malaysia	2	6	0	2
Philippines	6	4	4	1
Singapore	2	0	0	2
Sri Lanka	4	3	1	2
Thailand	2	10	5	0
AUSTRALIA	2	0	2	0
EUROPE				
England	2	0	1	1
Italy	2	9	5	5
Netherlands	1	1	0	0
Russia	1	1	2	0
LATIN AMERICA				
Bolivia	1	0	1	0
Brazil	3	0	3	0
Costa Rica	1	0	1	0
Honduras	2	1	2	2
Mexico	4	1	7	7
Nicaragua	1	3	1	4
Trinidad	1	0	1	0
MIDDLE EAST				
Jordan	2	2	0	0
UNITED STATES				
Commercial	12	29	9	18
Government	5	5	7	3
KSU				
Ag. Econ. Teaching	3	5	2	10
Faculty-Staff	9	13	0	4
Libraries	2	1	0	6
Universities	6	2	6	3

III. TRAINING PROGRAMS

Observations made by project staff members while on overseas assignments continue to indicate the need for increased technical training of various types. The technical training provided under this agreement is considered to be one of the most significant contributions of the agreement. Training provides a foundation on which the developing countries can rely in self-resolution of technical problems related to storage, processing and marketing.

A variety of types of training are possible under this agreement and some training has been utilized as shown in previous technical assistance assignments. The on-campus AID Grain Storage and Marketing Short Course, held each year at Kansas State University, continues to be the main training effort under the agreement.

Other on-campus training includes degree program training and special training programs for AID-sponsored participants. In addition, staff members have taken part in 8 special training programs: International Grains Program (IGP)-- (a) Portuguese Milling Short Course for 2 days in July 1981 with 24 participants; (b) Philippines Wheat Industry Team for 1 day in September 1981 with 5 participants; (c) Nigerian Bakery Team for 1 day in October 1981 with 4 participants; (d) Latin American Feed Manufacturing Short Course for 2 weeks in November 1981 with 24 participants from 6 countries; (e) Grain Marketing Short Course for 1 day in December 1981 with 19 participants from 6 countries; (f) Latin America Milling Short Course for 1 day in May 1982 for 24 participants from 9 countries; (g) South East Asia Cereal Chemistry Team for 1 day in June 1982 for 3 participants from 3 countries; and (h) South African Wheat Board visitor for 1 day in June 1982.

Training provided in conjunction with Cooperative Agreement AID/DSAN-CA-0256 is discussed in greater detail in the following paragraphs.

A. AID Grain Storage and Marketing Short Course - 1981

The eleventh annual AID Grain Storage and Marketing Short Course was held June 15 through July 31, 1981.

One week's orientation in Washington, D. C. was provided by the USDA/AID International Training Office. Seven weeks of intensive lecture, discussion, laboratory, workshop and field trip training was provided on the Kansas State University campus June 15 through July 31, 1981.

Based on previous years' recommendations and experiences, it was determined to revamp the old manuals into a notebook form making it possible to add or delete materials more easily.

The Storage notebook includes four sections: (1) Fundamentals (including: the post-production system; structure of cereal grains and legumes; microorganisms; mycotoxins; physical, functional and biochemical changes during storage and assessing losses in the post-harvest system), (2) Grain Sampling, Inspection and Classification (including: introduction; grain inspection service in the U. S.; grain inspection systems and standards for developing countries; sampling grain and grain inspection and classification), (3) Handling, Conditioning and

ties and operation; solar drying; planning storage facilities; maintenance of grain storage facilities; rice milling and parboiling and erection of facilities) and (4) Sanitation (including: pest control in grain storage; stored-grain insect biology and identification; damage caused by stored-grain insects; rodent biology and identification; bird biology and identification; inspection; housekeeping; physical and mechanical methods of control; detection of contaminants in grain; contact insecticides; fumigation; rodent control and bird control).

The Marketing notebook includes three parts: (I) General Marketing (including: principles of management and operations and organization of the grain business--subdivided into agricultural policy; the marketing environment; marketing management; marketing firms and their design; principles of the futures market and grain accounting), (II) Development of Marketing Systems (including: systems and their development; facilitating market operations; grain transportation planning and storage costs and alternatives) and (III) Feasibility Analysis in Agriculture and Agribusiness Development (including: definitive planning; forecasting; economic analysis; financial analysis and transportation and location analysis).

The approach, in the past, seems to work quite well in that the group is split between the technical and economic groups based on participant preference.

A 1-week field trip was taken following arrangements similar to the previous year. Accompanied by six KSU staff members and the technical leader, the group began the trip on July 13 by traveling to the Kansas City area to observe grain storage facility manufacturing, river storage facilities and the Board of Trade marketing functions. The group then traveled to Stuttgart, Arkansas to visit the Rice Branch Experiment Station and a small rice mill. They observed rice production, storage, handling and processing facilities and toured a soybean processing plant. The group continued on to New Orleans, Louisiana where they visited the Federal Grain Inspection Service and toured an export elevator, port facilities and observed sacking operations. Literature was provided in addition to the tours.

The 1981 Short Course included 28 participants from 14 countries including Bangladesh (1), Cameroon (1), Costa Rica (1), El Salvador (2), Ghana (1), Honduras (4), Jordan (1), Malaysia (1), Mexico (4), Nigeria (5), Rwanda (1), Senegal (4), Sierra Leone (1) and Tanzania (1).

A questionnaire, supplied by the USDA Training Office, was completed by each participant at the end of the 7 weeks' intensive training at KSU. A summary of responses to the written questionnaire is as follows:

FINAL EVALUATION QUESTIONNAIRE
Grain Storage and Marketing--June 15-July 31, 1981

A. PARTICIPANT DATA

The personal data you provide serves two purposes. Some responses are needed for records on funding sources. Others help us to gather information we can use to continue to improve course effectiveness by tailoring presentations to participant backgrounds and experiences. (If you do not wish to provide any personal data, please begin with Section B.)

(1) Sponsorship: AID (11) FAO (3) Other (13)

(2) Sex: Male (25) Female (2)

(3) Is this course part of your academic program in the U.S.? Yes (8) No (17)

(4) What is the length of your stay in the U.S. up to the present?

2--47 days
1--51 days
1--52 days
1--55 days
1--6 weeks
2--7 weeks
1--14 weeks
11--2 months
1--7 months
1--11 months/21 days
1--1 year/2 months
1--6 years
1--6½ years

(5) Approximately how many years of work experience do you have?

1--0 years
1--1 year
1--1 year/7 mos.
2--2 years
1--3 years
2--4 years
3--5 years
1--6 years
1--7 years
2--8 years
2--9 years
1--11 years
1--12 years
3--13 years
1--15 years
1--16 years
1--18 years
1--20 years
1--25 years

(6) What is your primary professional (or educational) field?

1--Produce Inspection and Pest
4--Agriculture
1--Entomology
1--Agricultural Business
1--Commerce
2--Economics
1--Lab Technician
1--Research
2--Storage/Preservation of Grain
1--Technical Quality Agent
1--Cereal Grain Preservation
1--Agricultural Economist
1--Agronomist
1--Business Management
1--Financial Analyst
1--Grain Preservation
1--Grain Preservation Technician
1--Grain Research
1--Public Accountant
1--Head Warehouseman
1--Assistant Storage Technician
1--Inspector - Cooperative System

(7) Please indicate the highest academic level you have achieved (or its equivalent):

Secondary Diploma (4) B.S. (15) M.A./M.S. (6) Ph.D. (0)

(8) Please indicate your home country:

5--Nigeria	1--Costa Rica
1--Tanzania	2--El Salvador
1--Philippines	4--Honduras
1--Ghana	4--Mexico
1--Sierra Leone	3--Senegal
1--Cameroon	1--Rwanda

B. COURSE ENROLLMENT AND ORIENTATION

Before arriving in Washington:

		Yes	No
(1)	Were the financial arrangements for the course clear?	(18)	(5)
(2)	Were the general objectives of the training course clear?	(16)	(7)

(3) Do you have any comments or suggestions on the enrollment of participants for this course?

--Selection of participants on the basis of proper academic as well as professional background.
--Information about the course is not enough.
--Agricultural engineers should be involved because they are responsible for assembling or erecting storage facilities
--Since I'm a K-State graduate student and take this as part of my academic program I did not have the opportunity to join the orientation in Washington, D. C. I just attended the economics part of the course.
--There should be a minimum of college education for all the participants.
--It should be made clear in the brochure that agricultural planners and agricultural engineers be included in the enrollment list.

--The participants should speak English.
--The acceptance notice to the participants should be sent a week ahead of time.
--Invite persons of the same academic level and with the same experience on the job.
--There should be a minimum level of education.
--Complete information should be sent in the language of the country.
--Everything was as planned.

--I would like to continue studying storage if I could get a scholarship.
--Everything went normally with the help of AID/Dakar.

(4) How helpful was the Washington International Center Orientation?

Not at all Helpful		Moderately Helpful		Very Helpful
1(0)	2(0)	3(1)	4(0)	5(4)

(5) How helpful was the USDA orientation in Washington D. C.?

Not at all Helpful		Moderately Helpful		Very Helpful
1(1)	2(0)	3(0)	4(0)	5(4)

(6) What comments or suggestions do you have for the orientation segment of the course?

--Suggest only one well-organized International Center for Orientation covering all important segments of the course.
--Accommodations should be provided for participants during future orientation.
--Should continue with more group activities for the period.

--There should be a representative of AID to meet the participants when they arrive in Washington.
--I arrived late; no comments on orientation in Washington.
--In the future, there should be more practical aspects in the course since the time is short.
--It should be longer to put more emphasis on the practical aspects.

--The participating country should orient the student to the program which will be carried out and what subjects will be studied.
--There should be a meeting place upon our arrival in Washington where they would give us an idea of the objective or mission to be accomplished in Washington.
--I suggest that for the orientation in the International Center there should be translators.
--Differentiate more between marketing and storage. Put more emphasis on marketing.

C. TRAINING ENVIRONMENT AND SUPPORT ARRANGEMENTS

(1) Please indicate your satisfaction with the following support arrangements.

	Not at All Satisfied		Moderately Satisfied		Very Satisfied
Training Facilities	1(0)	2(0)	3(2)	4(7)	5(19)
Housing Accommodations	1(0)	2(0)	3(10)	4(8)	5(8)
On-going Administrative Support at Training Site	1(0)	2(0)	3(3)	4(6)	5(17)
Administrative Support by USDA Program Specialist	1(1)	2(0)	3(1)	4(4)	5(19)

(2) If you feel any of the arrangements were inadequate, please suggest how they might be improved.

--Rooms were terribly cold at times. (3)
--USDA too far away from participants until presentation of certificates.
--Visual displays in different languages.
--Holding seminars or discussion forums on outstanding issues of the developing nations.
--Rationalization of field trips and program activities of the course itself.
--PHDS needs to be rationalized and developed.

--We had a small problem with moisture in the rooms, but it was taken care of.
--We had problems with moisture in the rooms, but it was a natural phenomenon. The authorities tried to solve the problem; they gave us extra

blankets.
--Individual rooms should be given to those who desire them. I didn't ask, but it should be proposed in the beginning.
--In general, they were satisfactory.

--I want to make sure that the complaint about books not being available in Spanish is heard.
--All the arrangements were good.
--If you are going to combine people in a corridor of a dorm, o.k., but you should remember there are differences in customs.
--Air condition the corridors between the rooms. There is little ventilation.

D. THE INSTRUCTORS

Please rate your major instructor(s) in the following areas by circling a number on the scale from 1 to 5. (Please write in the instructor's names.)

Dr. Borsdorf:

	Poor		Satisfactory		Excellent
Knowledge of subject matter	1(0)	2(0)	3(0)	4(3)	5(10)
Effectiveness of presentation	1(0)	2(0)	3(3)	4(8)	5(2)
Ability to promote discussion	1(0)	2(0)	3(1)	4(4)	5(7)
Organization and clarity	1(0)	2(0)	3(2)	4(7)	5(4)
Overall effectiveness	1(0)	2(0)	3(1)	4(8)	5(4)

Comments: --He should encourage group study cases solving.
--Very initiative, cooperative, amiable and thought-provoking.
--He knows the subject matter very well and handled it very well. He is skilled, especially in Financial Analysis. He's very effective. He's willing to answer and entertains questions and answers. He should always lecture in such types of topics.
--He is a good instructor, but some of his study cases had some typing errors that means he never bothered to proofread.
--Although he knows his subject, his ability to explain clearly needs improvement.

--Improve the method of the case studies.

--Some classes were not planned according to the Manual.
--There is difficulty with the language.

Rosemary Burroughs:	Poor		Satisfactory		Excellent
Knowledge of subject matter	1(0)	2(0)	3(0)	4(0)	5(3)
Effectiveness of presentation	1(0)	2(0)	3(0)	4(0)	5(3)
Ability to promote discussion	1(0)	2(0)	3(0)	4(0)	5(3)
Organization and clarity	1(0)	2(0)	3(0)	4(1)	5(2)
Overall effectiveness	1(0)	2(0)	3(0)	4(0)	5(3)

Comments: --The problem of microorganisms is very complex and requires a lot of attention.

--Excellent professor.

Dr. Chung:	Poor		Satisfactory		Excellent
Knowledge of subject matter	1(0)	2(0)	3(0)	4(0)	5(9)
Effectiveness of presentation	1(0)	2(0)	3(0)	4(1)	5(7)
Ability to promote discussion	1(0)	2(0)	3(0)	4(0)	5(8)
Organization and clarity	1(0)	2(0)	3(0)	4(1)	5(7)
Overall effectiveness	1(0)	2(0)	3(0)	4(1)	5(7)

Comments: --Very jovial and makes the whole class lively.
--My sincere congratulations.
--His knowledge was well conveyed.

Dr. Hugo:	Poor		Satisfactory		Excellent
Knowledge of subject matter	1(0)	2(0)	3(0)	4(3)	5(7)
Effectiveness of presentation	1(0)	2(0)	3(0)	4(5)	5(5)
Ability to promote discussion	1(0)	2(0)	3(1)	4(7)	5(2)
Organization and clarity	1(0)	2(0)	3(0)	4(6)	5(3)
Overall effectiveness	1(0)	2(0)	3(0)	4(7)	5(3)

Comments: --Very hard-working, enthusiastic and research oriented.
--He explains clearly and he presents the subject matter very effectively. He's very approachable. Borsdorf and Hugo did a really good job during the training. They made a faithful appearance.
--Study cases should be done in groups not on individual basis, so he should promote this.
--Very effective and helpful. He has an excellent grip on his subjects.

--Place more emphasis on practical cases.

--In the first lectures, I had trouble with clarity.

Dr. Pedersen:	Poor		Satisfactory		Excellent
Knowledge of subject matter	1(0)	2(0)	3(0)	4(0)	5(10)
Effectiveness of presentation	1(0)	2(0)	3(0)	4(1)	5(8)
Ability to promote discussion	1(0)	2(0)	3(0)	4(1)	5(8)
Organization and clarity	1(0)	2(0)	3(0)	4(0)	5(8)
Overall effectiveness	1(0)	2(0)	3(0)	4(0)	5(9)

Comments: --Speaks clearly to the understanding of all participants.
--Lectures were well-prepared and effectively delivered on each occasion.

--He is very open to discussion and doesn't hesitate to say that he doesn't know something for sure.

Dr. Haque:	Poor		Satisfactory		Excellent
Knowledge of subject matter	1(1)	2(0)	3(0)	4(0)	5(0)
Effectiveness of presentation	1(0)	2(0)	3(0)	4(0)	5(0)
Ability to promote discussion	1(0)	2(0)	3(0)	4(0)	5(0)
Organization and clarity	1(0)	2(0)	3(0)	4(0)	5(0)
Overall effectiveness	1(0)	2(0)	3(0)	4(0)	5(0)

Comments: --He should be better prepared when presenting "Rice Milling."

Dr. Kiser:	Poor		Satisfactory		Excellent
Knowledge of subject matter	1(0)	2(0)	3(0)	4(0)	5(1)
Effectiveness of presentation	1(0)	2(0)	3(0)	4(1)	5(0)
Ability to promote discussion	1(0)	2(0)	3(0)	4(0)	5(0)
Organization and clarity	1(0)	2(0)	3(0)	4(0)	5(0)
Overall effectiveness	1(0)	2(0)	3(0)	4(1)	5(0)

Comments: --Some classes were not planned according to the Manual.

Dr. Wright:	Poor		Satisfactory		Excellent
Knowledge of subject matter	1(0)	2(0)	3(0)	4(1)	5(0)
Effectiveness of presentation	1(0)	2(0)	3(1)	4(0)	5(0)
Ability to promote discussion	1(0)	2(0)	3(0)	4(1)	5(0)
Organization and clarity	1(0)	2(0)	3(1)	4(0)	5(0)
Overall effectiveness	1(0)	2(0)	3(0)	4(1)	5(0)

Comments: --Satisfactory

Carl Reed:	Poor		Satisfactory		Excellent
Knowledge of subject matter	1(0)	2(0)	3(0)	4(0)	5(1)
Effectiveness of presentation	1(0)	2(0)	3(0)	4(0)	5(1)
Ability to promote discussion	1(0)	2(0)	3(0)	4(0)	5(1)
Organization and clarity	1(0)	2(0)	3(0)	4(0)	5(1)
Overall effectiveness	1(0)	2(0)	3(0)	4(0)	5(1)

Comments: --Cooperative and hospitable.

Dr. Kiser and Dr. Hugo:	Poor		Satisfactory		Excellent
Knowledge of subject matter	1(0)	2(0)	3(0)	4(0)	5(1)
Effectiveness of presentation	1(0)	2(0)	3(0)	4(0)	5(1)
Ability to promote discussion	1(0)	2(0)	3(0)	4(1)	5(0)
Organization and clarity	1(0)	2(0)	3(0)	4(0)	5(1)
Overall effectiveness	1(0)	2(0)	3(0)	4(0)	5(1)

Dr. Wright, Dr. Mills, Rosemary Burroughs:

	Poor		Satisfactory		Excellent
Knowledge of subject matter	1(0)	2(0)	3(0)	4(0)	5(2)
Effectiveness of presentation	1(0)	2(0)	3(0)	4(1)	5(1)
Ability to promote discussion	1(0)	2(0)	3(1)	4(0)	5(1)
Organization and clarity	1(0)	2(0)	3(1)	4(0)	5(1)
Overall effectiveness	1(0)	2(0)	3(0)	4(1)	5(1)

Comments: --This part of the course is the most important for me. I would like more practical work to be able to master the techniques.

Dr. Chung, Dr. Pedersen, Dr. Haque, Carl Reed:

	Poor		Satisfactory		Excellent
Knowledge of subject matter	1(0)	2(0)	3(0)	4(0)	5(2)
Effectiveness of presentation	1(0)	2(0)	3(0)	4(1)	5(1)
Ability to promote discussion	1(0)	2(0)	3(0)	4(0)	5(2)
Organization and clarity	1(0)	2(0)	3(0)	4(1)	5(1)
Overall effectiveness	1(0)	2(0)	3(0)	4(1)	5(1)

Comments: --The notes should be more detailed. They are too schematic. If this is not possible, the notes should be synthetized.

Dr. Kiser and Dr. Hugo:	Poor		Satisfactory		Excellent
Knowledge of subject matter	1(0)	2(0)	3(0)	4(0)	5(1)
Effectiveness of presentation	1(0)	2(0)	3(0)	4(0)	5(1)
Ability to promote discussion	1(0)	2(0)	3(0)	4(1)	5(0)
Organization and clarity	1(0)	2(0)	3(0)	4(0)	5(1)
Overall effectiveness	1(0)	2(0)	3(0)	4(0)	5(1)

E. TRAINING OBJECTIVES

Below are the training objectives for this course. Please circle the number which indicates the degree to which you feel that each training objective was achieved.

(1) During this course, you will learn food and feed grain drying, storage, handling, transportation, and marketing from farm to final consumption.

Not Achieved		Partially Achieved		Fully Achieved
1(0)	2(0)	3(7)	4(13)	5(8)

What types of training experiences might have enabled you to more fully achieve this objective?

Comments: --At least basic training in general agriculture.
--Observe actual drying and aeration of grains.
--Marketing, storage and planning in grain businesses.
--More case studies.

--Greater emphasis should have been placed on a level at which participating countries can afford.
--Marketing aspect was not sufficiently emphasized.
--Visits to elevators and farms.

--Professional experience.
--Practical experience.
--Length of the course and more practical work.
--Sampling practicum.
--Assessment of post-production and storage losses.
--The construction of a small inexpensive solar dryer.
--Good storage of grain in warehouses.

--More practical work.
--Doing practical work in a small silo.
--Observe directly in the field drying practices in different types of dryers.
--Grain marketing in the field.
--A field trip where we could see the process of drying and the entire related system.
--I liked best storage, handling and sales to the consumer.

(2) During this course, you will study basic fundamentals of grain storage and marketing as well as the practical knowledge and techniques required in grain storage and marketing.

Not Achieved		Partially Achieved		Fully Achieved
1 (0)	2(0)	3(6)	4(13)	5(8)

What types of training experiences might have enabled you to more fully achieve this objective?

Comments: --One has to be involved to be able to really have interest in this subject.
--Product inspection.
--Transportation and marketing accounting.
--Doing actual loss assessment study.
--In terms of practical knowledge and techniques required in grain storage: should arrange for more practicals in grain inspection, drying.
--Marketing storage and planning in grain business.
--More case studies.
--Some biology and knowledge of elementary physics/chemistry.

--Professional experience.
--Practical experience.
--There should be a lot of field work to learn from experience.
--Storage techniques.
--Pesticide study.
--Pest studies and control methods.
--How to organize marketing channels, coordinate, control, direct, etc.

--Greater pedagocial capability of the speakers (marketing).
--I think that since this part, storage, is my strong point, I was able to assimilate it.

--Storage, preservation, handling, processing.
--Developing several practical cases.
--None.

(3) Miscellaneous comments on training objectives.

--More emphasis on subjects in grain marketing, supplemented by a study tour.
--For the marketing group, the trip to New Orleans had no value.

V. COURSE ACTIVITIES FOR FINAL WEEK

ACTIVITY:	Not Useful		Moderately Useful		Very Useful
(1) Economic Analysis	1(0)	2(0)	3(0)	4(1)	5(3)

Comments: --I learned a whole lot about it. Very relevant to my studies.
--Useful, but time allowed too short for the material.

(2) Economic Analysis (Case studies)	1(0)	2(0)	3(0)	4(4)	5(2)

Comments: --More and more group discussion, policy analysis and project analysis instead of such case studies.
--Case studies program itself may be dropped from the regular class schedules. It may be introduced as homework program.
--Instead of going for so many case studies, some sort of seminar in case analysis through discussion may be more effective.
--This is the part which should have been given a great deal of attention and time by the participants. Case studies are sources where the participants could interact. If case study sessions could be arranged in such a manner that participants would be grouped into 2 or 3, somehow, there will be more effective sharing of the varied ideas they have which will surely benefit all.
--Group approach to solution of problems is recommended.
--Case studies should follow immediately after the lecture on the subject matter.
--Case studies for economic analysis were very important but little time was allocated to it and we were not working in groups.

(3) Financial Analysis	1(0)	2(0)	3(0)	4(2)	5(2)

Comments: --The topic is very relevant to my undertaking.
--A useful exercise; time devoted too short.

(4) Financial Analysis (Case studies)	1(0)	2(0)	3(0)	4(3)	5(0)

Comments: --More of the case studies in groups will be more beneficial.
--Case studies should include country statements of the participants.
--Very important, but little time was allocated to them. Group solving should be encouraged. Adults usually learn more when they discuss issues together. The instructor will have to talk to groups and direct them.

(5) Transportation	1(0)	2(0)	3(0)	4(1)	5(0)

Comments: --This topic was a little bit vague for me.

(6) Transportation (Case studies)	1(0)	2(0)	3(0)	4(2)	5(0)

Comments: --Participants should be divided into working groups based on

areas of interest.
--But farm from the usual lecture was given.

		Not Useful		Moderately Useful		Useful
(7)	Price Analysis	1(0)	2(0)	3(0)	4(0)	5(1)

Comments: --It is very useful for marketing people and a great deal of attention should be given to the topic by the participants.

(8)	Price Analysis (Case studies)	1(0)	2(0)	3(0)	4(1)	5(0)
(9)	Forecasting	1(0)	2(0)	3(0)	4(0)	5(1)

Comments: --I was able to understand more about forecasting because the topic was handled and explained well. My vague ideas about forecasting were somehow cleared.

(10)	Locational Analysis	1(0)	2(0)	3(0)	4(1)	5(0)

Comments: --This topic was not emphasized very much.

(11)	Strategic Food Reserves	1(0)	2(0)	3(0)	4(2)	5(2)

Comments: --This being the key issue of today's food strategy and policy, more timely and seminar programs desired.
--A useful activity; only too short.
--The need for a food reserve is necessary in countries where the production fluctuates.

(12)	Strategic Food Reserves (Studies)	1(0)	2(0)	3(0)	4(0)	5(1)

Comments: --Very useful, but they could be improved.
--More time should be spent on practical aspects than on theories.
--In general, the French translation was not the best it could have been.

(13)	Fumigation	1(0)	2(0)	3(0)	4(1)	5(5)

Comments: --More storage structures should be used in future to keep every member deeply involved in the fumigation exercise.
--As corrective method, and the precisions were given on how to use the pesticide.

14)	Fumigation Demonstration	1(0)	2(0)	3(1)	4(4)	5(6)

Comments: --This type of demonstration helps little to the participants of semilevel. It could be replaced by a discussion forum on fumigation and its effectiveness.
--It was important to us to do the fumigation ourself because this is what we are going to show our junior staff to do at home by using phostoxin.
--Very useful. Fumigation method with other fumigants necessary.
--A complete success.
--This should be given to only the storage group. For the other group, they perhaps don't need the technology, but maybe costs, etc.
--Personal interests should be considered and alternatives should be offered to this activity. A class could be given on a specific subject.

--This is good practice.
--Very practical cases, it is easier to assimilate the information.

		Not Useful		Moderately Useful		Very Useful
(15)	Fumigants	1(0)	2(0)	3(0)	4(0)	5(2)
	Comments: --The pesticides should be explained in more detail.					
(16)	Crop Losses Assessment	1(0)	2(0)	3(2)	4(3)	5(5)
	Comments: --It could be followed by a practical demonstration. --Should have a practical on this. --More time should be devoted to the subject. --Too short. More group activity necessary. --This method allows us to determine when losses occur. --Excellent, but I think that it should have more time since this is the main objective.					
(16b)	Critique	1(0)	2(0)	3(0)	4(0)	5(1)
	Comments: --As much as possible, this period should be very closely related.					
(17)	Rice Milling and Inspection	1(0)	2(0)	3(0)	4(0)	5(1)
(18)	Pest Control	1(0)	2(0)	3(0)	4(0)	5(2)
	Comments: --There was practical demonstration of fumigation which gave me clear understanding of the lecture. --I think this activity should have more time and should go into more detail.					
(19)	Rodent Control	1(0)	2(0)	3(1)	4(2)	5(3)
	Comments: --Should have a demonstration. --Very interesting.					
(20)	Bird Control	1(0)	2(0)	3(1)	4(0)	5(2)
	Comments: --Very good.					
(21)	Rodent and Bird Control	1(0)	2(0)	3(0)	4(0)	5(4)
	Comments: --Well defined.					
(22)	Grain Inspection Practical	1(0)	2(0)	3(1)	4(0)	5(1)
	Comments: --Should inspect more different types of grain.					
(23)	Erection of Facilities	1(0)	2(0)	3(2)	4(0)	5(3)
(24)	Practical Exams	1(0)	2(0)	3(0)	4(1)	5(4)
	Comments: --It really made me know how much we have gained from the lectures and practicals. --This should not come on the last day of the course.					
(25)	Contaminant Analysis	1(0)	2(0)	3(0)	4(0)	5(2)
	Comments: --Food can be contaminated in many ways.					

		Not Useful		Moderately Useful		Very Useful
(25a)	Informative Session	1(0)	2(0)	3(0)	4(0)	5(1)
	Comments: --Although secondary, this could be made an integral part of the program.					
(26)	Aeration	1(0)	2(0)	3(0)	4(0)	5(1)
	Comments: --Magnificant.					
(27)	Marketing, Practical Exercises	1(0)	2(0)	3(0)	4(1)	5(0)
	Comments: --With this type of exercise there is a series of problems which theoretically are more difficult.					
(28)	Psychometric Chart	1(0)	2(0)	3(0)	4(0)	5(1)
(29)	Transportation Costs	1(0)	2(0)	3(0)	4(1)	5(0)
	Comments: --It would be better if it followed the lecture on transportatior					
(30)	Use of Insecticides	1(0)	2(0)	3(0)	4(1)	5(2)
(31)	Discussions with Professors	1(0)	2(0)	3(0)	4(0)	5(1)
(32)	General Review	1(0)	2(0)	3(0)	4(2)	5(2)
	Comments: --Should be better organized to avoid boredom. --I think there should be a few more days where we could discuss problems with the groups of professors.					
(33)	Rodeo	1(0)	2(0)	3(0)	4(0)	5(1)
	Comments: --Very interesting and entertaining.					
(34)	Banquet	1(0)	2(0)	3(0)	4(3)	5(6)
	Comments: --Participants should be invited to say something. --Address of the President of the University and the speaker should be given to participants. --An excellent arrangement. At least one participant should have been allowed to talk. --There should be a representative of the group who has a chance to address the audience. --There was no participation or representative of the participants. We should have the opportunity to speak and show our thanks.					

(35) General Comment: I think everything was good the last week.

F. ORGANIZATION AND CONDUCT OF PROGRAM

(1) How do you feel about the amount of time devoted to each of the following activities?

	None	Too Little	About Right	Too Much
Lectures	(0)	(8)	(17)	(1)
Large Group Discussions	(1)	(11)	(14)	(1)
Small Group Work	(2)	(11)	(11)	(1)

	None	Too Little	About Right	Too Much
Sharing of Home Country Issues	(9)	(8)	(17)	(1)
Field Trips	(0)	(5)	(16)	(5)
Individual Consultation with Instructors	(1)	(3)	(20)	(3)

Comments: --More time should be given to this course. We are learning too many important things within a short time.
--Rationalization of the program as per above topics.
--Field trip was too much since in most of the places we saw almost the same things.

--I congratulate the staff for their willingness towards the participants. They were always available.

--It is necessary to distinguish certain field trips.
--There were no group discussions or chances to exchange ideas.
--Much time was lost on personal subjects.
--I am highly satisfied with the coordination of the course.
--The help was excellent, especially Carl Reed and Dr. Pedersen.
--Everything was at the best level.

(2) How helpful were the following activities in facilitating your learning?

	Not At All		Moderately		Very
Lectures	1(0)	2(0)	3(2)	4(5)	5(17)
Large Group Discussions	1(1)	2(0)	3(5)	4(4)	5(8)
Small Group Work	1(4)	2(2)	3(2)	4(4)	5(6)
Sharing of Home Country Issues	1(3)	2(1)	3(1)	4(2)	5(7)
Field Trips	1(2)	2(0)	3(3)	4(3)	5(15)
Individual Consultation with Instructors	1(0)	2(0)	3(1)	4(5)	5(14)

Comments: --There was no provision on the course for sharing of home country issues.
--Time is too short.
--No time was allocated for sharing home country ideas.
--As there was little provision for group discussions, home country issues and group work, no evaluation is given.

--I talked with the instructors a lot, and they helped me greatly.
--The GMT in Clay Center organized a good discussion.

--There were no large group discussions.
--There was no sharing of home country issues.
--For the marketing group, the trip is not necessary.

	Too Short	About Right	Too Long
(3) Was the daily schedule:	(2)	(21)	(6)
Was the rest and break time:	(0)	(28)	(0)
Was the overall length of the course:	(13)	(13)	(1)

(4) The level of presentation was:

Too simple (0) About right (11) Too complex (0)

(5) Were you satisfied with order in which topics were presented? Yes(24) No (1)
If not, what would you change?
--Case studies should follow immediately after lectures on topics.
--Engineering lectures were too technical for participants whose specialization was in the humanities.
--I also call lectures the talks given to us by persons on field trips.
--I think courses such as these would work well if they lasted six months.
--Try to finish each of the subjects and not try to intermingle them so you don't lose the continuity.

G. FIELD EXPERIENCE

(1) Circle a number on the scale from 1 to 5 to rate the adequacy of the following arrangements for your major field trip(s).

	Not Adequate		Adequate		Very Good
Preparatory Information	1(1)	2(4)	3(4)	4(6)	5(9)
Transportation	1(0)	2(0)	3(3)	4(7)	5(17)
Helpfulness of USDA or University Personnel	1(0)	2(0)	3(2)	4(5)	5(19)
Responsiveness of Field Site Personnel to Participant Needs	1(0)	2(0)	3(1)	4(7)	5(19)
Overall Coordination	1(0)	2(0)	3(1)	4(8)	5(15)

(2) What factors contributed to the success of the field experience(s)?

--Everything was well-arranged, but the field trips were of little gain to me. Since the time for serious work was pinched off for a tourist sessic marketing class had so much within a short time. We would have preferrec to stay back.
--Field trip was well arranged.
--Friendliness of the guides and the team leader.
--All the above factors were responsible for the success of the field trip.
--Good leadership of the instructor.
--Good and long-term planning by the Institute and good leadership of Dr. Pedersen.
--Interaction of all the people visited with the participants.
--The trip arrangements by instructors.

--Preparatory information.
--The help given by USDA and the University coordination and sensitivity of staff to participant's needs.
--The staff on the trip were very sensitive.
--The people we met answered all our questions. Special mention to "Research Marketing Lab."
--The exchange of methods and techniques.
--The contact. In several of the field trips, much new knowledge was given us.

--The accessibility of the persons on the trip who accepted us into their centers.
--The excellent disposition of the people towards the group.
--The willingness of the people to cooperate and share their experiences.
--The communication between the entire group including professors and field personnel.
--Adequate opportunities for the class to learn what they wanted.
--Good preparation of the subject and material for explanation.
--The activities carried out; the businesses visited.
--Because everything was coordinated at the right time.

(3) What factors lessened the overall success of the field experience(s)?

--Storage oriented.
--Tourist oriented.
--Too many elevators, since most of us don't have these big elevators back home.
--There were not enough marketing experiences included in the trip.
--At various places that was planned to be visited, should arrange for a demonstration of what that particular institution/facility does, especially at FGIS. There should be a demonstration on grain sampling, various inspection procedures, etc. (as at Board of Trade).

--Time factor.
--The lack of contact (the lack of further explanation).

--Before visiting a location, it would be good to have general information of the activities in each visit.
--Sometimes a little more information on the activity going on in the places visited.
--The fact that there was no previous information on several of the places visited.
--The lodging was far from the places visited in New Orleans.
--The hotels.
--The long distances covered to see an export warehouse.
--The length of the visits. I think it would be better not to visit so many facilities.
--The lectures that they gave us on two occasions were not sufficient; in one case they repeated things we already knew, in another they talked to us about planting rice which is not in the subject matter of this course.
--Several visits to elevators that only gave us elementary information which we already knew.

(4) How useful did you find the field experience(s) in furthering your achievement of course objectives?

Not Useful		Moderately Useful		Very Useful
1(0)	2(0)	3(4)	4(11)	5(11)

H. MATERIALS

(1) The written materials used in this course have been:

Not At All Helpful		Moderately Helpful		Very Helpful
1(0)	2(0)	3(5)	4(7)	5(16)

(2) The audio-visual learning activities or materials used in this course have been:

Not At All Helpful		Moderately Helpful		Very Helpful
1(0)	2(0)	3(4)	4(9)	5(15)

(3) Do you have any suggestions for improvement or use of the written or audio-visual materials?

--Audio-visual aids to be presented in the relevant languages of participants.
--Slides should be written in bolder type and efforts should be made to prevent slurred images on the screen.
--Languages should be written horizontally in bold letters so that the participants can read them easily.
--The outlines for the lectures should include more information to make them more meaningful.
--Opportunity for practice in the use of audio-visual and laboratory equipments, after normal classes, should be provided in the future.
--Visual display in different languages is needed.

--For the written materials, the explanations should all be translated from English to French. (2)
--There should be more explanation.

--The printed material should be revised and the translation improved.
--There should be more care taken with the quality of the written translations
--I think all additional material should be in Spanish.
--The written and AV material should be 100% in Spanish. We got a lot of material in English which will do us no good.
--The written material should have more content.
--Fill and update the marketing manual and not give greater emphasis to the technical part.
--Excellent.
--The equipment should have better projection and the slides should have letters which are totally visible.
--Films could be used to describe the situation in a country; after the presentation there could be group discussions to develop the analytical capacity of the participants in relation to situations where they may have some influence.

I. YOUR PARTICIPATION

(1) To what degree do you feel you shared your ideas and experiences with the group?

Did Not Share		Shared Somewhat		Shared a Great Deal
1(0)	2(0)	3(16)	4(10)	5(13)

(2) To what extent did your understanding of the English language limit your ability to: (Only English were asked following question)

	Did Not Limit		Somewhat Limited		Greatly Limited
Understand lectures	1(9)	2(1)	3(1)	4(0)	5(0)
Participate in discussions	1(7)	2(1)	3(1)	4(0)	5(0)
Ask questions	1(9)	2(1)	3(1)	4(0)	5(0)

J. COURSE CONTENT

(1) Which of the sessions included in the present course do you feel should be lengthened or expanded?

--Price analysis, economic analysis, financial analysis, strategic food programs.
--More case studies.
--Pest control, the content of the subject given to the combined class of technical and marketing should be enlarged.
--Conducting loss assessment techniques.
--All of what we have done.
--Principles of marketing.
--Economic, financial and price analysis.
--Entomology aspect should be lengthened.
--Price analysis, management analysis.
--Engineering/technological comparative systems.
--Insect identification.
--Marketing/economic sessions.

--Different methods of marketing and storage.
--Case studies in financial analysis, economic analysis and transport analysis.
--Insects, fungi, drying.
--Pest control, use of pesticides, insect study, loss assessment.
--Microorganisms and loss assessment.
--Insect and pest control.

--Aeration.
--Aeration methods.
--Postharvest loss assessment and more knowledge on this problem. These areas should be expanded.
--Postharvest loss. (2)
--Grain drying. (2)
--Control.
--Storage.
--Preservation.
--Insect and mold identification.
--Laboratory practice. I think they are somewhat limited in time.
--Everything.
--Financial analysis, economic analysis, futures market and price analysis
--Marketing, especially in economic and financial analysis.
--Project evaluation.
--The sections themselves are fine, except that the speed with which they are given makes it difficult for us.

(2) Which of the sessions included in the present course do you feel should be shortened?

--Sessions on facilities.
--Engineering and construction details of elevators.
--Nothing should be shortened.
--Construction of storage facilities.
--Field trips: Kansas, Manhattan, New Orleans.

--The theoretical part.

--Sometimes the field trips should be presented as options and alternatives should be given such as the opportunity to go more into detail in subjects of common interest.
--Group discussions. These tend to deviate from the intended subject.
--Nothing. (3)
--Marketing part for the technical group.
--The first four weeks were general information. I think the participants know much of this before coming to the course and should have studied this before coming. This would allow the course to be dedicated entirely to deepening their knowledge in the subject matter and not just get a superficial analysis.

(3) What topics, if any, do you feel should be <u>added</u> to this course?

--Case studies from developing countries.
--Storage problems in developing countries and possible solutions.
--More emphasis should be made on storage aspects of rice.
--I think the topics are just about right, considering the duration of the course.
--Comparative systems, common food policy/management issues in the developing world.
--Food security program and policy analysis.
--Malnutrition.
--Storage of corn as ears with husks.

--Informative sessions on treatment of commodities.
--Storage in sacks.
--Repairing sacks.
--Norms and standards for developing countries.
--Study of a storage system in a given country as an example (plus more time).
--Much more practical work in labs and in the field.

--Biological control.
--These are complete courses. The only thing to be increased is the time.
--I don't think more subjects should be added, but I don't think that this should provide the participants with a torrent of information, but should rather develop in them the capability to analyse actual situations and to decide on or choose viable corrective actions.

(4) What topics, if any, do you feel should be <u>omitted</u> from this course?

--Nothing should be omitted. (2)
--No two week introduction to grain storage; only one week.
--No <u>irrelevant</u> field trips.

--Strategic food reserves.
--None. (2)

(5) Of all you have learned or experienced during the training program, what will be the most useful to you professionally in your home country?

--The sessions on produce grading, pest control in stored grain and grain marketing.

--In the field of storage. These I am personally involved in the production of good variety seeds to farmers.
--Setting up a marketing organization.
--Analysis or feasibility studies of agricultural projects.
--Improvement of pest control and storage practices.
--All aspects of storage lectures will be useful to me since I will have to start teaching a course on stored product pests when I get back to my country.
--How to work out for the grain losses.
--Grain storage in bulk.
--How can marketing be improved in my country so as to serve the farmers and the consumers (pricing forecasting).
--Feasibility analysis of grain projects.
--Project preparation, storage facilities, storage pests, all aspects of marketing.
--Insect behavior and their control methods; particularly an integrated control approach.
--Have gained a thorough idea on most of the important fields of the food strategy. Have also acquired a modest knowledge about various modern and developed food practices.
--Bag storage, maintenance of warehouse aeration, pest control, inspection and loss assessment.
--Everything in marketing.

--Economic, price, financial and transport analysis.
--Storage.
--Marketing.
--Fumigation, insects, fungi and drying.
--Housekeeping, pest control methods, pesticide and insect studies.
--Rodent study, sampling practicum and post-production loss assessment.
--Drying, rodent and insect control, inspection, microorganisms.
--Everything is very useful.
--Insect and rodent identification, practical inspection, storage.
--How to calculate moisture, sanitation, storage structures.

--The theoretical and practical knowledge acquired on aeration, drying, pest control, molds, grain inspection systems and in general everything related to grain preservation. (2)
--Drying, aeration, solar drying, postharvest loss assessment.
--Aeration.
--Control of insects and molds.
--Storage, since this is the field where I'm strongest.
--During the course, I obtained knowledge about grain storage which will help me understand the research on seeds in our country, and in addition I had the chance to obtain from the library all the necessary information for our work in Mexico.
--Analysis and projection of prices.
--The section on financial and economic analysis in the marketing classes.
--Project evaluation.
--Grain marketing.
--The knowledge of a marketing system as a whole. Before I didn't have a total view like I do now.

(6) How important was the subject matter for your job?

Not Important		Moderately Important		Very Important
1(0)	2(0)	3(2)	4(5)	5(22)

Comments: --Course is very relevant to the job I perform.
--Everything we learned is done in my country.
--Intermediate level technology applicable to situation in developing countries should be included.
--Quite relevant.

--Everything has a great importance because preservation is everything.
--This will allow me to have more knowledge and to watch more carefully the protection of stored grain which I am responsible for.

--In general.
--It is very important since this is the function I carry out in my work.

(7) The issues and problems discussed during the training were:

Not Relevant To My Work		Moderately Relevant		Very Relevant To My Work
1(0)	2(1)	3(4)	4(8)	5(15)

Comments: --Except that there was too much emphasis in bulk storage, every other thing was satisfactory.
--Most of the issues were of this country and we don't have the facilities of this country; but still, they were relevant.

--For example, the use of the psychrometric chart.
--Adequate.

--Because the nature of the course is the same as that of my business.
--Everything was related.
--Highly related.

K. OVERALL SATISFACTION

(1) Please indicate your overall satisfaction with the course.

Not At All Satisfied		Moderately Satisfied		Very Satisfied
1(0)	2(0)	3(3)	4(12)	5(14)

Comments: --Two weeks with storage group was too long a time. One week would have been okay. Some engineering classes were not too meaningful when we still had a lot to cover on marketing.
--Time wasted on non-related trips could have been spent on case studies relevant to one's individual interest in the market sector.
--Participants should be split into marketing and storage groups right from the beginning of the course. This will enable each of us to have enough time for his field of interest.
--A lot has been crowded in during the 7-week course.
--I really feel very satisfied with the course and with the performance of our instructors. They did a good job. Their efforts were very much appreciated.

--I really enjoyed the course and I appreciate the competence of the instructors.
--Rice storage should be more emphasized.
--The course has been exciting and the knowledge acquired would definitely enhance my performance.

--I am satisfied because the course objective were met. The rest of the work is up to the participants.

(2) Please check one of the following:

(28) I would recommend this course.

(0) I would not recommend this course.

(3) In addition to the comments you have made, do you have any other suggestions which we might be able to implement for next year's course?

--Course period should be extended.
--Rationalization of the program itself and its accompanying activities.
--Introduction of group discussions, and policy analysis.
--Uniformity in the selection of participants.
--U.S. embassies in developing countries should make better publicity of the course.
--It was very informative. Though it was presented in a broader point of view, my overall assession is that it was a real good course that everyone else should not miss taking. The duration was good enough. Each participant, I believe, has learned, if not all, a whole lot about marketing.
--I suggest that more of small group work/discussion should be incorporated in the program.
--I insist on group discussion in case studies.
--Arrange such that lectures are in the morning and practicals in the afternoon.
--There should be basic educational requirements for the course.
--Period of the course should either be increased or the course content trimmed down.
--Field trips should lay more emphasis on marketing.
--During the future banquets, there should be about 5 minutes for one of the participants to thank the organizers; most especially when everyone involved in the course was present.
--The brochure of the course is too general and not clear in objectives of course contents. Course contents make it clear that program planners, agricultural engineers, etc., will benefit from the course. This should be corrected.

--For the French speakers, the interpreter should be better because it is hard to follow the courses if you don't have any idea of what's going on in the professor's lectures.
--If possible, visit more storage units where they store in sacks.
--The class on conversion units should be among the very first classes (2nd, perhaps). This eliminates a certain confusion when talking about bushels, feet, BTU, etc.
--The interpreter was a handicap for me. Otherwise, I am satisfied with the effort made by the professor in general.

--Anticipate the problems of bureaucratic slowness as to the material sent out about the course.
--Have better accommodations in hotels on the trip.
--Keep marketing more in mind.
--In the marketing portion, there were problems with the clarity of the speakers. There was much information, but this was very general. There was little reference material since the manual is a guide, and there were not translations for all the material.
--The materials distributed to us were not totally satisfactory because even if the participant knew a little English, he would still prefer to have things in his own language.
--Consider the problems connected with simultaneous translation. I think there should be specialized interpreters to give better service to the participants who do not speak English.
--The translation equipment is deficient and should be revised because it will always be needed since not all the students have English.
--If possible, we should receive both courses, storage and marketing all through the course.
--A lot of the participants showed interest in rice. Perhaps you could improve and include discussions on the world rice market, storage problems, etc.
--I think for next year everyone should have the opportunity to correspond with the institutions they represent, plus 3 phone calls to your family. Thank you very much.
--For me this course was excellent and will benefit me. I would like to thank all the instructors and others who helped with the course.

B. AID Grain Storage and Marketing Short Course - 1982

Participants for the 1982 Grain Storage and Marketing Short Course arrived on campus June 12, 1982 after a one-week orientation in Washington, D. C.

Participants will spend 7 weeks of intensive training on the KSU campus. The training for the 1982 short course will follow the same general format as the 1981 short course with the exception of the field trip which will be taken to Tulsa, Oklahoma, several locations in Arkansas and end in Kansas City. The trip will be taken the fifth week of the short course. Five staff members will accompany the group.

Dr. Chin Kook Lee has taken the place of Mr. Robert Doan as International Training Administrator. Dr. Lee and Mr. Nathaniel Ferris, Office of International Training, AID, have worked closely with Kansas State University in notifying USAID Missions world-wide of the short course and seeing that participants were "called forward" to attend this course.

Participants for the 1982 Grain Storage and Marketing Short Course included 24 individuals from 15 countries and are as follows:

AFRICA

Botswana	-	Thabiwa Alfred Khiwa
Guinea	-	Lenaud Bangaly
Kenya	-	Allex W. W. Mwangolo

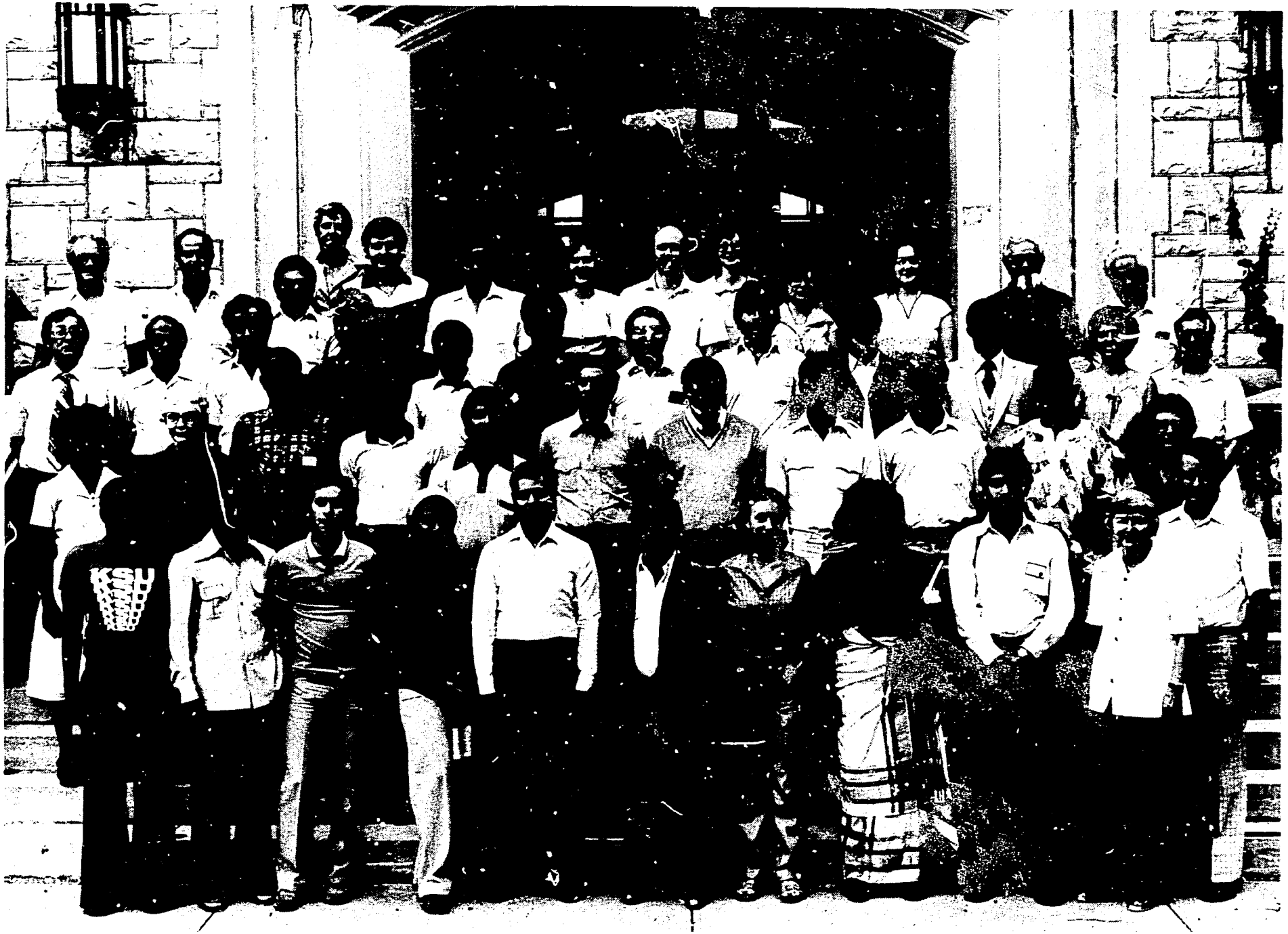
Liberia	-	David Kenkpen
Morocco	-	Jazouane Brahim
	-	Benlahboub Jazduli Hassane
Nigeria	-	Haruna Abubakar
Rwanda	-	Kayinamura Phocas
Togo	-	Kodjovi-Numado H. Ayaovi
	-	Kerim Tchero Bangana
ASIA		
Burma	-	Mynit Win
	-	Nyunt Swe
	-	Tin Tun
	-	Tin Cho Oo
India	-	V. K. Sehgal
Malaysia	-	Ismail Bin Hassan
	-	Manut Haji Yusoff
Philippines	-	Juan B. Jamias, Jr.
Sri Lanka	-	Rajendran Veeraraghavan
LATIN AMERICA		
Paraguay	-	Victor Garay Marecos
	-	Rigoberto Ruiz Diaz Acuna
	-	Miguel Angel Palacios M.
MIDDLE EAST		
Jordan	-	Nabil Ali Al-Saie
	-	Mohamed Abulghanam

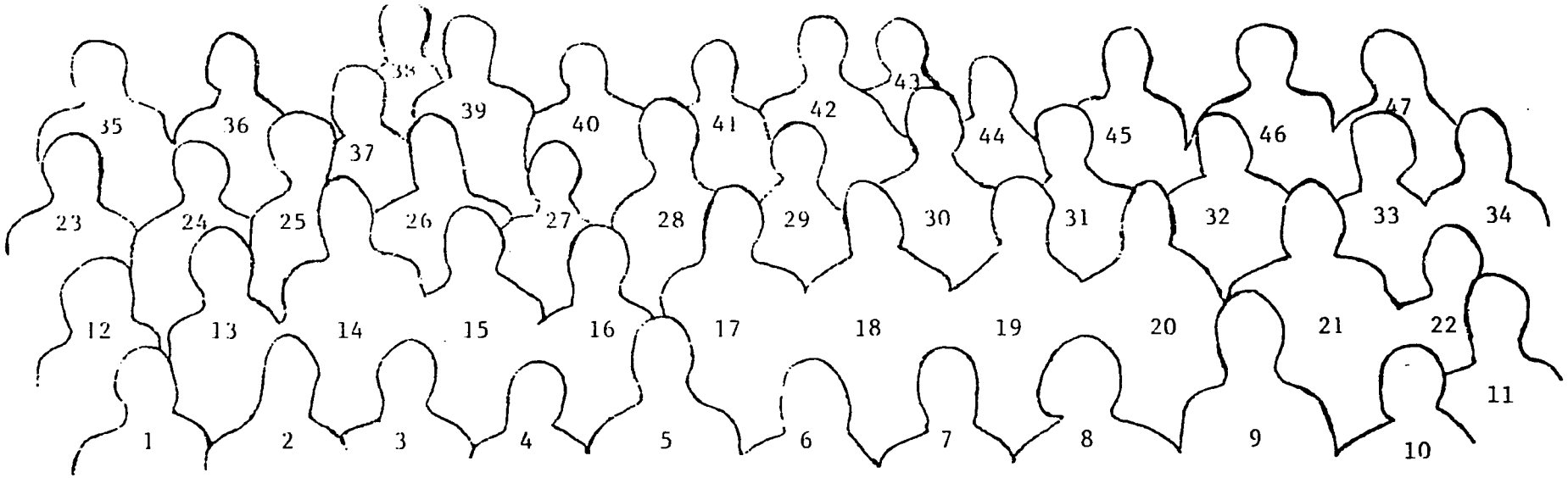
Evaluation and summary of the 1982 Grain Storage and Marketing Short Course will be included in next year's annual report.

C. Short Term On-Campus Training

Tanzania - Peace Corps: The scope of work was received from Peace Corps/ Washington May 26, 1981. Bonita Barger, training consultant for Peace Corps, met with the four Food and Feed Grain Institute staff members assigned to the project July 13-17, 1981 to explain training manual style and the design of technical instruction sessions. A. N. Mphuru, Senior Lecturer in Entomology, University of Dar es Salaam, arrived August 23, 1981 to consult with staff on course content. Returned Peace Corps volunteer (fisheries, Tanzania), Phillip Moershel, and Bonita Barger arrived August 30, 1981. Staff training began August 31 and ended September 8, 1981.

Trainees began arriving September 9, 1981. Nineteen trainees arrived; one was sent home after the first week of training for medical reasons. Assistant desk officer, Susan Payton, visited September 8-12, 1981. Training officer,


KSU



1981 GRAIN STORAGE AND MARKETING SHORT COURSE

June 15 - July 31, 1981

(1) Munyandamutsa Eugène-Rwanda, (2) Syed Rafiqul Alom-Bangladesh, (3) Carlos Ignacio Reyes González-Mexico, (4) Noorma Osman-Malaysia, (5) Miguel Abraham Sánchez-Honduras, (6) Ernest Williams-Sierra Leone, (7) Laura Gelsi-Spanish Interpreter, (8) Martha Nwihim-Nigeria, (9) Rafael Terán P.-Mexico, (10) Alicia Opheim-KSU, (11) Harvey Kiser-KSU, (12) Lucienne Cole-French Interpreter, (13) Francis Ellen Riordan-French Interpreter, (14) Sall Bounama-Senegal, (15) N'Dao Thierno-Senegal, (16) Javier Hernández Sánchez-Mexico, (17) Gil Samuel Puerto-Honduras, (18) Sene Amadou Banda-Senegal, (19) Dia Abdoulaye-Senegal, (20) Ademola Alani Kehinde-Nigeria, (21) Fajuyigbe Daniel Olatunde-Nigeria, (22) Rosemary Burroughs-KSU, (23) Do Sup Chung-KSU, (24) Ekramul Haque-KSU, (25) Adnan Mohammad Odeh-Jordan, (26) Adebayo Adeyinka-Nigeria, (27) Kitujime Simon Mbwilo-Tanzania, (28) Iloga Lazare-Cameroon, (29) Jorge Antonio Reyes-Pacheco-Honduras, (30) León Orellana P.-El Salvador, (31) Joseph Asare Baah-Ghana, (32) Lawrence Olasupo-Nigeria, (33) Valerie Wright-KSU, (34) Cherie Geiser, KSU, (35) Robert Mills-KSU, (36) Manuel Zeledón-Costa Rica, (37) Victor Manuel Martínez P.-El Salvador, (38) Roe Borsdorf-KSU, (39) Jorge Ramírez Ganzález-Mexico, (40) Santiago Espinal Chávez-Honduras, (41) Kathy Foster-KSU, (42) Carl Reed-KSU, (43) Marcia Longberg-KSU, (44) Rose Mary Reese-KSU, (45) Barbara Clark-KSU, (46) John Pedersen-KSU, (47) Ernie Gutierrez-Group Leader.

Fred Rosensweig, visited September 28-30, 1981. Training began September 9, 1981 at 2:00 p.m. with a two-day staging and introduction. It ended with the presentation of certificates on October 16, 1981 at 4:00 p.m. Trainees left Manhattan at 6:30 a.m., October 20, 1981.

FFGI staff members began preparing for the training shortly after the June meetings with Barger. Pre-course preparation included the following:

- studying background materials on Tanzanian life, economy, agriculture, and grain storage.
- culturing insects and molds so that both insects and damaged grain could be used as demonstration material and trainees' samples.
- procuring the standing grain to be used during experimental sessions.
- designing the structures to be built by the trainees.
- drawing plans and writing instructions for the construction materials requisition simulation.
- procuring tools and equipment to construct dryers and cribs.
- contacting outside individuals who assisted with the instruction.
- arranging for meals, lodging, and transport.
- requisitioning rooms for evening and weekend sessions.
- contracting an optometrist.
- compiling, cataloging and registering reserve reading materials.
- gathering and transporting equipment (balances, meters, microscopes, magnifying glasses, grain pans, etc.) for training sessions.
- readying the facilities which were still being constructed and thus, required thorough cleaning as well as the acquisition of furniture, office supplies, room darkening devices, chalkboards, toilet paper, cleaning supplies, etc.
- designing and writing session outlines.
- designing and writing certain supplemental materials, e. g. the technical skills checklist, weekly schedules, and the project overview.

Technical Component Training sessions dealing with grains post-production practices were designed and sequenced to assist the trainee in learning (a) how to recognize damage to grain, (b) how to assess the amount and significance of damage to grain, and (c) how to reduce damage to grain. Trainees were also given the opportunity to improve their information gathering and validating skills and to learn group organizing and motivating, and information transfer techniques. FFGI staff used experimental discovery learning techniques extensively in the technical sessions. Trainee interest and involvement remained high throughout most of the course.

Evaluation Component Each staff member was assigned a group of three or four trainees before training began. This staff member met with each individual during scheduled interviews and was primarily responsible for the maintenance of his/her file. The file contained the trainee's pre-training questionnaire, performance checklist, technical skills checklist, and learning objectives, all of which the trainee himself had completed during staging. Also in the file were work sheet No. 1 (which was filled out by a fellow trainee and listed that person's perception of the trainee's skills, knowledge, experience and interest), all weekly technical evaluations, summaries of interviews, and observations of those behaviors which had significance to the trainee's potential with Peace Corps.

Recommendations for Future Programs

1. The training period should be extended by 2 or 3 days.

2. The budget should include salary and benefits for a full-time, temporary administrative assistant.

3. Several students at this or nearby American universities should be contacted to assist in planning the technical sessions and to supply country-specific information. Honorariums, travel, and per diem should be budgeted for at least one such student from each country for which training is accomplished. These students would replace the host country official.

4. The budget should include salary and benefits for a 0.5 time cross-cultural trainer who would also have primary responsibility for organizing and facilitating the assessment component with the FFGI staff.

5. Evening sessions should be avoided when possible.

6. Less training time should be spent on construction.

7. Individual presentations, oral problem-solving questions and self-check tests should be utilized whenever possible. (This will require more free and unstructured time, especially during the final 2 weeks.) More emphasis should be placed on the design and presentation (by the trainee) of extension-type materials directed at the farmer or field-worker level. The resource manual should be periodically organized by the trainee and checked by the staff to encourage organization and synthesis of knowledge and to produce a more helpful resource tool.

8. The budget should again include salary and benefits for a full-time, temporary Returning Peace Corps Volunteer (RPCV) from one of the countries represented in the training. If possible, arrangements should be made for the RPCV to have access to a vehicle (either from the federal motor pool or rented) for non-recreational after-hours transport of trainees.

9. Innoculation requirements should be received at Kansas State at least 3 weeks before the start of training so that innoculations can be scheduled for early in the training period.

FFGI staff involved in training included: Carl Reed, course coordinator/grain storage specialist; Valerie Wright, storage entomologist; Ekramul Haque, agricultural engineer; and Rosemary Burroughs, mycologist.

Ghana - Following training received in the 1981 Grain Storage and Marketing Short Course and at the request of AID/Washington, International Training Office, Mr. Joseph A. Baah received an additional 5 months' training. The training period covered August 2-December 18, 1981.

The training began with a 3-week study tour which included the State of Kansas food and feed testing laboratory, and three U. S. government laboratories; the district Food and Drug Administration in Kansas City, Missouri; a regulatory and research facility; the Federal Grain Inspection Service headquarters in Kansas City, MO where new inspection techniques are developed; and the Stored Products Insects Research Laboratory in Savannah, Georgia.

Mr. Baah was enrolled in several classes for the fall semester at Kansas State University and the continued training had several components which follow:

1. Enrollment in Quality Assurance of Foods, a laboratory course meeting

two afternoons each week.

2. For 3 weeks he spent 4 hours a day with the entomology technician who maintains the stored product insects rearing and testing rooms learning and practicing insect colony maintenance.

3. Mr. Baah joined the group of Peace Corps Trainees learning the basics of grain storage and loss assessment techniques (September 10 to October 16, 1981). The course provided him opportunity to improve insect identification skills, to inspect many samples of damaged grain, to learn and practice field and storage loss assessment techniques, and to observe the training given to Peace Corps Volunteers.

4. With some staff direction, Mr. Baah planned, set up, conducted and reported a laboratory loss assessment experiment with stored products insects. This 8-week project gave him an opportunity to integrate the skills learned in class. A report was written following this training.

5. Loss assessment questionnaires for farmers and grain dealers, designed by an FFGI specialist, were adapted for Ghana by Mr. Baah. These were taken to Ghana and should serve as a good starting point for developing questionnaires to be used in Ghana's loss assessment program.

6. Mr. Baah did study identification of fungi invading maize and performed the minicolumn analysis for aflatoxin although time was limited because of other activities.

India - At the request of UNESCO/United Nations, 4 weeks of training was given by Dr. Do Sup Chung to Mr. V. K. Sehgal, Assistant Research Engineer. The training was on postharvest grain technology and study of various on-farm storage facilities and review of various on-farm storage facilities in developing countries. The training was begun on May 15 through June 14, 1981.

Mr. Sehgal attended the annual Grain Storage and Marketing Short Course and at its completion, Dr. Chung continued the extra training from August 1 through August 14, 1981.

D. Degree Program Training

Several students are in various stages of progress toward advanced degrees in postharvest grain technology under AID and other international organizations' support. Participants are listed with the area of study included as follows:

1. Grain Science

Dansou Kossou - Benin (formerly Dahomey) (completed)
Muljo Sidik - Indonesia
Carl Reed - Formerly Peace Corps (Costa Rica)
R. D. M. Bediako - Ghana (Crop Protection - undergraduate)
Mboye N'Dir - Senegal (Crop Protection/Storage - undergraduate)
Maria Regina Sartori - Brazil
Manuel Zeledon - Costa Rica
M. Naewbanj - Thailand
S. Abbouda - Sudan

2. Agricultural Economics

Zenaida Toquero - Philippines
Elizabeth Sto. Domingo - Philippines
Esterlina Olan - Philippines
Hahn Koo Lee - Korea
Byung Séo Ryu - Korea
Hipolito Costodio, Jr. - Philippines (completed)
Herminigoldo Montalvo - Philippines (off campus)
Jorge Reyes - Honduras
Rosseni Manolo - Philippines
Abdel Nahsem - Egypt

3. Agricultural Engineering

Kyung K. Park - Korea
Y. K. Lee - Korea
Gabr Abel Moshin - Sudan

4. Entomology

Noorma Osman - Malaysia
Yousif Seifelnasa - Sudan

E. Off-Campus Training

1. Nepal - AIC (Agricultural Inputs Corporation through "Seed Production and Input Storage Project/AID (SPISP 367-0118).

The "Grain and Seed Storage Management Short Course" was conducted in the Khairainitar Training Center near Pokhara, Nepal November 9-19, 1981. Since the training involved storage of seeds, the Seed Technology Laboratory at Mississippi State University was contacted and a joint training program developed between the KSU/AID Cooperative Agreement "Improvement of Postharvest Grain Systems" and Mississippi State's AID Cooperative Agreement.

Drs. John Pedersen, storage entomologist, and Cornelius Hugo, agricultural economist made up the KSU team while Dr. A. H. (Bill) Boyd made up the Mississippi State portion of the team. A training manual was specifically prepared for the course and was supplemented by reprints and other literature dealing with seeds.

Twenty participants took part in the training course and were issued Certificates of Training at the conclusion.

In general, the participant reaction to the course was good. All of the participants considered the course either useful or very useful. The subject material presented in the course was considered "about right" and the level of instruction "about right." About half of those responding considered the length of the course was "too short."

2. Philippines - APO (Asian Productivity Organization), PDC (the Productivity and Development Center of the Philippines) and SEARCA (Southeast Asian Regional Center for Graduate Study and Research in Agriculture)

The Training Course on Postharvest Prevention of Waste and Loss in

Rice was held in Los Baños from November 15 through December 12, 1981. Dr. Valerie Wright, stored product entomologist, assisted in this training.

Dr. Wright gave a 3-hour lecture on the relationship of insects to molds in grain deterioration; gave assistance in laboratory exercises on simple isolation for mold identification; interpretation of plated samples and assistance on insect pest infestation. Representatives of NAPHIRE, NFA, UPLB faculty and SEARCA post-harvest technical team and industry representatives instructed other sessions. There were 30 participants from 13 countries (Burma, Republic of China, Fiji, India, Indonesia, Japan, Korea, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, and Thailand).

In addition, a 2-hour lecture was given to NAPHIRE personnel (20-24 people) on the relationship of insects to molds in grain deterioration.

3. Botswana - BAMB (Botswana Agricultural Marketing Board) and USAID/Gaborone

The "Grain Preservation and Warehouse Management Short Course" was conducted from April 5-14, 1982 in Gaborone at the Institute for Development Management. Trainers included Dr. Cornelius Hugo, agricultural economist; Mr. Carl Reed, grain storage specialist; and Dr. John Pedersen, storage entomologist.

Training was provided for 22 participants who are currently depot managers and coop representatives with the objectives being (1) training in the fundamentals of grain storage management, grain handling, quality preservation and (2) training in fundamentals of warehouse management, inventory control, and principles of management and operations. A training manual was developed for this short course.

4. Upper Volta - OFNACER (Office National des Céréales Ministère du Dèveloppement Rural)

Fifteen participants were chosen by OFNACER to attend the "Trainers Course on Grain Preservation and Storage Management" held in Ouagadougou from May 10 through June 4, 1982. The participants represented each of the 10 warehouse locations (CDG's) plus the central warehouse (CNSAO) and security stocks (DSS). The technical and methodological training followed the 250 page manual prepared specifically for OFNACER and translated to French.

Dr. Valerie Wright, storage product entomologist, assisted by Dr. Dansou Kossou, grain storage specialist/translator, conducted the first portion of the training. Dr. Fred Teague, audio-visual specialist, assisted by Ms. Kathy Foster, translator, conducted the second portion.

In addition to the course content as listed in the proposed training outline: a) students learned procedures and handling of new equipment received from AID by OFNACER; b) emphasis was placed on practical methods of reducing losses in storage; c) checklists were developed specifically for OFNACER's needs in fumigation, inspection, and inventory control; d) sampling and inspection exercises and a fumigation demonstration were held at the central warehouse (CNSAO), the selling warehouse, and the security stock warehouses, respectively, e) specialized course content outlines were developed for potential training sessions, and f) four exams were given to evaluate student comprehension of technical information and training methodologies.

The second half of the course consisted of working intensively in the areas of training methodologies, planning and developing training activities,

and developing and utilizing audiovisual and printed materials in training. Specific topics covered included: introduction to training methods, a model for training grain storage personnel, methods of training, development of a training program, writing of training activities, principles of utilizing audiovisual materials, values of audiovisual materials in training, using slides in training, using overhead transparencies in training, producing slides for use in training, producing overhead transparancies for use in training, and using displays in training.

Student progress was evaluated by four examinations equally spaced throughout the training. At the conclusion of the course, participants were asked to rate the potential value of each topic and major activity to them as trainers of other warehouse managers in their regions. Most activities and topics were rated high, indicating that the participants tended to regard all course activities as being potentially of high value to them. More significantly, the participants rated the training program and development activities as being of greatest importance to them.

Also rated high in value by the participants were several activities and topics both in the technical information and in the training areas. These included: moisture content, insect identification, damage caused by insects, warehouse inspection, housekeeping, grain sampling and inspection, insecticides, fumigation, methods of training, writing of training activities, values of audiovisual materials in training, and producing overhead transparencies for use in training.

The evaluations given by the participants, as well as observations made by the team that conducted the short course, indicated that intensive training can improve the functioning of warehouse managers in Upper Volta and that selected managers can be used appropriately as trainers of their associates. Such an approach takes advantage of basic knowledge of how changes and improvements are most apt to occur in such organizations and establishes a framework in which improvement can be stimulated from within the organization rather than from external influences. More importantly, it places agents for change and advocates for improvement within the managerial ranks of the organization. This may well prove to be the most significant and long-lasting outcome of this "training of trainers" short course.

F. Training Facility

Completion of training facilities has been delayed due to the need to relocate the facilities from current site. Such relocation has come about due to changes in University plans for the land on which the training facility is currently located. A new location has been secured and approved and facility will be relocated during calendar year 1983.

IV. LABORATORY AND DEVELOPMENTAL SERVICES

This section of the annual report is devoted to describing activities under Cooperative Agreement AID/DSAN-CA-0256 that are rather broad in scope and not specifically directed to any one USAID Mission or host country. It includes activities that may have application and utilization in many host countries by USAID Missions such as: (1) developmental services, (2) development of slide series, (3) preparation of Grain Storage and Marketing manuals, and (4) linkages with other U. S. and foreign technical assistance programs.

A. Developmental Services

1. System for Assessment of Post-Production Losses of Rice Under Alternative Marketing Patterns

Work is nearing completion on this study. The objectives are: (1) To determine the range of alternative technologies currently available in rice harvesting, handling, threshing, cleaning and drying in the study area; (2) To determine the nature, patterns, magnitudes and causes of losses under various systems of post-production technology and management; (3) To isolate and measure factors that explain the choice of technology in rice post-production systems; and (4) To define the policy implications of the findings.

2. Feed Processing Plant Design and Analysis for Developing Countries

Work is nearing completion on this study with the objective of developing a computer model of optimum feed mill design.

3. An Investigation of the Accuracy of Two Postharvest Grain Loss Assessment Methods (formerly Loss Assessment Techniques on Various Types of Cereal Grains)

This research is completed and an abstract of the thesis follows:

The accuracies of two postharvest grain loss assessment methods were investigated. Weevils, from a Mexican strain of Sitophilus zeamais (Mots.), were used to provide 6 levels of infestation in 4 types of grain: yellow dent maize, rough rice, red sorghum and hard red winter wheat. The weevils were unable to oviposit in the rough rice and no useful data was obtained.

The Count and Weigh Method and the Standard Volume/Weight Method were used to estimate weight losses caused by one generation of insects. Observed (actual) weight losses (up to 9.1%) were measured accurately by weighing, measuring the moisture content, and converting to dry matter weight loss. The estimates and observed weight losses were compared using Duncan's multiple range test, a general linear models procedure from SAS, and a one-tailed F test.

The Count and Weigh Method estimated weight loss higher than was observed in maize. The estimated loss was very close to the observed weight loss in sorghum, but in wheat it was slightly less than that for observed weight loss. Using the one-tailed F test, the Count and Weigh Method accurately estimated loss at the 5% level of significance for sorghum and wheat only.

The Standard Volume/Weight Method underestimated loss in maize. In sorghum the method overestimated at the lower levels of loss and underestimated slightly at the higher levels of loss. In wheat the method consistently underestimated weight loss. The one-tailed F test indicated the Standard Volume/Weight Method accurately estimated weight loss at the 5% level of significance for maize and sorghum.

In another experiment using only wheat, maize weevils were allowed to oviposit for 5 days, and once a week for 5 weeks three different jars of wheat were removed from store. The observed weight losses were calculated and losses estimated using the Count and Weigh Method and the Standard Volume/Weight Metho Neither method accurately estimated the observed weight loss during the first generation of infestation.

Authors include Mr. Steven M. Graham and Dr. John R. Pedersen.

4. Alternative Food Grain Stability Programs for Central Asian Countries

Work continues on this research. The objective is to determine how a national and regional food grain reserve system would have worked to stabilize supply quantities within a 3-percent deviation band from long term trends in each of the six countries of the study area over the period from 1961 to 1981.

5. The Effect of Insects' Interaction on Stored Milled Rice and Its Basic Model of Structure

Work is nearing completion on this study. The main objective is to assess the effect of insect interaction on simulated bag storage and to implement a mathematical model to predict the pattern of population growth of each species.

6. Post-Production Loss Assessment Methodology

Work continues on this research. The main objective is to define accuracy and precision of methods used to assess losses due to insects in storage.

7. Effect of Controlled Atmosphere Storage on Preservation of Quality in Dry Beans (Phaseolus vulgaris L.)

This study continues with the main objective being to evaluate the influence of nitrogen on flavor, cooking quality and seed coat color.

8. Simulation of Regional Security Reserves to Serve the Republic of East Asia and the Oceania

The objective of this study is to determine how a national and regional food grain reserve system would have worked to stabilize supply quantities within a 3-percent deviation band from long term trends in each of the 11 countries of the study area over the period from 1961 to 1979. This study should be completed in the fall of 1982.

9. Factors Affecting The Storage of Pearl Millet (Pennisetum americanum [L.] Leeke)

This research has been completed and an abstract of the dissertation follows:

Factors affecting the storability of pearl millet (Pennisetum americanum [L.] Leeke) lines were assessed in studies of resistance to stored product insects, pericarp structure by scanning electron microscopy (SEM) and moisture content/relative humidity equilibria. Experiments were conducted with two major internal feeders, Sitotroga cerealella (Oliv.) and Sitophilus oryzae (L.), and an external feeder, Tribolium castaneum (Herbst).

Development of S. cerealella in single kernels of millet, sorghum, wheat and corn were compared over two generations. The largest moths were produced in corn and the smallest in millet regardless of sex or generation, with no consistent differences noted in moths obtained from wheat and sorghum. Eggs from females reared in millet were fewer, smaller and had lower hatchability than eggs from females reared in other grains. Loss caused over two generations was ranked corn > wheat > sorghum > millet and was correlated ($P < 0.01$) to body weight of emerged moths for all grains, except millet. Body and wing lengths were related to initial kernel weight of millet and wheat but not to that of sorghum or corn.

Susceptibility of twelve millet lines was assessed by infesting threshed and in-head samples with S. cerealella, S. oryzae and T. castaneum for two months. Major differences in susceptibility were dependent upon the form of storage and attacking insect. S. oryzae was the most destructive in both forms of storage and produced 1.5 times more offspring in threshed grain than in-head millet. Emergence and/or feeding sites on the damaged kernels were either in the endosperm (89.4%) or at the tip cap (10.6%). Reproduction of S. cerealella was 10.4% greater in-head than in threshed samples, with exit holes limited to the exposed crown. In threshed grain 52.5% of emergence holes were in the tip cap and 47.5% in the crown. T. castaneum did not multiply successfully in either form of millet storage.

Selected millet lines were compared for the effect of attached glumes and kernel aggregates on insect infestation. Attached glumes caused female weevils to oviposit over the endosperm instead of the preferred germ area and progeny numbers decreased slightly.

S. cerealella larvae survival was enhanced by presence of glumes on kernels and an apparently resistant line became susceptible. Artificial aggregates of glume-attached and glume-free kernels, simulating the effect of moth larvae webbing, increased weevil progeny and moth larvae survival. In a resistant line weevil progeny increased 12-fold when kernels were aggregated, there was no additive effect of attached glumes. S. cerealella increased 6-fold in aggregated glume-attached kernels.

SEM micrographs showed pericarp structural differences among lines which influenced resistance to internal feeders. Surface texture had a distinguishable effect on S. oryzae; more eggs were deposited on smooth-seeded lines than on rough ones. Smooth-seed lines with loose layer arrangement were more susceptible to weevil infestation than smooth lines with compact pericarp

The moisture content/relative humidity equilibria of four lines were compared. Adsorption isotherms were not represented by a single curve; however, no differences ($P < 0.05$) were found in desorption curves. At 70% R.H., maximum adsorption equilibrium moisture contents (EMC) for all samples were 13.5, 13.4 and 13.0% at 15°, 25° and 40°C, respectively; and maximum desorption EMC's were 15.8, 14.5 and 14.0%. In a selected line the adsorption EMC of small seeds was 0.09% higher than that of large seeds at 70% R.H. and 25°C. Small seeds contained less crude fat and more protein, ash and crude fiber than large.

Dr. Kossou Kohounko Dansou and Dr. John R. Pedersen were authors of this research.

10. Optimum Systems of Rough Rice Handling, Drying and Storage

This work is completed and an abstract of the thesis follows:

The objectives of this study were: (1) to develop a mass transfer coefficient for natural air drying of rough rice as a function of drying parameters, (2) to develop a mathematical model and model systems for rough rice handling, drying and storage systems, (3) to develop a new approach for design of optimum systems by MODM method, and (4) to develop the optimum systems for various farm sizes.

To accomplish the first objective, rice drying tests of long grain were conducted under the controlled natural air drying conditions. Three levels of drying parameters which were drying air temperature, relative humidity and airflow rate were tested in the experiments. Then, mass transfer coefficients were evaluated from the results of the drying test, and a function was developed for mass transfer coefficient by multiple regression analysis. After evaluation of mass transfer coefficient, the results of drying tests were compared with simulation results in the simulation program which was RICEDRY modified from KSUDRYER (Maurer, 1977). Then, the compared results were analyzed statistically, and there was not a significant difference between the test results and the simulation results.

For the second objective, systems analyses of rough rice handling, drying and storage were performed. This analysis included four receiving systems, two loading or elevating systems, and six drying and storage systems. Catalogs of grain conditioning and storage equipment, and facility planning manuals were collected from manufacturers and carefully studied. Then model systems were developed for grain drying, storage, receiving, elevating, and unloading. They consisted of number of systems, subsystem, number of subsystems and considerations of energy and grain damage. Also, a mathematical model was developed, which included price model, energy model, grain damage model, and general multiple objective problem. In this modeling, list prices obtained from manufacturers were incorporated into the price model. The general multiple objective problem was formulated to design the optimum systems with multiple conflicting objectives and system constraints.

To fill the third objective, nonlinear goal programming was introduced and the multiple objective design problem was formulated for this method. Then, NEWINGP program was used to solve the nonlinear goal programming problems, which was developed by Hwang and Paidy (1979) at Kansas State University.

Finally, optimum systems for various levels of farm size were developed by an example problem and model sensitivity analysis. The model application procedures were developed and tested by a large example problem including six drying methods and two handling systems. The model developed was used to formulate the system design problem for example, and sensitivity analysis was conducted for the changes of harvest volume and the priority level of objective function for drying and storage systems.

Authors include Dr. Dong Il Chang and Dr. Do Sup Chung.

11. Natural Convection Heat Transfer in Stored Milo

The objectives of the study were: (1) to determine if convective heat transfer occurs in stored milo by observing the changes in temperature, moisture, and quality of milo stored outdorrs in cylindrical steel bins; and (2) to develop two mathematical models to simulate temperatures and moisture contents of unventilated stored milo based on partial differential equations of heat and mass transfer.

Milo at two different initial moisture contents (16.2% (w.b.) and 14.7% (w.b.) respectively) was stored in four cylindrical steel bins. All bins have the same height of 50 inches, but two of them are 56 inches in diameter while the others are 30 inches in diameter. Temperature and moisture measurements of milo stored for a complete cycle of one year were collected. Data for mold infection was also collected to evaluate grain quality as affected by moisture translocation.

Two mathematical models are going to be developed to simulate temperatures and moisture contents of unventilated stored milo based on partial differential equations of heat and mass transfer.

This work is being conducted by Mr. Sirelkhatim Abbouda under the guidance of Dr. Do Sup Chung and is being supported by the Government of Sudan.

12. Postharvest Deterioration of Rough Rice, Milled Rice and Brown Rice

Rice grain deterioration during postharvest storage often results in economic losses. A study to determine the safe storage time prior to drying rice grains to moisture level safe for storage, therefore, offers an alternative to solving storage losses. The rate at which stored rough rice deteriorates largely depends on the initial condition of rice (moisture content, degree of mechanical damage, and amount of impurities) and of the environmental condition of storage (temperature and moisture migration during storage).

The deterioration rate of rough rice was monitored by measuring the amount of CO_2 evolved during storage and was translated to dry matter loss (DML) in grains. CO_2 measurement was based on the assumption that the rate of deterioration is proportional to the number of thriving microorganisms in grain during storage. This study aims to formulate an empirical equation for predicting the safe storage time for rough rice of different moisture content, degree of mechanical damage, and storage temperature and also, to establish a possible chemical index for assessing the degree of deterioration of rough rice.

The DML of rough rice samples with 16, 18, and 20% moisture content stored at 95°, 85°, 75° or 65°F was measured using the procedure of Steele et al. (1969). Regression equations obtained for rice stored at conditions studied indicated that the rate of rice deterioration (measured as % DML) is an exponential function of storage time. Visual inspection of stored samples showed evident mold growth at 0.1 and 0.2% DML. Quality evaluation of milled rice will also be done to correlate the monitoring system used in this study. An experiment on the effect of the degree of mechanical damage on the rate of rice deterioration is still going on. High correlation (0.98) between ergosterol (a predominant sterol component of most mold) and % DML in stored grain was obtained

This work is being conducted by Mr. Maitri Naewbanij with guidance of Drs. Paul A. Seib and Do Sup Chung. It is being supported by IDRC and the AID Cooperative Agreement.

13. Static Pressure Drop in a Fixed Bed of Grain Sorghum as Affected by Grain Moisture Content and Fines

The objectives of the study were (1) to study the effect of moisture content, and broken and fine materials on airflow resistance in a grain sorghum bed; and (2) to develop a model that will predict the effects of moisture content and fine material on airflow resistance.

Ten levels of airflow rate ranging from 0.025 to 0.19 m/s, five levels of moisture content ranging from 12 to 18.5%, and four levels of fine material (0, 2, 4 and 8%) were investigated. All the experiments were completed, and results are being analyzed.

This work is being conducted by Mr. Gabir Abdelmoshin under the guidance of Dr. Do Sup Chung. It is being supported by the Government of Sudan.

14. Computerized System for Feasible Agribusiness Development

This work continues with the objective being to provide a rigorous computerized system of analysis suitable for application to developing country conditions.

B. Slide File

As each of the teams under Cooperative Agreement AID/DSAN-CA-0256 work in the field, we continue to build our colored slides file. These slides show grain storage, processing and marketing situations. The slides have been used extensively in training sessions conducted at Kansas State University, both in the AID Grain Storage and Marketing Short Courses held in 1970 through 1972, 1974, 1975 through 1981, and in discussing grain storage and marketing with visitors and students under USAID sponsorship. Also, these slides are used in teaching off-campus training programs.

As the slide file continues to build, we plan to prepare series of slides with either taped or printed narratives on various aspects of storage and marketing that can be distributed to USAID Missions for use in self-training programs.

C. Preparation of Grain Storage and Marketing Manuals

Training Manuals

1. The short course presented in Nepal November 9-19, 1981 required the development of a training manual which was titled, "Grain and Seed Storage Management Short Course."

2. A manual titled "Botswana Grain Preservation and Storage Management Short Course" was developed for the course given at the Institute for Development Management April 5-16, 1982 in Gaborone.

3. The Upper Volta short course required the development of a 250 page manual prepared specifically for OFNACER and translated into French. The manual titled "Trainers Course on Grain Preservation and Storage Management" was used in the training held in Ouagadougou from May 10 through June 4, 1982. Simultaneous translation was given during the course for OFNACER participants.

4. Work continues on a manual with grain standardization and grading systems for developing countries by staff of the Grain Science Department/Food and Feed Grain Institute.

D. Other U. S. and Foreign Technical Assistance

1. Port of Spain, Trinidad

Dr. Robert Julian, coordinator and Dr. Ronald Echandi, consultant from Costa Rica, traveled to Trinidad from July 19-24, 1981 to participate in the First Consultative Meeting on Postharvest Losses in the Caribbean. Dr. Robert Morris, project manager AID/Washington, also attended. The purposes of the meeting were:

- Review, on an island-by-island basis, the general extent and magnitude of postharvest losses in perishable crops.
- Analyze the causes, as far as known, of postharvest losses and review the extent to which each contributes to the total problem.
- Discuss programs or projects in progress directed toward controlling postharvest losses.
- Review methods and systems for reducing postharvest losses in relation to their applicability in the Caribbean.
- Identify priorities for action programs, review resources available or required to implement the programs, and make recommendations for future activities.

All perishable crops grown in the Caribbean whether for local consumption or for export, were considered in a general sense during the meeting. The purpose was not to review postharvest losses in relation to specific crop situations, however.

The countries or islands represented were: Antigua, Bahamas, Barbados, Dominica, Dominican Republic, Guyana, Jamaica, Montserrat, Nevis, St. Kitts, Saint Lucia, St. Vincent and Trinidad and Tobago.

Dr. Julian made a 10 minute presentation and described the functions and activities of FFGI in the international area of developing countries.

V. ADDITIONAL ACTIVITIES

A. Conferences and Seminars

As a means of keeping current in the latest developments related to grain storage, marketing and agri-business development, staff members attend and participate in conferences, seminars and workshops.

1. Short Course Tour. July 1981.

Dr. John Pedersen, grain storage entomologist; Dr. Harvey Kiser, agricultural economist; Dr. Do Sup Chung, agricultural engineer; Dr. Paul Seib, cereal chemist; Ms. Kathy Foster, French interpreter and Ms. Alicia Opheim, Spanish interpreter conducted this tour for 28 participants from 14 countries who attended the annual Grain Storage and Marketing Short Course. The students studied storage, processing, marketing and transportation at various sites located in the Kansas City area, Arkansas and Louisiana.

2. American Society of Animal Science. Raleigh, North Carolina, July 1981.

Dr. Valerie Wright, entomologist, attended this annual meeting and presented a paper entitled "Feeding Value of Insect and Fungal Damaged Sorghum Grains for Lambs."

3. American Association of Agricultural Economists. Clemson, South Carolina, July 1981.

Dr. Richard Phillips, agricultural economist, attended this annual meeting and assisted in the awards program.

4. "Online '81" Conference. Dallas, Texas, November 1981.

Cherie Geiser, PHDS coordinator, attended meetings on agricultural information which included computer-based information services for agriculture, networking agriculture information and Fast Agriculture Communications Terminal System. She also worked with Paulette George as follow up on PIP's project which Ms. Geiser helped to develop the past year.

5. Entomological Society of America. San Diego, California, December 1981.

Dr. Valerie Wright, entomologist, attended the roundtable discussions and workshops on stored product entomology.

6. Pre-short Course Travel. April/May 1982.

Dr. Roe Borsdorf, agricultural economist, and Dr. Ekramul Haque, agricultural engineer, traveled to Little Rock, Arkansas and Tulsa, Oklahoma to set up sites for the annual Grain Storage and Marketing Short Course Tour to be held in July 1982.

10. Association of Operative Millers. Atlanta, Georgia, May 1982.

Dr. John Pedersen, grain storage entomologist, attended the Technical Workshops and served as a member of the Food Protection Committee.

2. Manila, Philippines

Dr. Paul Seib traveled to the Philippines October 9-18, 1981 to attend the GASGA Seminar, "Paddy Deterioration in the Humid Tropics." He presented a paper entitled "Paddy Loss to Microorganisms." An abstract of the paper follows:

The spoilage of rice by fungi will be reviewed. The rate of mold growth due to the natural inoculum on paddy is controlled primarily by moisture (water activity), temperature, condition of grain, and storage atmosphere. The degree of fungal damage has been assessed by grain grade, microbiological planting, titratable acidity, evolution of carbon dioxide, ergosterol, and mycotoxins. The basis of each method will be discussed along with their advantages and disadvantages. To discourage fungal damage of paddy, the following precautions must be taken: Calibrate moisture meters, minimize threshing damage, clean the grain well, dry to 13-14% moisture, control insects, and store under uniform temperature.

3. Andhra Pradesh, India

Dr. Do Sup Chung traveled to India November 1-7, 1981 to attend the ICRISAT/INTSORMIL (Title XII)/ICAR Symposium "Sorghum in the 80's." He presented a paper on the topic of "Post-Harvest Technology." This travel was not funded under the Cooperative Agreement.

4. Singapore/Philippines

Dr. Charles Deyoe traveled to Singapore/Philippines June 18-23, 1982 to attend the Policy Advisory Board meetings (SEARCA) in Singapore. As follow up to the meetings, he traveled to Manila to visit with Norman Teter, KSU's Technical Team Member at SEARCA.

5. Nairobi, Kenya

Dr. John Pedersen and Mrs. Rosemary Burroughs gave additional technical assistance to Gary Lewis, USAID/Nairobi through the African Desk, AID/Washington, D. C. This assistance was for the On-Farm Grain Storage Project and included drawings of labs/equipment catalogue/recommendations for lab/office building. The assistance began in late December 1981 and carried through January 1982.

B. Reports

A report is prepared for each overseas technical assistance assignment which KSU completes under an AID contract/agreement. The following reports were completed under Contract AID/csd-1588: Food Grain Drying, Storage, Handling and Transportation Report Series.

TECHNICAL ASSISTANCE REPORTS

*No. 1 Rice Drying Technology and Equipment Which Might be Applicable to Tropical Developing Countries. June 1968. Prepared by Dr. T. O. Hodges.

*No. 2 Brief Description for a Corn Handling Facility in Tropical Areas. June 1968. Prepared by Dr. T. O. Hodges and Dr. Harry B. Pfost.

*No. 3 Structural Requirements of Grain Bins. July 1968. Prepared by Dr. T. O. Hodges.

*No. 4 Report on Food Grain Storage, Marketing, Handling and Transportation in Jordan. July 1968. Prepared by John R. Pedersen.

*No. 4a Photographic Supplement, Food Grain Storage, Handling and Transportation in Jordan. July 1968. Prepared by John R. Pedersen.

*No. 5 A Proposal to Equip Metal Silos in Jordan with Aeration and Temperature Monitoring Equipment. August 1968. Prepared by John R. Pedersen.

*No. 6 Review of Grain Storage, Handling, Processing and Distribution Problems and Proposals in the Republic of Korea. September 1968. Prepared by Alden A. Ackels, Dr. P. Gormely and Martin Keck.

*No. 7 Assessment of Food Grain Storage Facilities, West Pakistan - 1968. October 1968. Prepared by Dr. T. Leo Wendling.

*No. 8 Implementation of Grain Storage Operations, Marketing Services and Price Stabilization in Honduras. October 1968. Prepared by John H. McCoy and Dwight S. Tolle.

*No. 9 Annual Report - 1967-1968 (November 1968).

*No. 10 Review of Grain Storage Handling and Distribution - Morocco 1969. April 1969. Prepared by Alden A. Ackels and John R. Pedersen.

*No. 11 Report on Grain Sanitation Workshop - July 7-12, 1969. Central Food Technological Research Institute, Mysore, India. July 1969. Prepared by John R. Pedersen.

*No. 12 Annual Report - 1968-1969.

*No. 13 Observations and Recommendations Concerning the Corn Marketing System in Guatemala. August 1969. Prepared by L. Orlo Sorenson.

*Denotes publication out of print.

*No. 14 An Analysis of Grain Storage and Price Stabilization Problems in El Salvador. September 1969. Prepared by John McCoy and Floyd Niernberger.

*No. 15 Review of Elevator Project in Honduras. October 1969. Prepared by Dr. Harry B. Pfost.

*No. 16 A Review of Rice Drying and Storage Problems in Ecuador. January 1970. Prepared by L. Orlo Sorenson.

*No. 17 Cereal and Dry Edible Bean Marketing and Warehousing in the States of Piaui and Paraiba, Brazil. February 1970. Prepared by Dwight S. Tolle.

*No. 17a Warehousing and Marketing Cereal and Beans in the State of Piaui, Brazil. February 1970. Prepared by Dwight S. Tolle.

*No. 17b Warehousing and Marketing Cereal and Beans in the State of Paraiba, Brazil. February 1970. Prepared by Dwight S. Tolle.

No. 18 Annual Report - 1969-1970.

*No. 20 Observations and Recommendations for Improving Grain Storage and Marketing in Colombia. December 1970. Prepared by Dr. Richard Phillips and Dr. Harry B. Pfost.

*No. 21 A Study and Plan for Regional Grain Stabilization in West Africa. December 1970. Prepared by Alden A. Ackels, Donald E. Anderson, George Brinkman and L. Orlo Sorenson.

*No. 22 Observations and Recommendations for Improving Grain Storage and Marketing in Bolivia. May 1971. Prepared by Dr. Floyd Niernberger and Dr. Harry B. Pfost.

No. 23 Annual Report - 1970-1971.

*No. 24 Recommendations for FECOAGROH Grain Storage and Handling Facilities in Honduras. July 1971. Prepared by Elwyn S. Holmes.

No. 25 Observations and Recommendations for Construction of Feed Mills in Senegal, Mali and Mauritania. August 1971. Dr. Harry B. Pfost.

*No. 27 Observations and Review of Regional Grain Storage and Purchasing Facilities in Guatemala. September 1971. Prepared by Dr. Do Sup Chung.

*No. 28 Improved Grain Marketing in Panama During the Decade Ahead. October 1971. Prepared by Dr. Richard Phillips.

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*No. 30 Tour of Some U. S. Grain Storage Facilities for Entente Fund Officials. May 1972. Prepared by Dr. Do Sup Chung.

*No. 31 Progress Report on Development of a Simple Storage Unit and Method Applicable to Humid Areas. June 1972. Prepared by Dr. Do Sup Chung.

No. 32 An Evaluation of INDECA's Role in the Guatemala Rural Development Program (Loan Paper Compliance and Organizational Efforts). February 1972. Prepared by James W. Lemley.

No. 33 Supply and Demand Projections for Food Grains in Ethiopia, 1970-1980. December 1972. Prepared by Mr. Fekadu Ebba and Dr. Richard Phillips.

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*No. 35 Review of Economics and Engineering Study - Rice Storage, Handling and Marketing. The Republic of Indonesia. March 1973. Prepared by Dr. Harry B. Pfost, Dr. Richard Phillips, Dr. Do Sup Chung and John R. Pedersen.

No. 36 Needs and Opportunities for Improved Grain Marketing in Panama. Executive Digest. March 1973. Prepared by Dr. Richard Phillips.

*No. 37 Research Report - Development of a Simple Grain Storage Unit and Method Applicable to Humid Areas. I. Laboratory Testing for Small Scale On-farm Drying and Storage. March 1973. Prepared by Dr. Do Sup Chung and Louis F. Fleske.

No. 38 Recommendations for Technical and Managerial Assistance - Rice Modernization Project - Guyana. May 1973. Prepared by Alden A. Ackels.

No. 39 Priorities for Improving Grain Marketing in Indonesia. May 1973. Prepared by Dr. Richard Phillips and Dr. Do Sup Chung.

*No. 40 Report on the Storage of Imported Corn in Indonesia. May 1973. Prepared by Dr. Richard Phillips and Dr. Do Sup Chung.

No. 41 Survey of the Quality of Imported Corn Stored in East Java, Indonesia--(Supplement to Report 40 - June 1973). July 1973. Prepared by Dr. Do Sup Chung and John W. Logan.

No. 42 Study of Grain Storage and Marketing in Bolivia. September 1973. Prepared by Dr. Harry B. Pfost and Dr. Floyd F. Niernberger.

No. 43 Grain Marketing and Market System Development in Haiti. December 1973. Prepared by Dr. L. Orlo Sorenson and Dr. Do Sup Chung.

No. 44 Evaluation of the Grain Management Program Simulation Model--Being Developed for Korea by Michigan State University--Contract AID/csd-2975. February 1974. Prepared by Dr. Richard Phillips and Dr. Paul L. Kelley.

No. 45 Implicit Exchange Rate Criterion Applied to Policies Regarding Foreign Investment in Korea. February 1974. Prepared by Jung Je Joe and Dr. Richard Phillips.

Due to a change in contract, the following reports were completed under Contract AID/ta-C-1162 (Formerly AID/csd-1588); Grain Storage, Processing and Marketing Report Series:

No. 46 Recommendations for Improving Philippine Grain Marketing and Price Stabilization Programs. May 1974. Prepared by Dr. Richard Phillips.

* No 47 Study of the Tunisian Grain Marketing System. August 1974. Prepared by Dr. Harry B. Pfost, Dr. Reynold Dahl, William Thornburrow and Kenneth Steinke.

No. 48 Recommendations for Drying and Storage of Grain in Peru. December 1974. Prepared by Dr. Norton C. Ives.

No. 49 Review and Recommendations for On-farm Grain Storage in Tanzania. May 1975. Prepared by Dr. Do Sup Chung.

No. 50 Evaluation and Cost Estimates for Grain Unloading, Storage and Distribution Facilities in Egypt. May 1975. Prepared by Donald S. Jack.

No. 51 Maize Marketing in Zaire. July 1975. Prepared by Dr. L. Orlo Sorenson, John R. Pedersen and Dr. Norton C. Ives.

No. 52 Farm Storage and Handling of Rice, Corn and Soybeans in the Guayas River Basin of Ecuador. July 1975. Prepared by Elwyn S. Holmes.

No. 53 Evaluation of the Current Position of Agricultural Development and Diversification Program as Pertaining to Soybeans. July 1975. Prepared by Don F. Shimon.

No. 54 Recommendations for Grain Storage and Preservation in Senegal. November 1975. Prepared by John R. Pedersen, William P. Spencer and Donald L. Pfost.

No. 55 Grain Storage and Handling Facilities in Panama and Evaluation: Proposed Agricultural Marketing Capital Assistance Programs. March-April 1975. Prepared by Dr. Roe Borsdorf.

No. 56 Review of Existing Proposal for Rice and Corn Drying and Storage Facilities in Ecuador. March 1975. Prepared by Dr. Do Sup Chung.

No. 57 Assessment of Grain Storage and Marketing Facilities in the Dominican Republic. March-April 1976. Prepared by Dr. Harry B. Pfost, Donald S. Jack and Cornelius Hugo.

No. 58 An Assessment of Agricultural Marketing Needs of the Soybean and Grains Sector in Ecuador. April 1976. Prepared by Dr. Roe Borsdorf and Dr. Walter G. Heid, Jr.

No. 59 Bangladesh Food Grain Storage and Stock Management Study. July 1976. Prepared by Dr. L. Orlo Sorenson and Dr. Do Sup Chung.

No. 60 Annual Report 1975-1976.

No. 61 Evaluation of the Market System and Potential for Agricultural Products in Paraguay. September 1976. Prepared by Dr. Richard Phillips and Dr. Roe Borsdorf.

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No. 68 Agricultural Marketing, Transportation, and Storage in Central Tunisia. July 1978. Prepared by Dr. Reynold Dahl.

No. 69 Korea Report (In Press).

*No. 70 Future Supply Potentials and Facility Requirements Government Sector of the Sri Lanka Rice Industry. January/September 1978. Prepared by Dr. Roe Borsdorf and Cornelius Hugo.

No. 71 Marketing, Transportation and Storage of Domestic and Imported Wheat in Bolivia. March 1978. Prepared by Dr. Harry B. Pfost and Dr. Reynold Dahl.

No. 72 Smallholder Grain Storage in Kenya: Problems and Proposed Solutions. February 1978. Prepared by Dr. Dale Anderson and Dr. Donald Pfost.

No. 73 Grain Storage Problems and Needs in Lesotho and Botswana. June 1978. Prepared by Dr. Dale Anderson and Donald Jack.

No. 74 Recommendations for Implementation of an In-Country Training Program for Grain Storage and Preservation in Senegal. June 1978. Prepared by Dr. John R. Pedersen and Ken Steinke. (In Press).

No. 75 Support Recommendations for Honduran Grain Marketing Policies and Programs. January 1979. Prepared by Dr. Richard Phillips, Dr. Dale Anderson, and Dr. Harry B. Pfost.

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No. 82 Feasibility Study of Converting the Bagged Grain Storage and Handling System for a Low-Cost Extrusion and Cooking Plant in San Jose, Costa Rica and Post-Harvest Soybean System Assessment. December 1979. Prepared by Dr. Harvey L. Kiser and Dr. Ekramul Haque. (In Press)

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*No. 1 Progress Report on Development of a Simple Storage Unit and Method Applicable to Humid Areas. June 1972. Prepared by Dr. Do Sup Chung. (Technical Assistance Report No. 31).

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SPECIAL REPORTS

No. 1 Building Viable Food Chains in the Developing Countries. August 1973. Prepared by Dr. Richard Phillips and Dr. Samuel G. Unger.

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*No. 3 Status of Grain Storage in Developing Countries. October 1974, Revised July 1975. Prepared by John R. Pedersen.

*No. 4 Losses Which Occur During Harvesting and Storage of Grains: A Bibliography. July 1976. Prepared by A. N. Mphuru.

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Annual Report 1980-81. (In Press)

Annual Report 1981-82. (In Press)

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