

PN-ANN-991

ISN 32774

931-0786

IMPROVEMENT OF POSTHARVEST GRAIN SYSTEMS

Grain Storage, Processing and Marketing



**KANSAS
STATE
UNIVERSITY**

**FOOD & FEED GRAIN INSTITUTE
MANHATTAN, KANSAS 66506**

ANNUAL REPORT

1980-1981

ANNUAL REPORT

Review of Activities
July 1, 1980 through June 30, 1981

Prepared for the

AGENCY FOR INTERNATIONAL DEVELOPMENT
UNITED STATES DEPARTMENT OF STATE

AID/ta-C-1162

Technical Assistance in Grain Storage, Processing, and Marketing
and Agri-business Development

and

Cooperative Agreement 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

TECHNICAL ASSISTANCE IN GRAIN STORAGE, PROCESSING, AND MARKETING AND AGRIBUSINESS DEVELOPMENT

AID/ta-C-1162
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 major portion of FY 1981 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 (PDS), 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.

REVIEW OF ACTIVITIES
July 1, 1980 through June 30, 1981

The following review summarizes KSU's activities during the first four (4) months of 1981 of its Contract, AID/ta-C-1162, which provided technical assistance in grain storage, processing, and marketing and agribusiness development in developing countries. The remaining eight (8) months of activities of the fiscal year were under Cooperative Agreement AID/DSAN-CA-0256 entitled "Improvement of Postharvest Grain Systems."

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

A. Technical Services Performed

AFRICA - Senegal - September/October 1980

Nature of Activity Upon request of USAID/Dakar and the officials of ONCAD (Office National de Cooperation et d'Assistance pour le Developpement), a five member team consisting of Dr. John Pedersen, storage entomologist; Ms. Kathy Foster, linguist; Dansou Kossou, assisting in translating; Dr. T. O. Thatcher, entomologist; and Dr. Fred Teague, audio-visual specialist traveled (at staggered dates) to Dakar to conduct the Grain Conservation and Storage Management Training Course. The travel covered a 6-weeks period from September 8 through October 17, 1980.

Objective The training objective was to give this group knowledge and skills that would allow them to train other personnel involved in grain storage activities in Senegal.

Summary of Activities The 6-week program was set up with the first 4 weeks dealing with theory, laboratory and field trips and the last 2 weeks concentrated on teaching methods and uses of audio-visual materials. Various check-lists (inspection, fumigation and sanitation) and a complete outline of a training manual for warehouse employees and other personnel in direct contact with millet storage in Senegal were developed to carry on the training program.

Subjects in theory covered grain status from harvest until the end of the period of storage with main emphasis on handling, inspection and control measures in order to minimize losses. Emphasis was also made on rodents and insects, their identification and control.

Methods of teaching with major emphasis on demonstrations were made to the future trainers. Maintenance of audio-visual equipment was taught also.

Closing activities on October 16 comprised of demonstrations of some audio-visual materials by participants, followed by speeches from the USAID Regional Director, the Ex-ONCAD Technical Director and distribution of certificates to the 15 participants.

Field trips were as follows: (a) Dakar port, THIES, Louga to observe grain in bag storage, pest damage identification and for inspection practices; (b) THIES, USAID and GTL warehouses to examine building designs with regard to environmental problems and (c) THIES for fumigation practices.

Other activities included meetings with Ex-ONCAD Technical Director, Mr. Niane, for overviewing millet storage problems, projections and eventual actions for better training team; meeting with USAID Deputy Director, Mr. Mel McCaw; visit of Mr. Carl Castleton, USAID training center administrator.

Reporting and Distribution A trip report was filed with the Project Manager, AID/Washington, D. C.

AFRICA - Rwanda - February 1981

Nature of Activity At the request of the Government of Rwanda and USAID/Kigali, Dr. Robert B. Mills, grain storage entomologist, and Dansou Kossou, grain storage specialist, observed storage practices and conducted a storage training seminar. Dr. Mills' travel was funded by CLUSA (Cooperative League of the USA).

The team was in Kigali from February 8 through 28, 1981.

Objectives The objectives of the team were to observe storage practices of the local Cooperative Crop Storage Program and of the national grain marketing storage program (OPROVIA/GRENARWA) and to conduct a storage training seminar for storage managers of both programs. Also, there was involvement in an evaluation of the GRENARWA storage program.

Summary of Activities During the first week, visits were made to three GRENARWA warehouses (Kigali, Nyabisindu, Kibungo) and one Catholic Relief Service silo at Kizigura (same type as being built by the cooperative LCS project). Planning sessions were held with various personnel of both projects, and preparations were made for the following week's training seminar.

There were approximately 26 participants in the seminar from both projects, mostly present, or future, storage managers. Additional Ministry of Agriculture personnel were invited for an overview of the training seminar on Thursday morning and to accompany the participants on a practical warehouse inspection exercise in the afternoon. Additional information is in Section III, Training.

The third week included a 2-day trip to northwest Rwanda to visit a GRENARWA warehouse at Kora, a CRS silo at Kanama, and a new LCS silo at Cyeru. There were visits with Dr. Ned Greeley, a member of the evaluation team, with Dr. Roland Marijnissen (ESAU, government research group) regarding using the air oven method for calibrating the moisture testers used by both projects. At present, neither project has conversion charts of beans, thus the moisture readings on the testers are not accurate for beans. There were discussions with leaders of both projects on storage practices and basic inspection, sampling, and moisture testing procedures and equipment.

Summary of Activities (a) visited several storage sites; (b) contributed to the evaluation of GREMARWA storage practices; (c) conducted storage seminar, which seemed to be well received; (d) assisted in arranging for air oven moisture determination of beans to calibrate the "Dickey-john" type moisture testers; (e) advised on sampling and inspection equipment needs; (f) modified a warehouse inspection checklist to be used weekly by GREMARWA storage managers; (g) simplified an existing CRS inspection checklist for use by LCS storage managers; (h) proposed a stock label for use on stacks of bags in warehouses; and (i) outlined a suggested coordinated program of practical research, training and technical support for both GREMARWA and LCS storage managers.

Reporting and Distribution A trip report was filed with the Project Manager, AID/Washington.

AFRICA - Zaire - February/March 1981

Nature of Activity Upon request from USAID/Kinshasa through AID/W, Drs. Roe Borsdorf, agricultural economist (marketing), and Cornelius Hugo, agricultural economist (marketing/transportation), traveled to Zaire from February 21 through March 21, 1981.

The two-man team joined Charles Shorter, AID/Washington, who acted as a team leader. The team was to prepare a rice marketing project PID.

Objectives The team was to investigate and decide which of two proposed rice producing areas, Bumba (Equateur) or the San Kuru river area (Kasai Oriental), should be selected for project design. Another rice growing area, Maniema in the Kivu Region, had already been decided against for reasons of inaccessibility.

Summary of Activities Team began researching documents; met with Zairian government agencies, voluntary development agencies and private merchants in preparation of PID. Team decision was presented in favor of Kasai Oriental Region as correct area for project design.

Francis Littleton, a PCV just finishing his tour, was added to the team by USAID/Kinshasa.

Team was given instruction to use the PID as a companion project to a previous project in the Bandundu Region, Kwilu Sub-Region (road construction). Team considered proposal and consensus was that alternative would result in a highly complex project design with a low probability of success since project now had to concern itself with more than rice production and marketing. Kasai Oriental rice project was still considered highly viable since it was not complex and team consensus was that possible project in this area held a high probability of successful implementation and completion as well as a strong impact on small farmers through diffusion processes. This was reported to DEO and team was instructed to continue alternative.

Team collected data, investigated new area designated, and interviewed possible participating agencies who were already doing development work in the now designated area.

Borsdorf and Hugo reviewed a technical manual for DEO and submitted a memo on the manual.

Discussion was held on second draft of PID and team was requested to provide a detailed outline and statement on a marketing study directed towards developing baseline data within the Idiofa and Bulunga zones of the Kwilu sub-region. Team complied and working paper was given to DEO.

Reporting and Distribution PID paper and working paper were left with DEO, USAID/Kinshasa. Team members maintained copies of these papers.

AFRICA - Cameroon - March/April 1981

Nature of Activity Dr. John Pedersen, at the request of USAID/Yaounde and in conjunction with the Regional Food Crop Project, traveled to Cameroon March 27 through April 13, 1981. He was requested to assist in a review of training needs.

Objectives Dr. Pedersen's objectives were to review various levels of grain storage in the Cameroon and assist in the development of an outline for a section to cover preservation of grains in storage in Phase II of the CREFPHY Crop Protection training program.

Summary of Activities Continuous consultation was conducted with Mr. John Franklin, Regional Crop Protection Training Specialist, during visits to farm, village and central level storage facility in and around Maroua and Garoua in the northern region of the Cameroon and Beminda and DSChang in the northwest region.

Reporting and Distribution Lists of reference on grain storage for the Yaounde CREFPHY training center were sent and an outline of material to be covered in the Crop Protection Program (Phase II) training was developed.

AFRICA - Upper Volta - May 1981

Nature of Activity At the request of the Government of Upper Volta through USAID/Ouagadougou, Dr. Robert Julian, coordinator, and Dansou Kossou, grain storage specialist (also serving as French translator), traveled to Upper Volta to conduct a training needs assessment.

Travel began May 17 and was concluded on May 22, 1981 for Mr. Kossou. Dr. Julian traveled to another assignment in Nepal covered under the Asia section of this report.

Objective The main objective was to conduct a training needs assessment and determine logistics for a requested "Training of Trainers" short course in grain storage management to be determined at a later date.

Summary of Activities Discussions were held with USAID officials in relation to administrative and grain storage areas of OFNACER. Areas covered were:

- overall production system
- major cereal crops
- storage of grains
- marketing (general).

Most of the USAID and OFNACER discussions involved marketing and storage management problems. A major concern of OFNACER and USAID was centered around the 1980 yield of red and white sorghum which amounted to approximately one (1) million metric tons. It was estimated that only 1% was marketed. At present, OFNACER has a total of 43,500 metric tons of storage capacity and anticipates an additional 17,500 metric tons to be built by USAID Project and the German security stock project. The major crops requiring storage are millet and sorghum with maize and rice as minor crops.

The main objective of the Government of Upper Volta in establishing the National Cereal Grain Office (OFNACER) was to give marketing protection to both farmers and consumers. The creation of regional grain storage and import of cereals has been one part of implementing the government program.

A field trip was taken to observe storage facilities and conditions of stored grains at the National Center of Storage at Ouagadougou. The team was told that OFNACER has, at present, a total of 43,500 MT of storage capacity and anticipates an additional 17,500 MT to be constructed through USAID and German security stock project. The current capacity is not considered adequate.

Most of the grain purchased from the rural areas and received from PL 480 are stored in the central warehouse. This constitutes considerable transportation cost from the farmer to the center. OFNACER does not feel that the existing rural and private small storage facilities are satisfactory to store grain for OFNACER under contract.

The crops in storage that were observed by the team were sorghum, millet, corn and rice. OFNACER security reserve stock was stored in a temporary "Readel" silo structure, above ground, constructed of wire mesh and polyethylene covering. At the time of the visit, the structure was being unloaded. The grain, white and yellow sorghum, had been bag stored since 1978 with apparently little management. Most of the bags observed were insect infested with the grain unfit for human consumption.

In visiting the concrete block constructed warehouses, satisfactory storage facilities were observed but upon inspection of bagged grains, major problems relating to insect and rodent activities were obvious. The stacking appeared adequate but in one warehouse, rice, sorghum and corn meal were stored together. The corn meal was heavily infested with insects. Attempts had been made to fumigate but possibly after infestation was too far advanced.

The Mossi graneries near Ouagadougou were in a family compound. They were of two types: a woven straw granery mainly reserved for sorghum or millet in head form and the mud-covered type for threshed grain. They held an estimated capacity of 1,000 pounds. Farmers claimed that during successive good years, rotation between graneries helped to keep the grain in condition. Because of the two previous bad seasons, the graneries observed were only half filled.

Discussions were held with top OFNACER personnel to determine training needs. At the present time, eleven (11) OFNACER personnel have received instruction in the 7-week KSU Grain Storage and Marketing Short Course. These people are available for an in-country "Training of Trainers" short course in storage management to enable them to give in-service training of their existing warehouse personnel and to train others as additional storage warehouses are built.

OFNACER officials discussed their specific needs and anticipated problems relating to their need of a Training of Trainers short course. The following was discussed:

1. Number of participants (15)
 - a. Controllers - 3
 - b. Managers - 12

Participants would be chosen from those with previous KSU storage training where possible.

2. Training site: The training site appeared not to be a problem. OFNACER officials stated that adequate training center facilities would be available, but they could not make a final decision at that time.

3. Suggested training period: March-April 1982.

4. Length of course: 6 weeks.

5. Course content: The course content for the in-country training discussed was based on OFNACER-recognized needs. They felt that major emphasis should be placed on insect control, stock rotation and preservation of flour. OFNACER suggested the following areas of course content:

- a. Fundamentals of grain preservation are necessary to draw attention to problems in storage related to moisture-relative humidity relationship, humidity to temperature changes and humidity and temperature to deterioration caused by insects and molds.

- b. Basic biology, behavior and identification of stored product insects with emphasis on those insects which cause more problems within Upper Volta.

- c. Information related to pesticide-fumigants used in controlling pests of cereal grain, methods of application, equipment used, care and maintenance required for protection of equipment and users.

- d. Sanitation and control measures:

- inspection
- housekeeping
- mechanical and physical methods

- e. Stacking/stock rotation procedures

- f. Methods of teaching and use of audio-visual training equipment

6. Training equipment: Training materials were not available for observation because a mobile team was working in another part of the country. However, training materials required for a training of trainers course should represent that which can be afforded by the country and maintained properly by training teams later on.

Four basic pieces of equipment needed are:

- training equipment (audio-visual)

- inspection equipment
- pest control equipment
- pesticides and fumigants.

The KSU team will need to bring along translation equipment since Upper Volta is a French speaking country. Also, equipment transformers (220 +110V) may be needed for some of the equipment.

7. Daily teaching schedule: 7 - 12:30 p.m. (morning)
3 - 5:30 p.m. (afternoon)

From the storage management problems observed, it is highly recommended that the "Training of Trainers" course in warehouse management be initiated as soon as possible (spring 1981).

The following recommendations are suggested:

1. The training needs assessment indicates that considerable training in storage management is needed in OFNACER. The "Training of Trainers" course in-country will give OFNACER the capability to train their own staff in the future.
2. Action should be taken to purchase the equipment required for good storage management practices and equipment should be available for training program (c. f. equipment list attached).
3. Selection of participants should be completed several months prior to the short course and information sent to KSU on experience of each participant selected (both controllers and managers). This will assist KSU in designing the course to meet the needs of all individuals.
4. Make a final decision on training site and available facilities and convey information to KSU.
5. It is recommended that a KSU followup one (1) year after completion of the training program be requested by OFNACER to determine the success of the training and determine if future technical assistance is needed in the program.

Reporting and Distribution A final proposal was drafted and sent to Project Manager, AID/Washington and to the USAID/Ouagadougou Mission. A trip report was also filed with the Project Manager.

ASIA - Korea - August 1980

Nature of Activity Dr. Do Sup Chung, agricultural engineer, by request of the Institute of Agricultural Science and Development, College of Agriculture, Seoul National University, traveled to Suwon to assist in a Rice Post-Production Technology Workshop. The travel covered the period August 15-23, 1980.

Objectives This technical assistance is also listed in Section IV, Laboratory and Developmental Services. The objectives of this TDY are listed in that section.

Reporting and Distribution An oral report of the assistance was given to the Coordinator and Director of the Food and Feed Grain Institute.

ASIA - Bangladesh - January 1981

Nature of Activity Upon request of USAID/Dacca through AID/DSB Office in Washington, Dr. Ekramul Haque traveled to Bangladesh to assist in project 388-0024 "Fertilizer Distribution Improvement." The travel began on January 9 and ended January 25, 1981.

Objective Dr. Haque was to make observations of imported wheat seed and make recommendations regarding infestation of the grain.

Summary of Activities Locations which were visited by Dr. Haque included BADC (Bangladesh Agricultural Development Corporation) fields, seed processing and preservation section, farms in Dacca; Food Ministry, Entomology Division of Bangladesh Rice Research Institute, Processing Division, Bangladesh Agricultural Research Institute, Wheat Scientific Section in Joydebpur, Dacca; District Seed Office-BADC, Tangail; Seed Processing, Storage and Preservation Center, Madhupur, Tangail; Pahartali Seed Processing Center, Contract Growers Section, Shipping Department, BADC, Chittagong; Seed Division of BADC, Khulna; Seed Processing and Preservation Center, in Kushtia; Movement Section in Khulna; Seed Processing, Storage and Preservation Center, Chuadanga Kushtia; Tebunia Seed Processing, Storage and Preservation Center in Tebunia, Pabna; Seed Processing Storage and Preservation Center and District Seeds Office in Bogra; Kellaband Seed Processing, Storage and Preservation Center in Kellaband, Rangpur; and the Office of Seed Agronomist and District Seeds Office in Dinajpur. Dr. Haque also visited the USAID offices of the Director, Deputy Director, Chief-Office of Food and Agriculture, Project Officer, and others. Mr. Robert Gonsalves of USAID and Mr. Mohammad Alam of BADC accompanied Dr. Haque to all the processing plants, godowns and offices and kept him informed of USAID and BADC activities.

Based on results of tests he conducted, interviews, supporting substantive evidence and professional experience, Dr. Haque came to the following conclusions:

- PAVON F-76 wheat seed was infested by insects before arrival in the Bangladesh port. Indications were that infestation originated within the bags and invasion did not take place from without after shipment. Also indicated was the possibility of the shipment being made of different lots of different sources. The presence of germ-damaged wheat kernels in seeds suggests either the use of an older stock rather than 1980 harvest, poor storage conditions or pre-harvest damage in grain.
- No INIA bags were observed indicating infestation. The inner poly liner bags effectively kept the moisture out of the grain and helped maintain the moisture at a lower level in the INIA bags than that of PAVON. Dr. Haque strongly recommended the use of solid inner polyethylene film of sufficient strength with outer hessian or woven polypropylene bags similar to the INIA bags.
- With proper bagging, seed moisture can be maintained at about 10% (w.b.). It is recommended that moistures below 10% (w.b.) be used for future procurement. Lower moisture materially reduces the potential for infestation.
- Observations showed hook damage in four bags out of five. Use of hooks is widespread in consignments from Chittagong and Khulna ports. In the INIA bags, use of hooks cause the bag to lose some of its moisture sealing and infestation barrier quality, depending on the extent of damage. INIA samples

showed moisture contents around 10% (w.b.) and was consistently lower than PAVON moisture and the equilibrium moisture content. This suggests that even with hook damage, the solid polyethylene liner bags were quite effective in preventing the moisture from getting into the grain mass. In most cases, hook damage was about 1 to 2 inches in length and with grain pressure on the damaged area, the opening remained very small. However, this must not be an excuse for using hooks. A damaged polyethylene liner bag cannot substitute an undamaged one. In monsoon seasons, the hook damage will very likely cause quick increases in localized moisture, increasing the risk of infestation. Authorities should stop the practice of using hooks immediately.

- Housekeeping in BADC processing plants that were visited seemed good to excellent. But storage conditions in hired godowns are poor and will invite infestation. Bags were stored on the damp floor without dunnage; if possible, concrete godowns should be used with better housekeeping.

- BADC does not have portable and/or convenient moisture testers which could be carried into the field during harvest. Quick reading, portable hygro-thermometers are also needed. BADC should have portable moisture testers and hygro-thermometers in all their godowns. If the cost is too high, at least the ship receiving points and the processing plants should have these test devices.

- Modern technologies are available to detect hidden infestation in the form of eggs and other stages of insect development, inside or outside the kernel, not detectable by the naked eye. BADC should have such testing techniques available in the port areas and analyze samples frequently as the seed is received from the ship.

- BADC should train the seed processing plant and warehouse managers, inspection and laboratory personnel and a few of the connected administrators in post-harvest grain and seed storage technology. It was suggested that the annual Grain Storage and Marketing Short Course be a source of this training as well as a possible in-country short course curtailed to specific needs during a mutually agreeable time.

- If possible, importation of a large quantity of seeds at one time should be avoided. Quality control in large quantity seed handling is prone to be less strict.

- Even though seeds are certified, consumer representatives should see what they are getting from the seller. It is strongly suggested that some appropriate seed experts should be present in the seller's plant to guarantee that quality standards and requirements in respect of diseases, pests and treatment; purity; inert matter; germination; other crop seeds; moisture; total weed seeds; and packaging materials and specifications are strictly adhered to. The consumer may also specify other requirements in the seed.

- A few kernels of "pink wheat" were found in samples taken. This clearly demonstrates that a few lots, or all, were treated with chemicals. Public health hazard must be considered if the option of releasing the wheat as human food is suggested.

- In Tebunia, Pabna Seed Processing Center, INIA seed was being regraded and rebagged in jute bags. In doing so, some moisture was added to the grain during handling. If BADC thinks regrading has to be done for agronomical

reasons, then a solid polyethylene inner bag should be used. If regrading is being done for storage reasons alone, then the gains obtained by regrading will probably be more than offset by increased susceptibility to insect and fungi due to moisture increase with the use of the jute bag. If storage is the only reason motivating the regrading, BADC should stop the practice and watch the grain carefully.

● A few PAVON bags were found with moisture content as low as 10.5% (w.b.). This suggests two things; either the whole consignment probably had moisture content as low as 10% (w.b.) at the time of bagging or only some lots had that level of moisture. In either case because of poor bags, moisture most likely was increased during ship voyage and in Bangladesh. The bags deep inside the stacks in the ship hold gained less moisture than the outer bags.

If these recommendations are followed properly, it is felt that the risk of infestations in imported wheat seed will be minimized.

Reporting and Distribution Draft copies of the report entitled "Insect Infestation in Wheat Seeds (PAVON F-76) Imported from Mexico in 1980 by Bangladesh Agricultural Development Corporation (BADC)" were sent to Project Officer, USAID/Washington, D. C. and USAID/Dacca.

ASIA - Philippines/Thailand - May 1981

Nature of Activity At the request of SEARCA (Norman Teter) and at the approval of Project Manager, AID/Washington, Ms. Cherie Geiser traveled to the Philippines and Thailand to give technical assistance.

The travel covered the period May 2 through May 18, 1981.

Objectives The objectives of this assistance were (1) to present a seminar on PHDS to interested researchers in the Philippines; (2) to develop areas of cooperation with agricultural libraries in Southeast Asia; (3) to confer with PHDS clients in the Philippines and Thailand; (4) to introduce PHDS, as well as PIP, informational services to prospective clients; and (5) to ascertain if there is a need in Southeast Asia for PHDS services.

Summary of Activities Overall, Ms. Geiser felt the assistance accomplished all of the above objectives. Many new clients were introduced to PHDS and PIP services. The largest group of new clientele was obtained via a seminar given to National Foods Authority staff in Manila.

Cooperation was established with several agricultural libraries; particularly in the area of document exchange. The strongest link was developed with the Agricultural Information Bank in Los Baños. Details of this relationship are outlined later in this report.

Feedback from PHDS clients in this area was an enlightening experience. It was discovered that most of the clients were only utilizing one or two of the services offered and that many hesitated requesting services because they felt there were "strings attached" to our free services. It was believed that individual meetings helped to clear up these misunderstandings. In addition, it was strongly emphasized that they could assist us by contributing their publications to our collection.

The most gratifying aspect of this trip was to discover the type of documentation provided by PHDS is indeed needed in Thailand and the Philippines.

Most of the libraries or reading rooms visited contained books; but very few had an adequate collection of research journals. Since the PHDS collection consists primarily of journal articles, it is felt we are serving a definite purpose by providing access to these materials for researchers who have few means of obtaining these documents as quickly or as cheaply.

Contacted Dr. S. C. Andales, Head of Grain Processing Division at University of the Philippines, Los Baños. He had been a PHDS client since March 1981. He indicated interest in computer programs for drying and processing of grains. FFGI agricultural engineers will be contacted for information. Andales suggested that if UPLB requests become too heavy, we might be able to have the UPLB Library reproduce PHDS acquisitions lists for the faculty.

Visited Dr. Belen Morallo Rejesus, Department of Entomology who has been a PHDS client since January 1980. We discussed exchange of publications and the possibility of PHDS subscribing to "The Philippine Entomologist."

Dr. Lina L. Ilag, Department of Plant Pathology and PHDS client since December 1980, was contacted. PHDS services were reviewed and information was given on PIP informational services.

Met Ms. L. B. Gregorio, Director-UPLB Library. Explained PHDS services and went into detail about PIP as she is currently working on a perishables bibliography. The UPLB Library is the AGRIS National Library Center for the Philippines.

Mr. Norman Teter, Agricultural Engineer and SEARCA Postharvest Technical Team Member, made all arrangements for Ms. Geiser's contacts in the Philippines and Thailand. With his assistance, she reached many people and organizations on this trip.

Briefly met with Dr. DePadua, Technical Team Leader and Dr. Russell, Economist.

Set up materials exchange arrangements with Antonio S. Frio, Communication Specialist for SEARCA who is in charge of a small postharvest collection for the technical team.

Met with Mrs. J. C. Sison, Project Manager for Agricultural Information Bank for Asia (AIBA), Los Baños. Approximately 2 days were spent discussing PHDS and AIBA services. The following briefly summarizes proposed areas of cooperation established between the two information centers:

1. PHDS and AIBA will work cooperatively on a Postharvest Bibliography Project which should be completed late in 1981.
2. The bibliography will include the following commodities: corn, rice, sorghum, and legumes.
3. The bibliography will cover citations published during 1970-1980.
4. The majority of the acquisitions will come from the ASEAN countries.
5. AIBA will be responsible for producing the bibliography and updates.
6. PHDS will provide document delivery according to policies already established. The bibliography will assign a special code to those articles available from PHDS.

7. PHDS will provide AIBA free monthly acquisitions lists as a current awareness tool.
8. PHDS may send copies of the CALS printouts it receives in the grain postharvest area to AIBA.
9. PHDS will run computer searches of its database for the commodities which will be listed in the AIBA bibliography.
10. AIBA will send PHDS citations from AGRIS printouts, as well as copies of publications which they may receive from ASEAN countries.

Visited with Ms. Leonides S. Halos, Research Assistant, Agricultural Engineering Department, International Rice Research Institute (IRRI), Los Baños. She has been a PHDS client since March 1981. The acquisitions lists and document copies received from PHDS are routed around the department and then housed in the IRRI Library. If needed, she felt the IRRI Library might reproduce the acquisitions lists for all interested IRRI departments.

Met Dr. Ernesto B. Pantastico, Director-ASEAN Postharvest Horticulture Training and Research Center, Los Baños, as well as the Center's Librarian. Explained the establishment of the Postharvest Institute of Perishables in Idaho to them and left contact addresses with them.

Presented a short seminar on PHDS services and activities to 39 participants from the National Postharvest Institute for Research and Extension (NAPHIRE), the Training and Research Services Division (TRSD) and the Ministry of Agriculture. NAPHIRE and TRSD are components of the National Foods Authority. A slide presentation was given and folders, containing order forms and sample materials, were distributed.

Eleven of the 39 participants filled out PHDS Order Forms. Three of these individuals were selected to receive Acquisitions Lists which they would route to the remaining group.

Dr. F. M. Caliboso, Chief-Research Division, NAPHIRE and Mrs. Nora V. Dantes, Supervising Librarian-Ministry of Agriculture Library, were both contacted individually after the seminar. Both have been PHDS clients since March 1981.

Visited with Dr. D. G. Guinn, Assistant to the Team Leader; Dr. J. G. Snell, Economist and Dr. Rex F. Daly, Senior Policy Analyst, of the KSU Integrated Agricultural Production and Marketing Project, Manila. Both Dr. Snell and Dr. Daly were very interested in PHDS services and asked to be included on our mailing list.

Paid a courtesy call to Dr. A. C. Campos, President of Central Luzon State University, Munoz. He suggested a visit to their University Library. Contacted Mrs. Celia De La Cruz, Director-CLSU Library and explained how PHDS might help supplement their materials in the grain postharvest area.

Visited Dr. U. A. Acasio, Feed Grain Processing Consultant, for the new feed mill facility being constructed at CLSU. Toured the facility, discussed subscribing to a Philippine agricultural engineering journal and left a folder of information which Acasio plans to share with some of the graduate students in need of postharvest information.

Conferred with Mrs. Sriwai Singhagajen, Chief of Storage and Processing Section, Agricultural Engineering Division, Department of Agriculture, Bangkok, Thailand. Mrs. Sriwai has been a PHDS client since March 1981. She requested a list of FFGI reports as well as some microfiche samples. PHDS' need for publications generated by her section was emphasized.

During a meeting with Mr. Kriang Krai Mekvanich, Head of Food Losses Prevention Sub-Division, Department of Agricultural Extension, the need was expressed for information on rice harvesting machinery at the appropriate technology level.

Visited with Mrs. Ratchanee Kanchanomai, Assistant Director-Thai National Documentation Center, Bangkok. Toured the Center and discussed possible areas of cooperation. The Center is willing to compile bibliographies of interest to PHDS, but explained that translations of Thai publications would be prohibitively expensive for our Service.

After explaining PIP's new informational service to Mrs. Sing Ching Tongdee, Postharvest Technology Library, Thailand Institute of Scientific & Technological Research, Bangkok, it was decided to remove her from the PHDS client list and place her on PIP's mailing list because her research centers around perishable commodities.

Discussed PHDS services and proposed AIBA cooperation with Ms. Darunna Somboonkun, Director-Kasetsart University Library, Bangkok.

Dr. Jacques Valls, Director-Asian Institute of Technology (AIT), Bangkok, explained that their library contains 20,000 volumes and heavily emphasizes engineering. Four regional documentation centers are also included in their facility: geotechnical, low-cost construction, renewable energies, environmental sanitation. Was unable to set up a free exchange of materials with the library. They only provide publications at cost. In addition, there seemed to be little interest in the grain postharvest area.

Met with Dr. V. K. Jindal, Agricultural Engineer, who has been a PHDS client since March 1981. During our discussion, I clarified several of our services and emphasized the need for postharvest publications produced from AIT.

Reporting and Distribution A trip report was filed with the Project Manager, AID/Washington.

ASIA - Korea - May 1981

Nature of Activity Dr. Do Sup Chung, agricultural engineer, at the request of the Korean Institute of Science and Technology, traveled to Korea May 18 through 28, 1981 to attend the Institute's workshop and present a paper.

Objectives The objectives of the workshop included: (1) an exchange of knowledge and experiences and creation of long-term relationships among scientists and professionals of the Asian region concerned with the technological advancement in rural areas; (2) identification of common problems of the Asian countries; and (3) initiating bilateral and multilateral cooperation projects for coping with common problems under similar conditions making maximum use of the technological capabilities of the various countries.

Summary of Activities Dr. Chung presented a paper at the Regional Workshop on Rural Development Technology entitled, "Grain Post-Harvest Technology Programs for Developing Countries in the U. S." An abstract of the paper is as follows:

ABSTRACT

Various grain post-harvest technology programs of the Food and Feed Grain Institute, Kansas State University, under USAID/Washington cooperative agreement are briefly discussed. On-farm grain storage and drying situations in Southeast Asia, South America and Africa are reviewed.

Various research activities related to rural development resulting from the Food and Feed Grain Institute's involvement with developing countries are explained. Also, several problems associated with grain post-harvest technology development for developing countries and a few suggestions for improving rural development programs, especially in the grain post-harvest technology area, are discussed.

The above paper was authored by Drs. DoSup Chung, Charles W. Deyoe and Robert E. Julian.

Reporting and Distribution Copies of the above paper were handed out to attendees of the workshop.

ASIA - Nepal - May 1981

Nature of Activity Dr. Robert Julian, Coordinator, at the request of the Government of Nepal through AID/Kathmandu traveled to Nepal to supply training assistance. Dr. Julian traveled from May 23 through May 30, 1981.

Objectives A training needs assessment for the Seed Production and Input Storage Project was one objective while observation of storage management of seed grains for small farmers was the second objective.

Summary of Activities On May 25, Dr. Julian visited the Ministry of Agriculture Technology Division Offices and the processing and storage area for small seed crops. Equipment included gravity cleaners, small dryer and dehumidifying unit which was used primarily for drying and cleaning of vegetable seed. A small vegetable seed storage unit was visited and stored product problems were discussed with Mr. Purush Amatya, Senior Plant Pathologist. The afternoon was spent with Mr. Basnet and Mr. S. K. Bhalla in the FAO Project Offices discussing the work being done with small farmers in regard to the design of small storage units.

All data has been collected but not yet processed on a FAO postharvest loss assessment for Nepal. After data has been evaluated, they will send FFGI the results and methodology used.

The morning of May 26 was spent with personnel of the Office of Seed Production and Input Storage Project (SPIS) discussing storage problems of cereal grains which could be reduced by special training of personnel. The afternoon was spent in observing Kathmandu storage (3,200 M.T.) of seed grains and fertilizer storage.

Field trips taken May 27 and 28 included the following:

- Visit to local warehouse at Bimala Nagar (250 M.T.).
- Training Center at Khairanitar which also has guest houses and dormitories for short courses. Facilities on Training Center grounds includes storage warehouses and a grain processing plant.
- Pokhara Valley - visited AIC (Agricultural Inputs Corporation) Western Regional Office and discussed training needs. Also the AIC Regional Warehouse (500 M.T.) was visited and storage problems discussed.
- Visited small hill farm that was contracted to grow seed corn for AIC. Observed storage method used by hill farmers.

The morning of May 29 was spent discussing content that SPIC thought would be most desirable in a course. The item SPIC felt was very important to their program was the training of supervisors which would monitor all inventory and management of the warehouse (godowns).

The afternoon was spent with USAID in discussing logistics, costs, equipment, etc.

Reporting and Distribution A trip report was filed with AID/Washington, Project Manager. An assessment report, recommendations and training proposal will be submitted in the near future.

LATIN AMERICA - Panama - August/September 1980

Nature of Activity Following up on a request by USAID/Panama, Drs. Roe Borsdorf and Cornelius Hugo traveled to Panama City August 9 through September 6, 1980. The request was for a marketing study for Instituto de Mercadeo Agropecuario (IMA). Because the travel was funded by USAID/Panama, the assistance is covered under the Section IV-D, Laboratory and Developmental Services.

LATIN AMERICA - Costa Rica - January 1981

Nature of Activity The University of Costa Rica, through AID/Washington, requested the assistance of Dr. Robert Julian, coordinator, to discuss postharvest development.

Dr. Julian was in San Jose from January 18 through 30, 1981.

Objective The objective of this TDY was to review research and training possibilities under Agreement AID/DSAN-CA-0256 and the KSU/UCR cooperative agreement.

Summary of Activities Four small farms were visited to observe grain stored in 55 gallon drums for 2 to 3 year periods. Other methods of storage in use were fabricated Guatemalan steel silos (small). All grain observed was in excellent condition.

A visit was also made to a research station where Peace Corps Volunteers were experimenting with prototype solar dryers - great problem with plastic

covering, very inefficient and costly. CNP loaning money ₡100 to small farmers who wished to try solar dryers developed by Peace Corp.

The American Institute of Agricultural Sciences (IICA) was visited and discussions were held on activities in Central America in the postharvest area. Jose Pando, IICA Postharvest Specialist, stated they were only starting in the postharvest sector. They had one project in the Dominican Republic. Discussed cooperation with UCR and KSU.

A visit was made to CARE Director, John McLeod, who arranged a field trip to a CARE soybean processing plant and storage facility. Discussed the past KSU assistance by Dr. Ekramul Haque in designing new storage facilities.

Visited AID/Costa Rica's Food and Agriculture Officer, Larry Laird. Discussed support of the UCR/KSU Cooperative Agreement with USAID/Costa Rica funds.

Reporting and Distribution A trip report was filed with the Project Manager, AID/Washington.

LATIN AMERICA - Costa Rica - February 1981

Nature of Activity At the request of CARE, Costa Rica, Dr. Ekramul Haque, agricultural engineer, traveled to San Jose to conduct a preliminary study of grain dryers for small farms for University of Costa Rica and a study on an LEC plant. Travel began February 17 and ended February 28, 1981.

Objectives The objective for the request from CIGRAS, University of Costa Rica was to develop a proposal on low cost grain dryers for small farms.

The objective for CARE was to determine specifications for the proposed bulk storage in CARE's LEC Plant located in San Jose and to determine if the construction of the project could be locally built without much foreign assistance.

Summary of Activities Dr. Haque was assisted by Dr. Miguel Mora who was his counterpart at CIGRAS as well as Mr. John T. McLeod, CARE, Costa Rica.

In-depth discussions were held with Dr. Mora on the problems of grain drying on small farms. Data was collected on rainfall, solar insolation and wind velocities in different parts of Costa Rica. In some parts of the country, rainfall during harvest is too heavy to utilize solar energy economically and technically. From this TDY, it became apparent that the dryers to be developed should run on biofuel and natural convection. For dry regions, a solar dryer may have some promise. A third alternative looks like a dryer run both on solar and combustion heat energy. The main challenge lies in making the dryer low cost.

Dr. Haque made as many contacts as possible to determine for CARE if their proposed bulk system in LEC plant can be built by local expertise. It appears that there are firms in Costa Rica which can build the facility on a turnkey basis or through organizing a group of consultants, suppliers and builders. The options are open to CARE.

Reporting and Distribution A trip report was filed with the Project Manager, AID/Washington. An article entitled "Specifications for the Proposed Bulk Storage in CARE LEC Plant San Jose, Costa Rica," was sent to Mr. John T. McLeod, Director, CARE. A proposal for CIGRAS is being developed.

LATIN AMERICA - Peru - May 1981

Nature of Activity Dr. Ekramul Haque, agricultural engineer, and Dr. Harvey L. Kiser, agricultural economist, traveled to Lima, Peru to give technical assistance at the request of USAID/Lima through DS/AGR/Washington, D. C. in grain drying, storage and marketing.

Objectives For Upper Huallaga Area Development Project, to prepare a project paper. For the subtropical lands project, to assist in improving the implementation of the project.

Summary of Activities The purpose of the Upper Huallaga Area Development Project is to promote agricultural and regional development and to facilitate establishment of legal agricultural and agro-industrial alternatives to cocoa production between Tingo Maria in the Huanuco Department and Campanilla in the San Martin Department. The project will finance physical infrastructure in the form of access roads, basic market and storage facilities, energy production, agricultural processing industries and machinery services related to land clearing and soil preparation. Agricultural credit, research and extension services will also be funded under the project.

For this project the team was requested to (1) review and analyze the preliminary study on grain drying and storage that the Foundation for National Development had prepared; (2) visit Tingo Maria area and make recommendations for drying, storing and moving rice, corn and soybeans from the project area to the main marketing centers; (3) recommend the location and type of facilities needed for drying and storing grains, the technical personnel required to operate them and a list of equipment needed for these facilities; and (5) submit a report.

The purpose of the Sub-Tropical Lands Development Projects is to develop the Huallaga Central and Bajo Mayo's agricultural potential. The project area is in the high jungle located in the Department of San Martin. Achievement of the project purpose will be through basic infrastructure and institutional interventions aimed at testing a low cost development model for possible replication in other areas in Peru. The basic project components are: roads, road maintenance, agriculture credit, land clearing, farm machinery equipment and service, marketing facilities and services, land surveying and titling activities, extension services, and resource studies and technical assistance.

For this project the team was requested to (1) visit the grain storage facilities in Tarapoto and Juanjui and make recommendations to increase their capacity if necessary; (2) establish the steps to be taken for drying, storing and moving corn, rice and soybeans and suggest appropriate operational procedure for the existing storage facilities; (3) establish quality grading procedures for incoming grain; (4) analyze the current practice of storing grains in bags and make recommendations for changing to storing in bulk; and (5) submit a report.

Places visited included the following: USAID Office, Lima; ECASA facility, Tingo Maria; Cas Naranjillo Cooperative; Ministry of Agriculture Office, Tingo Maria; ENCI facility, Naranjillo; Ministry of Agriculture Office, Uchiza; ENCI facility, Progreso; Aucayacu Cooperative; Ralston Purina, Tingo Maria; A private cocoa merchant in Tingo Maria; SENAMHI, Tingo Maria; ENCI facility, Tarapoto; Ministry of Agriculture Office, Tarapoto; Sub-Tropical Lands Development Project Office, Tarapoto; ECASA Office, Tarapoto; ENCI Warehouse, Picota; and ENCI Warehouse, Puerto Rico.

Recommendations are as follows:

- Because of heavy rainfall almost every month of the year, the grain drying need in the Upper Huallaga project area is more pressing than the Sub-Tropical Lands Development project area which is drier.
- ENCI should discontinue the use of inflatable temporary silos for high moisture grain storage.
- Peru does not seem to have the necessary infrastructure to transport grain in bulk. Under the present circumstances, transporting grain in bags seems appropriate.
- For maintaining grain quality, the team recommended bulk grain drying and storage facilities at various locations in the project area.
- We recommended postharvest grain storage, marketing and management training for the warehouse managers and technicians.
- ENCI and ECASA should be merged into a single entity rather than two separate organizations.
- The Government of Peru (GOP) should establish a long range plan of phasing out its direct market interventions and increase its role as a regulator by monitoring quality measurements, warehouse management and operations and accuracy of weighing.
- GOP should increase support prices for corn and rice on a monthly basis to account for the increases in storage costs.
- The roads in the areas should be developed to allow travel during rainy periods.
- GOP should establish a drying charge for corn.
- Additional grade factors for moldy, heat-damaged and sprouted grains and distinctly low-quality grain should be established.
- The moisture meters should be periodically checked against reference moisture testers.
- Market information on production and inventory levels of grain needs to be collected and released for public knowledge.
- GOP should improve the warehouse record keeping.
- GOP should provide financial incentive and technical assistance to private and/or cooperatives in buying, marketing and processing grain.
- Rice should be milled at a time such that milled rice does not need a long storage time.
- An evaluation of on-farm drying and storage system should be conducted.

- Before grain is stored, the warehouse should be treated for insects. Grain should be fumigated immediately upon receipt. In case of heavy insect infestation, the fumigation should be done in bulk and bags fumigated before rebagging.
- Warehouses under the control of Ministry of Agriculture should be rehabilitated.

Reporting and Distribution A trip report was filed with the Project Manager, AID/Washington. Cost figures were established and submitted to USAID/Lima on the recommended storage installations. A technical assistance report is in the process of being drafted and will be distributed when printed.

B. Follow up on Previous Overseas Requests

AFRICA - Senegal

Nature of Activity As a result of a request in June 1978 for a Technical Advisor in Grain Storage to ONCAD and Ken Steinke's subsequent return travel to KSU in March 1980, a training program was developed with the staff of FFGI. The Government of Senegal, through USAID/Dakar, requested the training which began on September 4 and was completed October 17, 1980. The short course was titled, "Grain Storage Management" and was translated simultaneously to French by Ms. Kathy Foster and Mr. Dansou Kossou.

The team was composed of Dr. John Pedersen, Ms. Kathy Foster, Mr. Dansou Kossou, Dr. Fred Teague and Mr. Ted Thatcher.

Objectives The goals of the course included providing basic background information on the preservation of cereal grains during storage to a corps of individuals who will use this knowledge in conjunction with their own understanding of the conditions in Senegal to train warehouse managers and workers; quality agents and fumigators; and secco managers.

Reporting and Distribution A trip report was filed with the Project Manager, AID/Washington, D. C.

C. Potential Areas for Technical Assistance

1. AFRICA

a. Upper Volta - A proposal has been submitted to provide a "Training of Trainers" intensive 6-week short course in Grain Storage Management for OFNACER (Upper Volta National Grains Office) personnel. Tentative date set for the training is May-June 1982.

2. ASIA

a. India - Following up on travel in January 1980 by Dr. Richard Phillips and in February 1980 by Dr. Roe Borsdorf, a request for in-country training in Irrigation Project Analysis was received in September 1981. This training would be conducted under the Rajasthan Medium Irrigation Project. Tentative travel for January-February 1982 by Dr. Phillips has been suggested.

b. Nepal - As a follow up to travel by Dr. Robert Julian in May 1981, a tentative proposal was sent to USAID Field Supervisor, Peter Rood in Kathmandu with copies to Dr. Robert Morris, Project Manager, AID/Washington. This was to propose the training dates of November 2 through 20, 1981 (3 weeks) for the Grain and Seed Storage Management Short Course to be held in Kathmandu.

3. LATIN AMERICA

a. Honduras - Additional assistance may be required by IHMA (Instituto Hondureño de Mercadeo Agrícola) to complete an agreement for technical support of marketing and economic policies.

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 Contract AID/ta-C-1162 and Cooperative Agreement AID/DSAN-CA-0256.

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

- Visited VISCA, Baybay, Leyte, Philippines to become acquainted with postharvest operations of the Philippine Root Crops Research and Training Center.
- Visited Department of Trade, Singapore and discussed rice imports, handling and storage. Also discussed construction of a new warehouse and advantages/disadvantages of controlled humidity storage and gave recommendations on observations.
- Kuala Lumpur, Malaysia--discussions revolved around needed research and development in procurement and handling of wet paddy and storage of milled rice. Also discussed warehouse humidity control system.
- Alor Setar (Bukit Raya station) reviewed report on project activities and methods being pursued in handling of wet paddy and made suggestions and recommendations.
- Visited National Grains Authority and International Rice Research Institute and proceeded with the following:
 - (a) worked with project team on on-farm losses from microorganisms
 - (b) worked with NGA committee on five losses in warehouses namely:
 - (1) shrinkage, (2) dry matter loss to microorganisms, (3) dry matter loss to insects, (4) dry matter loss to rodents and birds and (5) spillage and other physical removal
 - (c) worked with NGA infrastructure on construction at Central Luzon State University
 - (d) spoke at NAPHIRE (National Post-Harvest Institute for Research and Extension) training course on grain storage

(e) consulted on designing bulk storage aeration.

- Visited BULOG in Jakarta, Indonesia to discuss redirecting IDRC research and ASEAN corn deterioration research and training in handling secondary crops.

- Traveled to Singapore and discussed concepts of controlled bagged storage and made recommendations.

- Pasir Mas, Kelantan, Malaysia--to work with MARDI (Malaysian Agricultural Research and Development Institute) and Farmers Agriculture Marketing Association on peanut processing and make recommendations.

- Tsukuba Science City, Tokyo University, Nagoya University, Okayama University, Japan--to attend the 4th Biennial Convention of the Asian Association of Agriculture Colleges and Universities. Spoke on "Grain Storage--A University Challenge."

- Bangkok, Thailand--Follow-up discussion with the Director and staff of the Marketing Organization for Farmers (MOF) including past training of operators in Post-Harvest Processing Technology. Also, discussions were held on drying and bulk storage complexes of Danish/New Zealand origin presently under construction or completed as well as bulk storage problems.

- Khon Kaen, Thailand--Follow-up discussions with University staff on 4-week Regional Training Course on Post-Harvest Technology to which they had sent two participants. Also discussed were the following:

- post-harvest engineering graduate degree programs
- training of extension officers
- peanut sheller
- seed propagation and conservation programs.

- Chiang Mai, Thailand--University of Chiang Mai, Faculty/Institute of Agricultural Technology to discuss their present position in respect to teaching and research in post-harvest engineering.

- Kuala Lumpur (Serdang) and Alor Setar (Bukit Raya), Malaysia--visited MARDI to monitor on-going research project on the handling of wet paddy at Bukit Raya; to discuss ASEAN project proposals related to post-harvest processing technology; to discuss with KADA the forthcoming Post-Harvest Workshop.

- Lembaga Padi Dan Beras Negara (LPN) to discuss proposed study visit of MOF officials (Bangkok) to study bulk handling of food grain; LPN's paddy post-harvest processing problems; and on-going research projects.

- Iloilo, Pototan, Dumangas, Otono, Panay--to learn about NAPHIRE paddy deterioration study; to initialize contact and cooperation with RCPC (Rural Crop Protection Center) of the Bureau of Plant Industry; and to assess current paddy quality in NFA (National Food Authority) warehouses.

- Jakarta, Bogor and Tambun, Indonesia--to accomplish the following:

- participate in 1-week seminar on Appropriate Mechanics for Rural Development with special reference to small farming in ASEAN countries

- to attend meeting of Technical Team
 - participate in MS Graduate Evaluation
 - draft proposals for BULOG's Food Research and Training Center to be considered for through ASEAN Working Group on Grains.
 - to assist in preparation of 1981 Exchange Program to be conducted in Indonesia (April 1981).
- Manila--ASEAN Grains Working Group to assist in project proposals for EEC and Australian financing.
 - Bangkok, Thailand--Planning discussion with Ministry of Agriculture and Cooperatives in regard to Post-Harvest Extension Services Sub-Division Program and to give recommendations; visit new research facilities at Klong Luang; to request support for programmed visits to Department of Agricultural Extension and Department of Agricultural/Ag Regulatory Division; to make recommendations regarding: export grain shipment phytocertifications, monitoring of imports and grain storage pests.
 - Kuala Lumpur, Malaysia--To consult on bulk storage of milled rice; convey correspondence regarding exchange program in April; to review progress of paddy aeration project; and to review rice hull burner designs.
 - Singapore--To deliver invitation to Exchange Program; discuss 1982 Workshop venue; and to plan rice storage godown.
 - Visit by Cherie Geiser, KSU Food and Feed Grain Institute to help library research through PHDS; assisted Ms. Geiser in coordinating KSU activities and to promote research work.
 - Bangkok, Thailand--To further develop the post-harvest documentation service, to clarify Thailand positions on grain post-harvest workshop and policy advisory board, to check on entomological training need and to visit extension services project.
 - Bukit Raya Station, Malaysia--To accompany Dr. De Padua to help with IDRC project, PAB meeting plans and LPN training and consultation.
 - DBP, Manila and NFA, Quezon City, Philippines--To confirm training commitment to DBP, to coordinate design of demonstration storage at CLSU, to consult on grading studies and to work on progress of NFA warehouse loss assessment.
 - Malaysia (Kuala Lumpur, Tanjong Karang and Kuching (Sarawak))--LPN operations and needs as follows:
 - discuss agenda and date for LPN consultation meeting
 - discuss program, preparation and date for 5-weeks training course centered around recently acquired rice processing facilities
 - discuss LPN request for support in development training program to be implemented at their new training center in Alor Setar (Kedah State)

- monitor on-going research project on storage of paddy in concrete silos under aerated conditions
- discuss with LPN authorities the serious paddy processing problems in their complexes
- study rice post-harvest processing needs in Sarawak to assist LPN in formulation of recommendations
- to attend opening of LPN's new regional office in Kuching, Sarawak
- to study LPN operations in Sabah.

● Malaysia (Kuala Lumpur and Penana)--To attend ASEAN Working Group and Policy Advisory Board meetings.

II. INFORMATIONAL SERVICES

As a part of the technical assistance provided under Contract AID/ta-C-1162 and 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 contract/agreement.

A. Post-Harvest Documentation Service (PHDS)

In its third year of operation, the PHDS continued advertising efforts begun in 1979-1980 through the use of brochures, news articles, conferences, and presentations.

Brochures--A wide distribution of a professionally printed brochure (as opposed to xeroxed versions sent out in previous years) to over 2,000 individuals worldwide was the culmination of continued advertising efforts in 1980-1981. USAID/Washington was sent 1,500 copies for their distribution.

News Articles--Articles about PHDS appeared in the Quarterly Bulletin of the International Association of Agricultural Librarians and Documentalists, SEARCA's (Southeast Asia Cooperative Postharvest Research and Development Programme) Postharvest Quarterly and the GASGA (Group for Assistance on Systems relating to Grain After-harvest) Newsletter.

Conferences--Attending the Online '80 Conference in San Francisco, California provided another means of informing researchers about PHDS. A technical assistance trip to the Philippines and Thailand greatly promoted PHDS' informational services in that region.

Presentations--The 1980 "Grain Storage and Marketing Short Course" participants utilized PHDS much more effectively as a result of a scheduled lecture. The majority of the participants became PHDS clients upon returning to their home countries.

All of these activities have increased the number of PHDS clientele (currently over 200 international) and more than doubled informational output each operating year as per the following:

<u>Year</u>	<u>Document Requests</u>	<u>Search Requests</u>
1979	181	5
1980	563	28
1981	1,240	75

Total acquisitions to date are 2,740. Approximately 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 (batch searches of bibliographical databases), Group for Assistance on Systems relating to Grains After-harvest (exchange documents with eight international organizations), journals, U. S. Agricultural Experiment Stations

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POSTHARVEST DOCUMENTATION SERVICE
Automated Searches/Document Copies Requested

<u>Location</u>	<u>No. of Searches</u>	<u>No. of Fiche</u>	<u>No. of Paper Copies</u>
AFRICA			
Benin	1	0	68
Ghana	2	1	11
Nigeria	3	0	13
Rwanda	0	0	2
Senegal	1	0	4
Sierra Leone	2	0	0
Tanzania	4	2	5
Uganda	0	0	1
ASIA			
Burma	0	0	28
Fiji	0	0	2
India	1	1	67
Indonesia	6	0	5
Malaysia	6	0	12
Pakistan	0	0	13
Philippines	26	56	51
Sri Lanka	0	0	26
Taiwan	1	0	0
Thailand	2	0	0
AUSTRALIA	0	0	4
EUROPE			
Denmark	2	0	3
England	0	2	6
Italy	1	2	8
LATIN/CENTRAL/SOUTH AMERICA			
Brazil	1	17	142
Costa Rica	2	4	21
El Salvador	0	0	45
Guatemala	0	9	0
Honduras	0	0	2
Jamaica	0	0	17
Mexico	0	3	0
Venezuela	0	0	12
MIDDLE EAST			
Israel	0	0	26
NEAR EAST/NORTH AFRICA			
Egypt	0	0	1
Morocco	0	0	20
CANADA	2	0	1
UNITED STATES			
Miscellaneous	3	3	42
KSU/FFGI Staff	9	152	334
Totals	108	670	1,314

and Cooperative Extension Services, miscellaneous national and international organizations, PHDS clients, and Food and Feed Grain Institute staff.

This year 80 publications on fruits and vegetables were removed from PHDS' collection and sent to the newly created Postharvest Institute for Perishables, University of Idaho. A close-working cooperation was established with this Institute and documents of interest to either information service are freely exchanged.

B. Technical Information Requests

Korea - Korea Institute of Science and Technology requested information on hygroscopic properties of grains and natural air drying of grains

Philippines - IRRI requested information on grain storage and drying

China - Grain Storage Division, Peking - requested information on grain storage and drying

Australia - Grain Security Foundation, Ltd. - information on design plan of natural convection dryer for on-farm use (KSU model)

Australia - information on dryers for on-farm storage in developing countries

New Zealand - information on alkali treatment of straw for animal feed

Honduras - information on small grain storage bins

New Zealand - grain processing information

India - information on grain handling equipment

New Guinea - Ministry of Agriculture - information on post-harvest grain losses

Australia - Grain Security Foundation - information on small grain dryer (A'Brook)

Pakistan - FAO - information on grain harvesting equipment for small farm use in developing countries

Australia - information on chlorine treatment of conditioning water

Nigeria - information on rice processing

New Guinea - information on corn milling and milled corn products

Nepal - information on visual and audio-visual materials for training in postharvest technology

USA - Jarvis International, Kansas - requested information on drying and treating jute bags for paddy in Guyana, South Africa

----Farmland Industries, Missouri - information on self-training manuals for grain storage technicians at cooperatives in Kenya

- Don Parks, Iowa - information on grain storage (engineering aspects)
- Larry Johnson, Texas - information on hygroscopic properties of grains and oilseeds
- Larry Hindergast, Connecticut - information on systems and equipment to assure an uninfested product (in flour)
- Glen Swoyer, Kansas - information on malathion surface application and degradation
- John Ross, Kansas - information on insect fragment count procedure and inspection of carlots of wheat for internal infestation
- Frederick Morro, Connecticut - information on infested seeds for fluoroscope non-destructive testing.
- Jim Scott, Massachusetts - information on insect control in processed animal feeds
- Ron Moline, Minnesota - information on infested grain in farm storage and insect fragments
- Jack Soucheck, Illinois - information on microbiological control in flour
- Tim Koester, Kansas - information on contaminant analysis of cereal products
- Thomas Byrne - information on grain storage for refugee camps in Somalia

C. Visitors under USAID Sponsorship and Others

1. AFRICA

- a. Upper Volta (September 1980)
Mr. Alfred Banse, Director General, National Grain Marketing Board, visited with four staff members and discussed post-harvest training and grain storage problems.
- b. Republic of South Africa (September 1980)
Mr. Peter Ernst, Chief Production Engineer, visited with two staff members and discussed grain storage and visited elevators.

2. ASIA

- a. Philippines (July 1980)
Two staff members met with a three-member economics team and discussed marketing and storage problems.
- b. Peoples Republic of China (July 1980)
One staff member met with 12 member grain team and discussed grain storage problems.

- c. Peoples Republic of China (September 1980)
Guozhu Hua, Dechao Zeng, Bingcong Cheng, Zhenyu Li and Riulin Wang visited with a staff member and observed/discussed agricultural mechanization and post-production programs.
- d. Peoples Republic of China (October 1980)
Staff member discussed grain storage and preservation with seven-member grain storage and handling team.
- e. Japan (October 1980)
Dr. Kihada of Okinawa discussed grain storage and drying with staff member.
- f. Peoples Republic of China (October 1980)
Mr. Tao of Peking Grain Corporation discussed grain storage and drying with staff member.
- g. India (October 1980)
Staff member discussed grain storage and sanitation with six Indian wheat industry personnel.
- h. Korea (November 1980)
Y. I. Park, U. S. Feeds Grain Council, reviewed postharvest activities, documentation service and marketing aspects with staff members.
- i. Philippines (December 1980)
Edgardo Quisumbing, KSU/Philippines project coordinator, discussed food and feed processing with staff member.
- j. Philippines (January 1981)
Mr. Norman Teter, SEARCA, (FFGI staff member) visited staff members regarding postharvest problems and Post Harvest Documentation Service.
- k. Korea (January 1981)
Staff member observed and discussed Food and Feed Grain Institute activities with Dr. Doyle Jeon, World Bank consultant.
- l. Korea (February 1981)
Mr. Jae Sal Lee, former Minister of Agriculture and Fisheries, observed and discussed FFGI activities with staff member.
- m. Peoples Republic of China (April 1981)
Staff member discussed grain drying problems with Mr. Ting.
- n. Japan (May 1981)
Wheat team consisting of five members discussed grain storage and preservation with staff member.
- o. Korea (June 1981)
Mr. H. W. Kim, agri-committee, observed and discussed institute activities and visited bulk grain storage facilities with staff member.

3. LATIN AMERICA/CENTRAL AMERICA/SOUTH AMERICA

- a. Mexico, Jamaica, Peru, Haiti, Dominican Republic, Venezuela
(November 1980)
Staff member discussed grain storage and pest control with 28 members of Feed Manufacturing Short Course.
- b. Spain, Venezuela, Chile, Colombia, Nicaragua, Guatemala, Bolivia, Peru, Mexico, Jamaica, Dominican Republic, Indonesia (April 1981)
Staff member discussed futures marketing with 29 members of a U.S. Grain Marketing Systems Short Course.
- c. Bolivia (May 1981)
Seven staff members met with Jose Sanjines, Chief-Economics Department, Executive Secretariat of PL 480-Title III program to discuss FFGI activities, possible future technical assistance, stored grain research, PHDS, wheat pricing policy, food reserves and institutional strengthening.
- d. Colombia (May 1981)
Mr. Luis Moncada discussed FFGI training programs on grain storage and feed manufacturing with a staff member.
- e. Brazil (June 1981)
Mill sanitation was discussed by a staff member with 21 members of a milling short course.

4. EUROPE

- a. Poland (September 1980)
Jan Boczek visited with staff member and discussed stored product entomology.
- b. France (October 1980)
Staff members discussed grain storage/stored product insect problems with Dr. Pierre Anglade, INRA.
- c. Italy (October 1980)
Staff members discussed loss assessment methods with Dr. Harlan Shuyler, Agriculture Officer, FAO.
- d. Switzerland (March 1981)
Staff member met with François Tremeaud, Chief of Cabinet-ILO, Geneva to discuss Kansas and U. S. agriculture in the world economy.
- e. Poland (May 1981)
Polish wheat team visited with a staff member and discussed mill sanitation.
- f. Portugal (June 1981)
Seven members of milling short course discussed mill sanitation with staff member.

5. NEW ZEALAND (July 1980)

Twenty-three Graingrowers met with staff members and discussed grain storage and Food and Feed Grain Institute activities.

6. AUSTRALIA (May 1981)

Four staff members met with Dr. Barry Longstaff and discussed computer simulation model for natural air drying of grains, stored product insects, wheat in long-term storage and use of inert gas.

7. CANADA (October 1980)

Fifteen feed manufacturers discussed grain storage and sanitation with staff member.

Dr. Gordon Yaciuk, IDRC, visited with staff members and discussed grain storage and drying and Post Harvest Documentation Services.

(January 1981)

Dr. F. L. Watters, Canada Agriculture, met with staff members and discussed current research on stored product insect control.

8. UNITED STATES

Dr. Robert Morris, AID/DSB/Washington, D. C., met with staff members and discussed new cooperative agreement (October 1980).

William Stellman, Ken Stafford, and Harry Fenwick (Postharvest Institute for Perishables), University of Idaho visited with staff members and discussed Food and Feed Grain Institute activities (November 1980).

Paulette George, Postharvest Institute for Perishables, discussed PHDS operation in detail to help in establishing PIP's Documentation Center (April 1981).

D. Requests for Institute Reports Prepared under This Contract/Agreement

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

<u>Location</u>	<u>Number of Requestors</u>	<u>TR</u>	<u>RR</u>	<u>SR</u>
AFRICA				
Burundi	1	0	0	2
Gambia	2	8	0	0
Guyana	1	0	1	0
Kenya	1	0	0	2
Mali	1	0	0	2
Nigeria	1	2	2	2
Rwanda	1	0	0	1
Tanzania	1	2	1	0
Togo	1	0	0	2
Upper Volta	2	0	0	9
ASIA				
Bangladesh	1	2	1	0
India	4	0	0	5
Philippines	4	1	2	6
Sri Lanka	1	2	0	0
Thailand	1	0	2	0
AUSTRALIA	2	0	2	0
EUROPE				
England	3	7	4	1
France	2	2	2	1
Germany	2	1	0	0
Hungary	1	2	0	0
Italy	1	2	2	0
Netherlands	2	2	1	0
Switzerland	1	0	0	1
LATIN AMERICA/SOUTH AMERICA				
Brazil	1	0	2	0
Colombia	1	0	1	0
Costa Rica	1	0	0	2
Dominican Republic	1	0	1	0
Ecuador	1	0	0	2
Honduras	3	2	1	2
Mexico	1	0	0	2
Nicaragua	1	0	0	2
CANADA	4	0	4	3
UNITED STATES				
Commercial	5	2	3	1
Government	9	17	5	6
KSU				
Ag. Econ. Teaching	1			38*
Faculty-Staff	19	23	18	11
Libraries	2	0	5	0
Universities	9	48	12	7
TOTALS	99	125	72	115

*User's Guide to Computerized System for Feasible Agribusiness Development, Vol. I Text and Charts, Vol. II Computer Programs.

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 contract/agreement is considered to be one of the most significant contributions of the contract/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 contract/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 contract/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 12 special training programs: International Grains Program (IGP)-- (a) Indian Wheat Industry Personnel for 2 days in October 1980 with 6 participants; (b) Peoples Republic of China Grain Storage and Handling delegation October 24, 1980 with 7 participants; Latin America Feed Manufacturing Short Course for 2 weeks in November 1980 with 29 participants from 7 countries; Mid-East Flour Milling Short Course for 3 weeks in February 1981 with 24 participants from 3 countries; Yugoslavian Flour Milling Short Course held for 3 weeks in March 1981 with 15 participants; U. S. Grain Marketing Systems Short Course held for 2 weeks in April 1981 for 29 participants from 12 countries; Japanese Wheat Team for 2 days in May 1981 with 5 participants; Polish Wheat team for 2 days in May 1981 with 5 participants; Portuguese Milling Short Course held for 3 weeks in June 1981 with 21 participants. Other training included: (a) Canadian Feed Manufacturers in October 1980 with 15 participants; (b) Association of Operative Millers Short Course held for 4 weeks in May 1981 with 52 participants; and Korean Feed Grain Team in May 1981 with 5 participants.

Training provided in conjunction with Contract AID/ta-C-1162 is discussed in greater detail in the following paragraphs.

A. AID Grain Storage and Marketing Short Course - 1980

The tenth annual AID Grain Storage and Marketing Short Course was held June 16 through August 1, 1980.

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 16 through August 1, 1980.

Based on previous years' recommendations in participant evaluations, attempts were made to provide greater depth of instruction in the economic and technical aspects for participants interested in these specific areas. A core of subject material for all participants included the following subject areas: Structure of cereal grains; grain inspection; standards and grading; moisture and its measurement; causes of losses; microflora and chemical, physical and nutritive changes; pest control; methods, equipment and structures for drying,

aerating and handling of stored grains; principles of management and operation; storage costs and alternatives; bookkeeping and inventory control; transportation and government in marketing.

The technical group received expanded training in the areas of: Moisture measurement; microflora; insect identification; biology and methods of detecting contamination; rodent and bird biology; pest control--inspection, house-keeping, physical and mechanical methods; insecticides and fumigation practices; grain drying and aeration; storage structure design; and grain grading and inspection practices. During the course training, two evaluations were given the technical group to determine if the training was being understood.

The economic group received expanded training in the areas of: Facilitating marketing operations; analysis of the marketing system; organization of the grain business; government involvement in grain marketing; grain transportation planning; master projection of grain data; and feasibility analysis of grain projects.

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 similar arrangements made the previous year. Accompanied by five KSU staff members, 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 elevators, port facilities and observed sacking operations. Literature was provided in addition to the tours.

The 1980 Short Course included 32 participants from 15 countries including Nicaragua (1), Ecuador (1), Costa Rica (1), Honduras (3), Mexico (2), Togo (1), Burundi (3), Kenya (2), Upper Volta (6), India (1), Japan (1), Mali (1), Brazil (2), Malaysia (3), and Nigeria (4).

"Participant Country Reports" continue to be an effective way of getting participants actively involved in discussing their individual country grain storage and marketing systems and problems. It is extremely important for the participants to be able to look at their own storage and marketing situations and evaluate them from the standpoint of strong and weak links in the total marketing chain. In the past, we have had difficulty in providing "Participant Country Information Summary" manuals to participants before they depart their home countries for the short course. The manuals are provided to assist the participants in gathering pertinent data on their countries' storage and marketing systems. Due to the fact that we are not receiving notification of which missions are sending participants with enough lead time so that manuals can be sent and those participants without the benefit of the manual are at somewhat of a disadvantage in presenting their reports and in certain other workshop activities, this practice has been discontinued.

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 16-August 1, 1980

I. Participant Data

1. Sponsorship: AID 13 FAO 4 Joint Commission 0 Other 11

2. Male 28 Female 2

3. Are you participating in any other training in the U.S. in addition to this course? YES 6 NO 25

4. Please list your primary professional (or educational) field.

- 3--Ag Engineer
- 2--Storage
- 2--Agronomy-Grain Storage Research
- 2--Crop Improvement
- 1--B.S. (Agricultural Engineering and Technology)
- 1--Inspection and grading of produce
- 1--B.S. (Agriculture) Working with Ministry of Co-op
- 1--Agricultural marketing
- 1--Graduate in Agriculture
- 1--University graduate, Economics of Delivery of Wheat and Barley
- 1--Pest Control and Grain Storage
- 1--Senior Co-operative officer (RC), Kenya
- 1--I have just finished professional training, called to manage and direct
- 1--Agricultural training (wheat)
- 1--Commercial agent in the management of stocks and sales
- 1--Plant pathologist
- 1--Controller of National Cereal Storage Center
- 1--Management controller (storage, sales, processing)
- 1--Public accountant
- 1--Economics (marketing)
- 1--Marketing expert and public accountant working in supervision of storage and preservation.
- 1--Grain handling
- 1--Economist
- 1--Civil Engineer; Specialist in Rural/Agricultural Consultation

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

- 1 year--4
- 2 years--4
- 3 years--2
- 4 years--3
- 5 years--1
- 6 years--3
- 7 years--1
- 8 years--1
- 9 years--2
- 10 years--3
- 12 years--2
- 13 years--1
- 15 years--1
- 20 years--1

6. Please indicate the highest academic level you have achieved.
 Secondary Diploma 6 B.S. 4 M.S. or M.A. 1 Ph.D. 0

7. What is the length of your stay in the U.S. up to the present?

7 weeks --- 15
 8 weeks --- 1
 2 months -- 9
 3 months -- 1
 4 months -- 1
 14 months -- 1
 11 years -- 1

II. Course Enrollment and Orientation

1. Before enrolling in the seminar, did you have sufficient information available to decide whether or not you wanted to attend? YES 21 NO 11

2. Were the objectives of the program clear to you before you began the seminar? YES 24 NO 8

3. Were the financial arrangements for the course clear to you before your arrival? YES 21 NO 10

4. See "Comments".

5. How helpful was the Washington International Center orientation?

Not at all		Moderately		Very useful	Did not attend
1(1)	2 (0)	3(0)	4(2)	5(3)	(20)

6. How helpful was the USDA orientation in Washington?

Not at all		Moderately		Very useful	Did not attend
1(1)	2 (1)	3(2)	4(1)	5(3)	(18)

7. See "Comments".

III. Training Environment and Support Arrangements

1. How adequate were the following arrangements?

	Not at all	Adequate	Very Good
<u>Training facilities</u>	(0)	(15)	(17)
<u>Housing Accommodations</u>	(1)	(15)	(16)
<u>Meals</u>	(10)	(13)	(8)
<u>Transportation</u>	(2)	(8)	(22)
<u>Field Trip Arrangements</u>	(0)	(14)	(18)
<u>Social Activities</u>	(4)	(17)	(11)

2. Do you consider that the daily schedule was generally 0 too short; 23 about right; 10 too long.
3. Was the rest and break time 5 too short; 23 about right; 4 too long.
4. Please rate the following individuals in terms of the support provided for the duration of the program.

	<u>Not Helpful</u>		<u>Moderately Helpful</u>		<u>Very Helpful</u>
a. USDA Program Coordinator (Ernie Gutierrez)	1(0)	2(1)	3(3)	4(4)	5(24)
b. On-site Training Coordinator (Dr. Robert Julian)	1(0)	2(0)	3(2)	4(2)	5(27)

See also "Comments".

IV. Training Objectives

- a. Grain storage, handling, drying, and marketing.

<u>Not Achieved</u>		<u>Partially Achieved</u>		<u>Fully Achieved</u>
1(0)	2(0)	3(10)	4(2)	5(12)

See also "Comments".

- b. Grain marketing and grain loss problems.

<u>Not Achieved</u>		<u>Partially Achieved</u>		<u>Fully Achieved</u>
1(0)	2(0)	3(8)	4(8)	5(13)

- c. Grain inspection and grading.

<u>Not Achieved</u>		<u>Partially Achieved</u>		<u>Fully Achieved</u>
1(0)	2(0)	3(3)	4(8)	5(9)

- d. Handling and marketing firms.

<u>Not Achieved</u>		<u>Partially Achieved</u>		<u>Fully Achieved</u>
1(0)	2(1)	3(1)	4(7)	5(8)

- e. Economic principles of marketing and organization of small and large firms.

<u>Not Achieved</u>		<u>Partially Achieved</u>		<u>Fully Achieved</u>
1(0)	2(1)	3(0)	4(7)	5(5)

See also "Comments".

V. Course Activities for Final Week

Activity	<u>Not Useful</u>		<u>Moderately Useful</u>		<u>Very Useful</u>
	a. Rodeo	1(2)	2(0)	3(11)	4(7)
b. County fair	1(0)	2(1)	3(4)	4(1)	5(4)
c. Banquet	1(0)	2(0)	3(2)	4(3)	5(20)
d. Trip to New Orleans	1(0)	2(0)	3(0)	4(0)	5(1)
e. Critique	1(0)	2(0)	3(0)	4(0)	5(1)
f. Barbeque Picnic	1(0)	2(0)	3(0)	4(0)	5(1)
g. Grain Loss Assessment	1(0)	2(0)	3(0)	4(0)	5(1)
h. Transport and Locational Analysis	1(0)	2(0)	3(0)	4(0)	5(1)
i. Abilene	1(0)	2(0)	3(0)	4(1)	5(0)
j. Exams	1(0)	2(0)	3(0)	4(1)	5(0)

See also "Comments".

IV. Field Experience(s)

A. Circle a number from 1 to 5 in order to rate the adequacy of the logistical arrangements for the field experience(s).

	<u>Not Adequate</u>		<u>Adequate</u>	<u>Very Good</u>	
1. Preparatory information	1(3)	2(1)	3(8)	4(10)	5(9)
2. Overall Coordination	1(0)	2(1)	3(6)	4(5)	5(20)
3. Transportation	1(1)	2(0)	3(6)	4(5)	5(19)
4. Housing	1(1)	2(1)	3(6)	4(7)	5(16)
5. Food	1(3)	2(3)	3(6)	4(9)	5(10)

B. The amount of time allocated to field experience(s) was 25 just right; 6 too little; 0 too much.

C. Determine your major field experience(s) and rate for overall satisfaction from 1 to 5.

	<u>Not Satisfied</u>		<u>Moderately Satisfied</u>		<u>Very Satisfied</u>
a. Local field trip	1(0)	2(0)	3(5)	4(4)	5(8)
b. Tour	1(0)	2(0)	3(1)	4(1)	5(3)
c. Inter-State	1(0)	2(0)	3(1)	4(0)	5(0)
d. Fumigation	1(0)	2(0)	3(0)	4(0)	5(2)

	<u>Not Satisfied</u>		<u>Moderately Satisfied</u>		<u>Very Satisfied</u>
e. Modern farming techniques and equipment	1(0)	2(0)	3(0)	4(0)	5(1)
f. Handling of products for shipment	1(0)	2(0)	3(1)	4(0)	5(2)
g. Irrigation systems and Board of Trade	1(0)	2(0)	3(0)	4(0)	5(1)
h. Marketing	1(0)	2(0)	3(1)	4(0)	5(2)
i. Storage	1(0)	2(0)	3(0)	4(2)	5(0)
j. Pest control	1(0)	2(0)	3(1)	4(0)	5(0)
k. Harvesting (wheat)	1(0)	2(0)	3(0)	4(1)	5(0)
l. Field losses	1(0)	2(0)	3(0)	4(0)	5(1)
m. New Orleans	1(0)	2(0)	3(2)	4(3)	5(8)
n. Grain preservation	1(0)	2(0)	3(0)	4(0)	5(1)
o. Project analysis	1(0)	2(0)	3(0)	4(0)	5(1)
p. Kansas	1(0)	2(0)	3(2)	4(0)	5(0)
q. Co-op	1(0)	2(0)	3(0)	4(0)	5(1)
r. Arkansas University	1(0)	2(0)	3(0)	4(0)	5(1)
s. Country Elevator	1(0)	2(0)	3(0)	4(1)	5(0)

D. See "Comments".

E. See "Comments".

F. How effective did the on-site personnel contribute to the overall success of your field experience(s)? (Circle a number from 1 to 5.)

<u>Not Effective</u>		<u>Moderately Effective</u>		<u>Very Effective</u>
1(0)	2(0)	3(4)	4(8)	5(18)

See also "Comments".

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

<u>Not useful</u>		<u>Moderately useful</u>		<u>Very useful</u>
1(0)	2(1)	3(3)	4(6)	5(21)

VII. The Instructors

The effective delivery of material is central to the success of a program. Please rate your instructor(s) for overall effectiveness of his/her presentations.

<u>Not Effective</u>		<u>Moderately Effective</u>		<u>Very Effective</u>
1(0)	2(0)	3(1)	4(7)	5(22)

See also "Comments".

VIII. Your Involvement

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

<u>Not at all</u>		<u>Moderately</u>		<u>Shared a great deal</u>
1(0)	2(1)	3(12)	4(9)	5(8)

2. Do you feel you participated to the extent you wanted? 22 YES 8 NO
If not, what would have helped to increase your participation?
See "Comments".

IX. Organization and Conduct of Program

1. How do you feel about the amount of time devoted to the following activities?

Lectures	(26)	(4)	(2)
Group Discussion	(15)	(0)	(15)
Small Group Work	(15)	(0)	(15)
Participant presentations	(24)	(6)	(1)
Field Trip	(28)	(1)	(2)
Individual consultation with Instructors	(22)	(0)	(8)

See also "Comments".

2. In general, was the level of presentation
4 too simple; 22 about right; 3 too complex.

3. The written materials used in this course have been:

<u>Not helpful</u>		<u>Moderately helpful</u>		<u>Very helpful</u>
1(0)	2(0)	3(6)	4(6)	5(20)

See also "Comments".

4. The issues and problems discussed during the training were:

<u>Not relevant to my work</u>		<u>Moderately relevant to my work</u>		<u>Very relevant to my work</u>
1(0)	2(2)	3(4)	4(7)	5(19)

See also "Comments".

5. If the English language was a problem, to what extent did it limit your understanding or participation?

<u>Not at all</u>		<u>Moderately</u>		<u>Very much</u>
1(8)	2(2)	3(11)	4(2)	5(3)

6. Were you satisfied with the order in which topics and activities were presented? 27 YES 4 NO

See also "Comments".

7. How satisfactory was the length of the course?

8 too short; 22 about right; 0 too long.

8. Which of the sessions included in the present course do you feel should be lengthened or expanded?

See "Comments".

9. Which of the sessions included in the present course do you feel should be shortened?

See "Comments".

10. What topics, if any, do you feel should be added to this course?

See "Comments".

11. What topics, if any, do you feel should be omitted from this course?

See "Comments".

X. Overall Satisfaction

1. Please indicate your overall satisfaction with the course by circling a number on the scale below.

<u>Not at all Satisfied</u>		<u>Moderately Satisfied</u>		<u>Very Satisfied</u>
1(5)	2(1)	3(1)	4(12)	5(16)

See also "Comments".

2. How important was the subject matter for your job?

<u>Not Important</u>		<u>Moderately Important</u>		<u>Very Important</u>
1(0)	2(1)	3(2)	4(9)	5(20)

See also "Comments".

3. Overall how valuable or beneficial has this course been in terms of your professional needs and responsibilities?

<u>Not at all Valuable</u>		<u>Moderately Valuable</u>		<u>Very Valuable</u>
1(0)	2(1)	3(4)	4(7)	5(20)

See also "Comments".

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

See "Comments".

5. Please check one of the following:

(28) I would recommend this course to other participants with backgrounds and interests similar to mine.

(0) I would not recommend this course to other participants with backgrounds and interests similar to mine.

6. 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?

See "Comments".

COMMENTS

I. Course Enrollment and Orientation

a. Enrollment

- Information was not sent out early enough.
- Information about the course should be supplied early to the participant with full details of the program.
- Send to the participants a month in advance information on life here, as well as the program for the course so that they will be informed before leaving home.
- Information should be sent sooner.
- I wish that in the future the participants could have all the necessary information before leaving home. In my case, it wasn't until I arrived in Washington that I found out the course would be held in Manhattan.

- The bottom line is the USDA should help by telling all the employers of the participants that it is necessary to send two or more technically different participants. So that both technical and economic aspects become useful to the employer.
- Enrollment should be two per every employer. One person could train in economics area and one in the technical area.

- The instructors should be made aware of the participants educational and rank background to be able to devise the best method of delivery, goods and service to them.
- Level of participants should be indicated in preliminary information.
- Should be done sooner and more general information should be asked about the participants so that the program can be adjusted to them.
- The candidates that apply should conform to the requirements of the course, since the difference in levels slows down the course.
- Professional level and knowledge.
- I would suggest that all the participants be at the same level.

- I wish USAID would send us precise information before we enroll.
- The checks arrive a little late.
- Perhaps in the countries it would be useful to other persons not sponsored by FAO, USAID or government. Developing countries need technical information.

- Participant should be informed that they do not need a lot of clothes. They should travel light. Facilities available on the campus should be part of the enrollment information.

- I would recommend to the participants of the next course to take an English course of at least one hour a day in order to facilitate their development in this country.

- I think that the enrollment of participants is the business of each country and I have no objection on this point.
- Everything was well organized.

- b. Orientation - Washington, D. C.
 - Adequate for a foreigner in a big city.
 - I think the orientation was well planned and satisfactory.
 - Adequate.
 - Very good; congratulations.
 - We had always collaboration and information.
 - Everything was very good.

 - Orientation is a good thing, so that each person can specialize in his field.
 - There should be at least 2-4 days orientation in Washington concerning the entire Grain Storage and Marketing Short Course.

 - The participants should be informed of the orientation in advance so that they can plan to attend.

- c. Orientation - Manhattan
 - It is important to get to know the University environment in order to know how the library and other necessary facilities function.

II. Training Environment and Support Arrangements

- a. Coordinators
 - Ernie Gutierrez seems to be more helpful to the Latin groups.

- b. Housing Accommodations
 - The point is, privacy is very important. Additionally, participants do behave like robots.

- c. Meals
 - The meals could be improved by trying to have a more specialized cuisine for the different backgrounds.

- The food habits of the visitors from foreign countries may be taken into consideration so that they may not remain hungry at times.
- Since the participants are all over the world, I would suggest that the food services at the dorm should be the international meal.

- There is no choice of food.
- Only you did is to give us American food that was too sweet. You did not pay attention to food problems. 70% of us come from rice eating countries, so if you order to stay in Moore Hall, you should have taken care of it.

- The arrangements of food should be based averagely on the type of nationalities attending the course.
- The food was not very convenient for all of us. I especially had constipation followed by headaches.

d. Social activities

- If possible, participants could be introduced to older students in the University or a family in Manhattan.
- A cultural night for the benefit of the trainers may be very useful so that the trainers may know more about America's culture life (traditional culture); this can be coupled with the banquet.

III. Training Objectives

Comments in this section have been integrated with the Comments in Section VIII because of the large amount of overlap with these groups of Comments.

IV. Course Activities for Final Week

a. Banquet

- Very well organized.
- This was a good opportunity to get together with the staff of the course.
- Gives each country the opportunity to express its thanks.
- Very emotional event.

- We noticed that the farmers and industry people were present. This shows us that they are interested in us and in our training.
- The food was good, and I was able to get to know certain people.
- It is a good way to say goodbye. The last time the participants and the staff can get together.
- The banquet allows the staff and the participants of the course to express their joy and to say goodbye.

- Very necessary because it allows us to meet the staff and to all get together.
- In general, the organization was good.
- For once, everyone was able to get together.
- The banquet was very good, in spite of the fact that it is not like ours (beer, music).

- The banquet was very important as all the participants will sit together with the lecturers and dine.
- The banquet is very necessary for it serves as a memorable occasion for both the participants and guests.
- The banquet was a chance to meet professors, office staffs, supporting organizations, representatives, etc., which make this course possible.

b. County Fair

- We got an idea of how the rural areas work.
- This kind of entertainment is fundamental for the group's recreation.
- This allows us to see how livestock are raised. Very important because this was our only chance.

- Fairly useful as a recreational activity.
- Very important, because to know and understand man, you must know his environment.

c. Course Critique

- The critique helps the instructors to devise an almost precise course for future participants.

d. Exams

- Helped to evaluate us and helped to evaluate ourselves and to know how much we learned in the course.

e. New Orleans Trip

- The trip to New Orleans was one of the most exciting for it was in line with the course objectives.

f. Rodeo

- Allows us to know the idiosyncrasies of the country and to share with it.
- Balanced the activities of the course with recreation.
- It is good for getting to know about cowboys and recreation in this country.
- Mental education.

- This helped us to know more about this country, its customs and celebrations.
- Useful as recreation and also as knowledge about American traditions.
- The rodeo was very satisfying because it is the first time I have been to one
- Endurance of man and beast.

- This teaches the participants about USA history and it is a nice distraction.
- This allows us to compare the rodeo in our country with the one here.
- Not useful because it is very dangerous.
- Too many risks involved.

- Very interesting, only I didn't have a horse.
- This is a part that we don't understand. It has some historical value, because I used to read Cowboy magazines when I was little.
- The rodeo exposed some of us to the kind of games going here. Helpful in relaxing our minds.

- I could see and have some ideas in mind how cowboys handle thier cattle.
- The rodeo should be continued. This is a part of American culture every foreigner should not miss seeing.

V. Field Experiences

a. Unsuccessful Comments

- I would have liked more practical work and the chance to handle instruments and machinery. Then the success of the course would be complete.
- On-site.
- More practical work.

- The group was too large.
- Time, plus the groups should be divided for the field trips (economic, technical), since some are interested in one thing and some in another.
- The group is quite big, where each individual has their interest in what to observe. So some places visited have poor response to certain participants.
- The group should be split into different fields. Let the participant work and learn about the organization they chose for a week. No tour and no field trip.

- On field trips, more time should be given to elevators and farms.
- Too long a time at one facility, make it short and it will be more interesting.
- The small amount of time for fumigation and storage demonstrations. More time should be given to them.
- A little inadequate distribution of time allotted for different disciplines.
- I would like to suggest an orientation as to the types of questions to ask on these visits since many participants ask irrelevant questions.
- The relatively short time given to certain visits didn't allow the participants to obtain all the information they need.

- Restrictions, i.e., a case in point is the refusal to allow participants to take photographs at Butler Manufacturing Co.
- We couldn't get off the sightseeing bus at the rice center and New Orleans. This was very unkind for us and very formal. I lost money. There is no need to see dryer companies. I couldn't understand this. One time is good enough to see dryer companies if you have such time. I would like to see a few waterways and barge systems.

- The local field trips were too numerous. Many times we saw the same silos. This could be limited to improve the course.
- Local elevators visited not worthwhile to be seen. (Poor housekeeping; old-fashioned structures). Would like to have more participation of the staff pointing out things already discussed or that were going to be discussed in class.

- There was a training centre who showed us their director's room, professor's room, student's room, his office room, and that is all. We do not gain in a visit of this nature.
- Too hot for too long.
- Lack of finances. The hotels were kind of expensive.
- The weather at this time.

b. Successful Comments

- The good coordination developed in the course.
- Coordination, the professors accompanying on the trips.
- Coordination.
- Very well arranged; very conversant instructor; hosts were very willing.
- Good coordination and the devotion of the staff and personnel (good will).
- The organization of the group trips. All persons responsible, down to the chauffeur, did their jobs well and always let us know when we would be taking a trip.

- The lectures given by the different officials that we visited contributed greatly to the success of the trips. (A diverse range of information was obtained.)
- The selection of staff and instructors and those in charge of giving explanations at the places we visited.
- Experienced lecturers.

- Availability of employees convened as well as their mutual cooperation.
- All the participants and field staff work together.
- Time; staff on hand.
- Environment; simplicity of professors; warm welcome on the part of the field trip hosts.
- The availability and the warm welcome given to us by silo and plant managers, and the organization by AID.

- Effective participation of everyone.
- The willingness of people to cooperate with the participants and the efficiency of the planning carried out.
- The harvest and post-harvest seasons allowed us to observe practical steps and the coordination of the KSU staff.
- The forms of wheat harvesting that we saw. The fumigation and storage demonstrations. The visits to silo and elevator manufacturers.
- We were shown what people have been doing in field and for the progress of agriculture.
- Modern technology in agriculture and the cooperation accorded to us by the staff of the university and the people we visited at various places.
- Seeing farmers crops and elevators are very good experiences.
- Visits to silos; discussions with managers.

- Local trip-receptions by manufacturing and cooperation. Tour due to accompanying staffs, a good bus driver, and the places that we see.
- The field trips, the bus driver, and the welcome we got at the various cooperatives.
- The visit to the Agric Museum, Abilene, Stuttgart. The swimming pools in the hotels and the dynamism of the bus driver.
- The New Orleans trip really let us get to know the U.S.A.

- It was a good idea to return by plane. A return by bus would have been too tiring since we were already worn out when we arrived at New Orleans.
- Everything was good.

c. Field Experiences - Onsite Personnel

- On-site personnel are cooperative in giving us details of the trip.
- Almost all were willing to explain everything in their firms or farms.
- Clear but rapid.
- Everything was done to make the field trips a success.

- Very effective because they put up with the good and the bad of the participants.
- It was organized as a group and the work was not left to one person.
- Very friendly, above reproach and very animated.
- I think many things enter through the eyes. More practical work.

- Well-trained staff.
- The people that gave the explanations tried to do their best.

VI. The Instructors/Instruction

a. Instructors

- The teaching and communication on the part of the instructors was excellent.
- Staff well-suited to the different areas and topics discussed.
- All showed great interest that we all get the most out of their knowledge.
- Variable, perhaps the main limiting factor is the time for each topic.
- From these course, you can see the love that the professors have for their jobs and the pleasure they take in communicating this information to us.
- The professors did a good job in the courses. Each one did his best.
- Very knowledgeable people.

- All professors were devoted to their work. Their courses were useful and instructive.

- All made up of very well-versed people and especially in the Economics section.
- Dr. Borsdorf; experienced and very effective.
- I will report to my country with a very good impression, especially of Dr. Borsdorf to whom I give my sincere thanks.

- I would like to take this occasion to sincerely thank Dr. Pederson for his presentations illustrated with lots of pictures.
- Dr. Chung and Dr. Pederson did a splendid job.

- Showing of color slides of certain difficult to identify items may be more useful.
- Some instructors during the course of giving instructions or lecturing do not stress the important points for the student to observe and further more the manuals are given in outline form only.

--It would be better if the instructors left the obligation of reading the materials to the participants, and avoided using their lectures to read the materials out loud. It would be more effective if the instructors used their time to present practical cases and let the participants read the materials at home.

b. The Instructors - Translation

- The interpreters were very mediocre, especially in French. We lost 1/3 of the course material, because of this problem.
- The interpreters were not all up to the job. We need good interpreters.
- As for translating into foreign languages, it seems you should hire professionals. If necessary, from foreign countries, especially for French. This is a real problem for French-speaking countries.
- The translating earphones which always broke down.

- If I had known English, I would have gotten more out of the training.
- I am very satisfied, but I would have been more satisfied if it were not for the language problem.
- I am not very satisfied because I don't speak the language.

VII. Your Involvement

- If possible, there should be time set for discussion and not listening to lectures continuously.
- To explain our methods and means of working.
- If I spoke English.
- Know English.

- Language; intellectual level.
- The problem of language was an obstacle to communication between the groups. We could have accepted each other better if we had spoken the same language.

VIII. Organization and Conduct of Program

a. General

- I wish the group were separated after the first week and that the courses of general interest be given to all participants together.
- More technical and economic groups should be divided early to give each group more time.
- Every participant should take specific topics only.

- The problem is not participants are satisfied with the course, in the sense, if not all are one-sided trained.
- Try to equalize the group by activities.

- Lengthening the duration of the course.
- Increase the length of the course and invite those who work in these subject areas; with a required education level or number of years of experience.
- Particularly satisfied with the organization and the program despite the fact that it is different and more difficult. We had to change our habits.

- The on-job training after class lectures would make the subjects more meaningful and effective.
- I think there should be personal work after the course.
- Since there is not enough free time to study in between classes, memorization has to be done mainly in class, and classes should be prepared to do so.
- It would be good to encourage the participants to study a little more since in this way they can return the knowledge acquired and do better on the tests.
- There should be time set for individual study and participants be given carry-home test for next day discussions. This will help quick understanding.
- Too much basic and fundamental.
- I would like to suggest a more advanced course (diploma) for those who earlier attended this course, be prepared which would enable more participants to attend for further studies.

b. Lectures

- The course is too general.
- About 30% of the lectures is basic, it would be better for you to have actual marketing or teaching.
- Actual situations of marketing is better.
- I suggest the course should be specific according to the field chosen by participant.
- I would suggest that the training be specific so that the participant can specialize at different fields they like.
- Time constraint. This leads to inadequate coverage of some topics in a hurried manner. Therefore, time should be extended.
- Lectures given although about right, are very brief and don't go into much detail.
- Generally, the lectures are compressed into one or two lectures which under normal circumstances would take longer.
- The issue is as much as possible, the course should be general and to the participants, i. e., all participants must offer technological and economical aspects of the course.
- All the sections of work were very good.

c. Written Materials

- Notes should be given and not the outline in the manual only.
- Some materials were only summaries or outlines.
- Materials; skeletal in the sense, books on such topics not available to the participants to read before lectures.
- Since this is a short course, the full notes should be supplied instead of schematic outlines in the manual.
- You should give us actual books, not similar books.
- More in-depth materials (hand-outs) should be given to supplement some lectures.

- The materials given should be in detailed form, which in my opinion would only then permit the instructors to lecture briefly.
- The notes in the books issued to the participant should include more notes and examples.
- Split the group according to the standard of participant educational background. (In order to provide written materials on different levels?)
- I wish that the course would be supplemented by books and summaries, especially for the French speakers who have language problems.
- More allowance for reference books.
- Improve the translation.
- Everything should be translated into the corresponding language and that will facilitate assimilation after the lecture.
- More didactic material.
- They should go according to how the technology advances.
- They should be distributed on time.
- I hope that in the future the participants will have the information needed to take the necessary measures.

d. Exams

- For the technical group, if the practical examination is held twice, therefore once in the middle of the course and again during the last week, would be more helpful. This may be done by avoiding the theoretical examination held, especially the marketing part which may not be of that much use compared to the technical part.
- So that participants can do better on the tests, I think there should be weekly evaluations.
- In marketing; include a short test (true and false, or similar at the end of each topic taught) highlighting the main points.

e. Individual Consultation with Instructors

- As far as consultations with professors, language was always a problem.
- Some time should be given to consultation with an interesting professor.

f. Relevancy of Issues Discussed

- These are problems that occur in our countries and thus are very relevant.
- I encounter many problems in my work which involve things I have learned.
- Since this is what I work with.
- Try to put the knowledge obtained to work in the project I am working on.
- This covers real problems in my work.
- The subjects discussed touched upon the problems in my own country.
- We have storage and marketing problems
- I would like to do more studying in the U.S. especially in the area of grain.
- I work with ENAC; a business dedicated to grain, storage, and handling.

- Since I work with grain handling and preservation, the technical group discussed many topics related to my work.
- Some subjects in the course are directly connected with my present job, while others are of no great significance.
- I work in grain storage research and took the marketing segment of the course.
- In the case of storage, we store grain in sacks.
- We don't have any large storage structures so we won't be using the material learned here all the time.
- My objective was to increase my knowledge about marketing, storage, etc.
- The technical group on phytopathology.
- The problems of implementation and direction of control are important to my job.

g. Courses to Lengthen - General

- Increase the practical work. (6)
- Practical aspect of the course.
- Practical training on the subjects taught to the technical group.
- Grain marketing and grain processing.
- The time given to production is too short. If it could be expanded the training would be complete. (2)
- Because of the time available, it was difficult for the staff to go into detail on the subjects discussed.
- All aspects of the course to impart rigorous training.
- Own library study time. At present not available.

IX. Courses to Lengthen - Grain Storage, Handling, Drying

- More time for drying.
- More explanations and practical work on aeration, and use of psychrometric charts.
- Practical problems on grain drying and aeration.
- More time for psychrometry and practice with aeration systems.
- Drying aeration, laboratory.
- We need more work with Dr. Chung on drying.
- I would like more lab sessions with Dr. Chung and others.
- Perhaps more time should be given to aspects such as aeration and drying; specifically for each grain.
- More practical work. (2)
- Storage aspect (more calculations), storage fungi and insects.
- More emphasis on molds. (2)
- More time for molds and diseases produced by them.
- I will like to spend more time in laboratory; to be more in contact with equipment (moisture tester, fungi and insect identification).
- There should be more practical work to be carried out by student especially in the field of pest control, processing.
- Possibly give more time to processing practices in the field.
- Grain processing.
- The laboratory sessions. (4)

- I need to see more machine operations rather than having a general outlook of it.
 - More visits.
 - Give more time and more practical work (storage, handling, drying grains).
 - Entomology and pesticides.
 - Inspection sessions.

 - Agricultural engineering.
 - More time on the technical part.
 - Maintenance of equipment for drying, receiving, milling and storage of grains.
- a. Grain Inspection and Grading
- More time should be devoted to the laboratory session.
 - More practical work.
 - More work with each grain on an individual basis, classification, damages, criteria.
- b. Handling and Marketing Firms
- You should give us some chances to discuss with a few farmers, or visit many farmers fields.
 - Time factor.
 - Reduce the technical aspects and have more visits to different areas to develop practical work.
 - More time, for example in rice milling.
- c. Grain Marketing
- In economics, the case studies and the forecasting were not entirely covered because of lack of time and the computer programs.
 - Marketing research; marketing systems; forecasting.
 - Since I work with technical marketing, I would like the practical visits increased and to develop a model project to practice marketing.

 - Economic and financial analysis.
 - Types of production credit (loans) for small farmers.
 - Project analysis and evaluation.

 - Transport and locational analysis.
 - Actual transportation by truck, barge, rail.
- d. Grain Marketing and Grain Loss Problems
- Measurement of post-harvest losses should be a course by itself.
 - Measurement/assessment of grain losses.
 - Subject on postharvest losses, i.e., the method and practical work on calculating postharvest losses should be emphasized, if possible, a course by itself.

 - Give more emphasis on losses.
 - Practical work. (3)
 - As I am from a rice producing country, I would like to know more on losses and marketing of rice rather than wheat and corn.

--I would like to have the participants work more with case studies relative to practical marketing problems.

e. Economic Principles of Marketing and Organization of Small and Large Firms

--Time factor.

--More case studies. We want to know actual status situation of marketing, transportation. (2)

--Managing the business, case studies, analysis and forecasting.

Courses to Shorten

--Marketing for the technical groups.

--Less economic theory.

--Less theory.

--Handling and economics.

--Country reports. (2)

--Less time on rodents.

--The subject of rodents. I think it is too long.

Courses to Add

--General use of computers.

--The course should be dealt with special emphasis to developing countries

--On job training for technical group.

--Option of more time for participants who are interested in increasing their knowledge on a certain topic.

--One week of intensive English.

--An English course should be given during this period. Maybe from 6:30 p.m. to 8:00 p.m.

--A short lecture to give more incentive to the participants to choose a specialization, since the current requirements demand it.

--If any of the participants could get a masters or PHDS, this would be good to know.

--Everything was good.

Courses to Delete

--Country reports. (2)

--No need to learn economic principles.

--None.

--Everything was good.

Participant Presentations

--We should know that we will be expected to give a country report since some of us have no direct relation with, for example, grain marketing, and therefore find it difficult to explain this aspect.

--Several participants mentioned that they were not informed about the country reports. I don't know what the reason was, however, I think it would be good to inform them.

--The country reports could be reduced by 30 minutes to give more hours for class or consultation with professors. The country reports could be done at the beginning of the course.

X. Overall Satisfaction

a. General

- Having worked with cereal grain storage for six years, and having participated in three technical short courses in my country, this course helped me a lot, contributed a lot for my professional activities, assembled a lot of theoretical and practical materials, very good relationships with the professors, and I hope I can set up a similar short course in my country to train technicians in this field in order to minimize our problems.
- I would like to take this space to thank the organizers and professors. Of all the courses I have attended, this one has been the most organized and complete as far as topics and practical work.
- I think it will please others as it has pleased me under the same conditions.
- I have gained a lot of knowledge and experience from the course.
- Overall, the course, especially the field trips, exposed me more to the working experience, which I needed more knowledge.
- There are many topics to be taught, but each topic presented is not adequate.

- Has improved my understanding of marketing and storage of grains.
- With this knowledge I will be able to serve more efficiently than before.
- Invaluable, priceless. I believe individual satisfaction is very relevant and satisfying.
- This ratified the need to know the former participants.
- I wasn't able to participate as much as I would have liked in the economic area.

b. Subjects Most Useful to Participants Professionally

- Cereal storage; cereal processing.
- Storage; marketing; handling.
- The courses Dr. Pederson taught are very important for my job.
- Everything related to storage (the whole course).

- Grain handling; drying; milling; storage; marketing.
- Material related to grain preservation; organization of the grain business; financial analysis and evaluation of projects.
- Grain storage.
- General aspects of grains storage matter (inspection of products, storage and pest control).

- Drying and storage.
- Some aspects such as grain processing is important to my nature of job.
- From developing country grain storage is very important because grain stored in good conditions doesn't lose its quality and loss is low. So by using the knowledge for the course, I can save loss of grain.

- Pest control.
- Pest control; sanitation of warehouses; application of fumigants and insecticides.
- Processing and pest control.
- I work regarding pest control and godown sanitation so I wish to have more information about that matter.
- Knowing rapid methods for determining grain moisture with various instruments and thus control the condition of the grain in relation to various pests and diseases. The evaluation of losses in the field and in storage and the various methods for remedying this that were shown to us.

- Grain storage and handling is insufficient in my country. I think that this course will help me instill in my country the need to train agricultural engineers in grain storage and handling and especially in the area of post-harvest losses.
- Dealing with crop improvement grain storage is another aspect to know how to keep or store the grain in good condition.
- As a trainer in storage/pest control in my organization, I would be able to do my work with more confidence. As a warehouse manager, I will practice what I learn here after certain modifications.

- Both storage and marketing of grains.
- Storage and loss reduction (site selection), marketing (transportation), economic and financial analysis of projects.

- Marketing management; grain accounting; marketing systems; forecasting.
- Storage-marketing (economics) were very useful to me because that is what I work with.
- The economic level, since my country has a subsistence agriculture and storage does not seem to be for the moment a serious problem.
- The marketing courses are very beneficial to me (transportation, marketing, planning methods). As for the technical classes, problems of storage, post-harvest and handling interest me because I work in a government service which works with grain marketing and food reserves.
- Being a marketing officer, it goes without saying that the subject matter (marketing) is important.

- Some subjects are relevant to any work while others are not.
- Transferring certain information to subordinates in training.
- Since I don't have much professional experience, I can't say to what degree I will profit from this, however I do need this information to support my reports and lectures that I will have in my work.

- In general, everything that the professors taught is of great interest and will be very important for the functions carried out in my country, and everything I saw here is applicable to my activities and those of the institution I represent.
- Everything that was analyzed.

- In general, all the topics discussed are of great importance to the fulfillment of my professional activities since the institution I work for is thinking of handling all aspects in the agricultural field.

--All aspects covered in the course are of great use to me since I work with storage and marketing of basic grains. Although both areas are of equal importance to me, I chose the technical group because I need training in this area.

B. AID Grain Storage and Marketing Short Course - 1981

Participants for the 1981 Grain Storage and Marketing Short Course arrived on campus June 14, 1981 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 1981 short course will follow the same general format as the 1980 short course with a field trip to Kansas City, Arkansas and Louisiana being taken the fifth week. Five staff members will accompany the group.

Mr. Robert Doan, International Training Administrator, Foreign Development Division, U.S.D.A. 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 1981 Grain Storage and Marketing Short Course included 28 individuals from 14 different countries and are as follows:

AFRICA

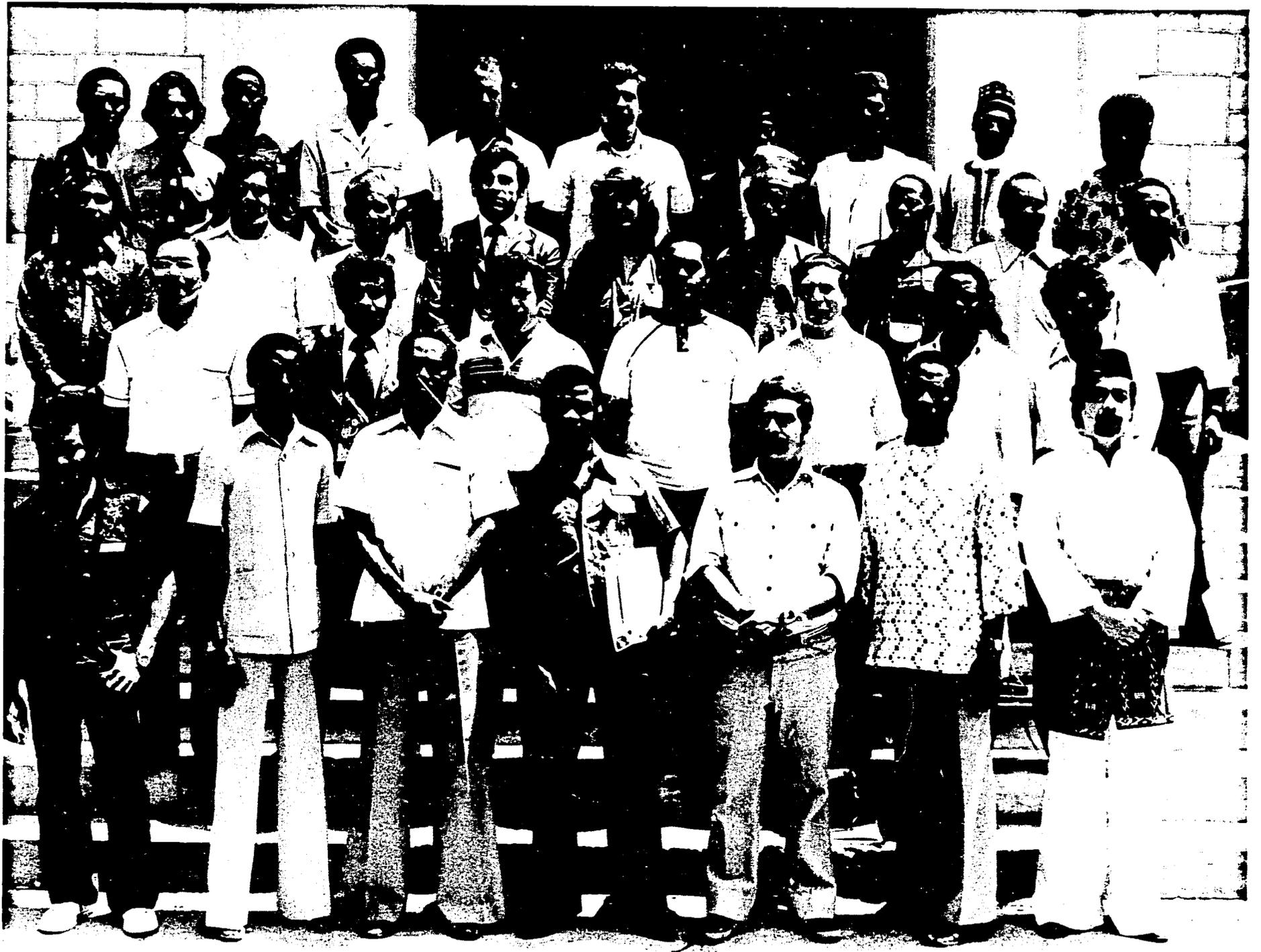
Cameroon	- Iloga Lazare
Ghana	- Joseph Asare Baah
Nigeria	- Ademola Alani Kehinde - Adebayo Adeginka - Fajuyighe Daniel Olatunde - Lawrence Olasupo - Martha Nwihim
Rwanda	- Munyandamutsa Eugène
Senegal	- N'Dao Thierno - Sene Amadou Banda - Dia Abdoulaye - Sall Bounama
Sierra Leone	- Ernest Williams
Tanzania	- Kitujime Simon Mbwilo

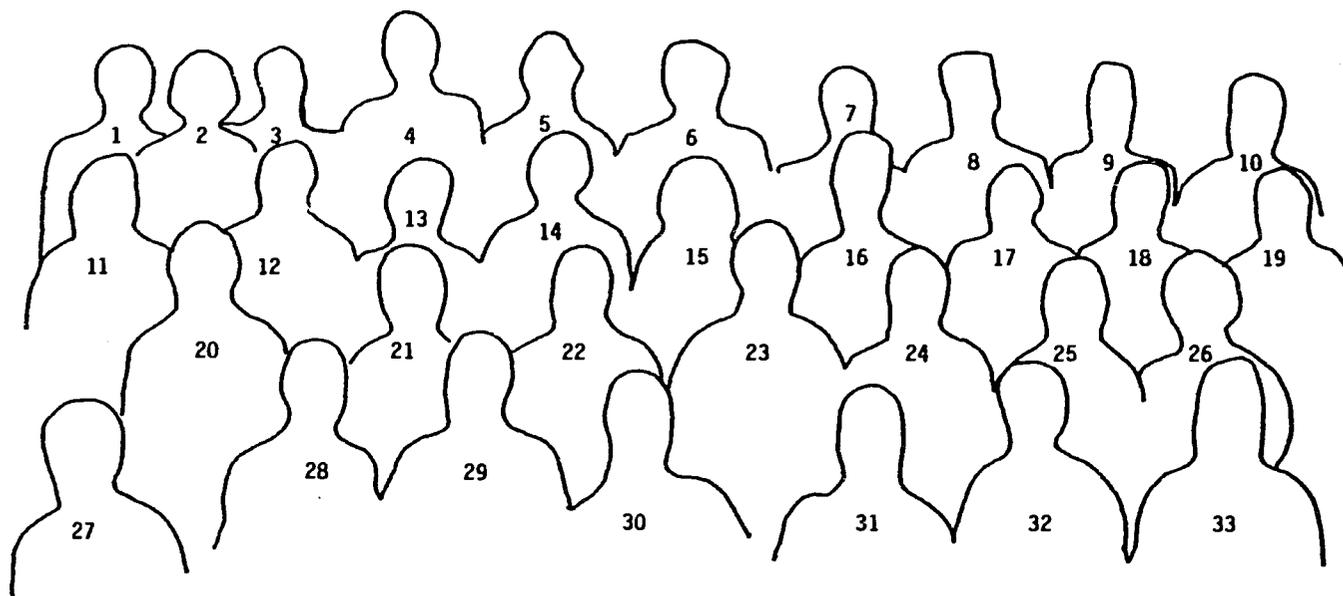
ASIA

Malaysia	- Noorma Osman
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LATIN AMERICA

Costa Rica	- Manuel Zeledón
El Salvador	- Victor Manuel Martínez P. - José León Orellana P.





1980 Grain Storage and Marketing Short Course Participants

1. H. Nikoyagize - Burundi
2. Knot Ravindranath - India
3. Zinguim Banse - Upper Volta
4. Rénovat Baragengana - Burundi
5. Joamar Jaquetti - Brazil
6. Manuel Andrade - Honduras
7. Macky Traore - Mali
8. Alajaba Umar - Nigeria
9. Isyaku Mohammed - Nigeria
10. Assiongbon Kpodar - Togo
11. Ahmad Hassan - Malaysia

12. René Arias - Honduras
13. Carlos Encarnacion - Philippines
14. José Elías - Mexico
15. Aura María Velásquez - Nicaragua
16. Malami Sulaiman - Nigeria
17. A. S. Y. Abdulazeez - Nigeria
18. Michael Gitau - Kenya
19. Richard Kipyegon - Kenya
20. Masayuki Hamaguchi - Japan
21. Jehu Rosete Díaz - Mexico
22. René Soler - Honduras

23. David Barendegere - Burundi
24. Jaime Gallegos - Ecuador
25. Antoine Ouedraogo - Upper Volta
26. Rashed Omar - Malaysia
27. Renato Mactal - Philippines
28. Bayala Bationo - Upper Volta
29. Oumar Ouedraogo - Upper Volta
30. Maxime Gouba - Upper Volta
31. Franklin Juárez - Costa Rica
32. François Ouandaogo - Upper Volta
33. Syed Azmi Othman - Malaysia

Not pictured - Maria Regina Sartori - Brazil

- Honduras - Santiago Espinal Chávez
 - Gil Samuel Puerto
 - Miguel Abraham Sánchez
 - Jorge Antonio Reyes-Pacheco
- Mexico - Jorge Ramirez González
 - Javier Hernandez Sánchez
 - Rafael Terán P.
 - Carlos Ignacio Reyes González

NEAR EAST

- Bangladesh - Syed Rafiqul Alom
- Jordan - Adnan Mohammad Odeh

Evaluation and summary of the 1981 Grain Storage and Marketing Short Course will be included in next year's annual report.

C. Short Term On-Campus Training

Korea - Training was provided over a 5-week period (October 28-November 25, 1980) for the following participants:

Man Yu Kee, Deputy Manager, Korea Development Bank
Sung Duck Kim, Assistant Director, Economic Planning Board

The training, co-sponsored by the Economic Planning Board (EPB), Republic of Korea, was titled, "Computerized Methods for Feasibility Analysis."

India - The following participants received training over a period of 12 weeks (February 2 through April 25, 1981):

Dr. Ugam Raj Meta, Agronomist, Department of Agriculture
Mr. Ramesh Chandra Sharma, Executive Engineer, Command Area Development
Mr. R. Nagaraj, Deputy Director, Central Water Commission.

The training was co-sponsored by the Government of Rajasthan and was titled, "Systematic Procedures for Effective Project Formulation and Evaluation."

Tanzania - A scope of work was received from Peace Corps/Washington, D. C. on May 26, 1981. Work began on writing a proposal/amendment to Cooperative Agreement AID/DSAN-CA-0256, housing/meal accommodations, and scheduling of meeting rooms, etc. Approximately 21 participants are expected to receive the training which is scheduled to begin September 8 and end on October 16, 1981 on the KSU campus. The trainees will then travel to Tanzania to begin their work.

Trainers will include Bonita Barger, training consultant/Peace Corps; Phillip Moershel, Returned Peace Corps Volunteer (fisheries, Tanzania); and A. N. Mphuru, Senior Lecturer in Entomology, University of Dar es Salaam, Tanzania.

Food and Feed Grain Institute trainers include Carl Reed, course coordinator/grain storage specialist; Valerie Wright, storage entomologist; Ekramul Haque,

agricultural engineer; and Rosemary Burroughs, mycologist. An in-depth report of the training will be included in next year's annual report.

D. Degree Program Training

Several students are in various stages of progress toward advanced degrees in post-harvest 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 (Dahomey)
Muljo Sidik - Indonesia
Steve Graham - Former Peace Corps (Benin) (completed)
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
Ampai Pugsunantwiwat - Thailand (completed)
M. Naewbanj - Thailand

2. Agricultural Economics

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

3. Agricultural Engineering

Dong Il Chang - Korea (completed)
Kyung K. Park - Korea
Ronald Jimenez - Costa Rica (completed)
Joselito Dela Cruz - Philippines (completed)
Apolonio Guevarra - Philippines (completed)
Yousef Assalimy - Yemen (completed)
Y. K. Lee - Korea
Dyan Cederstrom - (completed)

4. Entomology

Noorma Osman - Malaysia
Yousif Seifelnasa - Sudan

E. Off-Campus Training

1. Senegal - ONCAD (Office National de Cooperation et d'assistance pour le Developpement)

The Training Course on Grain Conservation and Storage Management was conducted in Dakar, Senegal September 5 through October 17, 1980. The training was conducted by Dr. John Pedersen, storage entomologist; Ms. Kathy Foster, interpreter/linguist; Mr. Dansou Kossou, graduate student/interpreter; Dr. Fred Teague, professor of Course and Curriculum Instruction; and Dr. T. O. Thatcher, entomologist.

Training was provided for 15 participants of Ex-ONCAD. Included in the subject matter was (a) grain status from harvest until the end of the period of storage with main emphasis on handling, inspection and control measures in order to minimize losses; (b) rodent and insect identification and control; (c) methods of teaching with major emphasis on demonstrations and (d) maintenance of audio-visual equipment. Various check-lists (inspection, fumigation and sanitation) and a complete outline of a training manual for warehouse employees and other personnel in direct contact with millet storage in Senegal were developed to conduct the training program.

Field trips were conducted to observe grain-in-bag storage, pest damage identification, inspection practices; to examine building designs with regard to environmental problems; and for fumigation practices.

2. Rwanda - OPROVIA/GRENARWA (Rwandan Government overhead agency for agriculture development/Granier National du Rwanda)

A 1-week seminar was conducted in Kigali for approximately 26 participants February 13 through 19, 1981. The participants were mostly present, or future, storage managers. Additional Ministry of Agriculture personnel were invited for an overview of the training seminar and to accompany the participants on a practical warehouse inspection exercise during an afternoon session.

The 5.5-day seminar included oral/slide presentations on grain structure and composition, moisture content/relative humidity/temperature relationships in storage, storage fungi, insect identification and damage, warehouse and silo inspection, sampling, insecticides, fumigants and insecticide safety, housekeeping, construction, stock management and bag-damage control.

The seminar included laboratory services on moisture testing, insect identification and damage, and use of the gas mask and gas detectors. The participants did both warehouse and silo inspections, using inspection checklists. The inspections were followed by discussions relating to the inspection findings.

The training was conducted by Dr. Robert B. Mills, grain storage entomologist, and Dansou Kossou, grain storage specialist, at the request of personnel of the OPROVIA/GRENARWA through AID/Kigali.

F. Training Facility

Modifications should be completed by fall 1981 on facilities to be used in practical "hands on" training for degree program participants and the 1982 Grain Storage and Marketing Short Course.

IV. LABORATORY AND DEVELOPMENTAL SERVICES

This section of the annual report is devoted to describing activities under Contract AID/ta-C-1162 and 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. A Bibliography on Postharvest Losses of Grains

Dr. Fabian N. C. Osuji, Senior Lecturer in Zoology, University of Ibadan, Ibadan, Nigeria prepared a review and annotated bibliography on post-harvest losses in grain legumes. This material is being published as Special Report No. 12 in the Grain Storage, Processing and Marketing series.

2. Laboratory Flight Studies of Grain Weevils (Curculionidae, Sitophilus)

This portion of the series, "Flight capability and factors involved in initiating grain infesting Sitophilus weevil flights", is completed. An abstract follows:

Adult weevils from a population of Mexican S. zeamais, reared at Kansas State University for several years, were used to investigate the effect of various factors on flight activity. Most experiments were conducted at $27 \pm 1^{\circ}\text{C}$, $67 \pm 3\%$ rh with 12 hr light per 24-hr cycle; however, temperature, photoperiod and light intensity were varied for specific experiments.

Age of adults significantly influenced ($P < 0.05$) number of flights, which began at age 2-3 days, peaked at 12-13 days, but with nearly as many flights by insects ranging in age from 10 to 30 days.

Males exhibited significantly greater ($P < 0.05$) numbers of flights than females at ages 13-14 days or 20-21 days.

Weevil flights during light periods were significantly greater ($P < 0.05$) than during dark periods, and when light/dark periods were reversed, time of day did not appear to influence numbers of flights.

Weevils without food exhibited significantly greater ($P < 0.05$) numbers of flights than weevils in sound corn during various light periods: 10, 12 and 14 hr per 24-hr cycle. During the 14-hr light period, weevil flights were significantly greater than during 10- or 12-hr light periods.

Corn which had been infested for 5 or 6 months significantly stimulated flight ($P < 0.05$), while corn infested less than 5 months or sound corn did not appear to stimulate flights.

Male and female weevils showed positive attraction to the odors of sound or deteriorated corn in a Y-tube olfactometer; however, these odors did not

stimulate flight.

With population density from 50 to 800, most flight occurred when 800 insects per cage were provided deteriorated corn. Weevils did not tend to fly in the presence of sound corn. Percent of weevils flying from deteriorated or sound corn was not affected by population density.

The greatest numbers of flights occurred at $27 \pm 0.5^\circ$ and $32 \pm 0.5^\circ$ C when insects were without food or in deteriorated corn. Very few flights were observed from sound corn at these temperatures or from deteriorated corn at $24 \pm 0.5^\circ$ C, and none at $21 \pm 0.5^\circ$ C from any feeding condition or at $24 \pm 0.5^\circ$ C from sound corn.

Flight differences among 5 Sitophilus populations indicated Mexican S. zeamais and Yucatan S. zeamais flew significantly more ($P < 0.05$) than Kansas S. zeamais, Arkansas S. zeamais or Kansas S. oryzae. No evidence of flight was observed for Kansas S. oryzae.

Authors include Dr. Ampai Ungsunantwiwat, Dr. John R. Pedersen and Dr. Robert B. Mills.

3. Extent of Damage to Stored Milled Rice by Insect Infestation (formerly titled "Milled Rice Losses in Simulated Bag Storage)

This study has been completed and an abstract follows:

Losses and damages to milled rice infested with maize weevils (MW), Sitophilus zeamais Mots. and red flour beetles (RFB) Tribolium castaneum (Herbst), alone and in combination were investigated. Medium grain Nato variety rice, reasonably well-milled with 25% broken kernels, was infested and stored in barrels simulating bags. Nine parameters of damage were assessed at 4 wk intervals over a 24 wks period. Quantitative losses were measured by flotation, volumetric, and gravimetric methods.

The RFB population increased slowly during the storage period and caused little damage to the rice in terms of dust production, moisture content (m.c.) changes or mold invasion. No appreciable weight loss was detected regardless of method used.

MW alone and in combination with RFB caused significant losses and damage. Increased numbers of insects were closely correlated with increased rice m.c., temperature, and numbers of damaged kernels. MW's decreased markedly after 16 wk in the presence of RFB, whereas, RFB multiplied well as the beetles probably utilized dust produced by weevils for food. Highest m.c.'s and largest quantities of dust (composed chiefly of insect frass and kernel fragments) were found near the bottom level of the barrels.

Increase in m.c. was followed by invasion of kernels by a succession of fungi: Aspergillus glaucus was predominant after 12 wk storage but was replaced by A. candidus and Penicillium spp. by 16 wk. In rice infested with MW alone A. candidus was predominant. Caked material and dust found by 20 wk yielded A. glaucus, A. candidus, A. versicolor, A. niger, yeasts and Penicillium spp. A trace amount of aflatoxin B₁ (5ppb) was detected in one sample of caked material from MW infestation.

Quantitative measurement of dry matter weight loss caused by MW and MW/RFB infestations ranged from 0.92 to 37.29% with an inconsistency in the degree of loss shown by the three methods used. Single and multiple linear regression equations were established to predict weight losses.

Quality deterioration was assessed by a panel of nine persons which compared the odor of rice samples from three locations in each combination of infestation and control with a reference sample stored at 4°C. Multiple comparison difference analyses indicated that MW alone and in combination with RFB altered the odor of rice by 12 wk, whereas RFB did not change the rice odor until after 20 wk storage. Odor of non-infested control rice did not differ significantly from the reference.

Authors of this study include Mr. Mulyo Sidik, Dr. John Pedersen and Dr. Carl Hoseney. This study was jointly funded by AID/ta-C-1162, USAID/Jakarta and BULOG (Indonesia).

4. The Infestibility of Pearl Millet by Stored-Product Insects (formerly titled "Susceptibility of Millet Varieties to Insect Infestation and Loss")

This study is completed as an INTSORMIL report and was funded by AID/DSAN-XII-G-0149. It will not be printed in the Grain Storage, Processing and Marketing series.

5. Deterioration of Rough Rice as Measured by Carbon Dioxide Production (formerly titled "Post-harvest Deterioration of Rough Rice")

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

The method of Steele, Saul and Hukill (Trans. of the ASAE 12: 685-689, No. 5, 1969) was used to follow the deterioration of rough rice during storage at four temperatures (18, 24, 29.5 and 35°C) and four moisture levels (15, 18, 21 and 23%). One variety of long grain rice and one variety of medium grain rice were studied in the 4 x 4 x 2 experimental design. In the laboratory-scale storage experiment, air was scrubbed free of carbon dioxide, conditioned to the proper relative humidity, passed through the grain, and the carbon dioxide released by the grain was followed with storage time. Each sample of grain was removed when its quality was judged to be lowered by invasion of destructive molds. Dry matter loss was calculated from CO₂ evolved, and ranged from 0.50 to 2.0% for all samples. The experimental curves showing dry matter loss with storage time are presented along with the regression lines and regression equation. In addition, data on milling yields and grades (U. S. Standard) are given for the samples stored at 15 and 18% moisture.

In a separate experiment long grain rice, when stored at 29.5°C and 18% moisture, was allowed to lose dry matter to six different levels (0.25 to 2.0%). This experiment was also done on medium grain rice at 29.5°C and 23% moisture. The rice samples were milled and graded unofficially.

This work was funded by USAID and the Indonesian Government and was authored by Mr. Amihardijono Sukabdi, Dr. Paul Seib and Dr. Do Sup Chung.

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

This research continues under cooperative agreement with the International Rice Research Institute in Los Baños, Philippines. It is expected to be printed in the near future as a Research Report in the Improvement of Post-harvest Grain Systems series.

7. Modeling and Optimization of Feed Mill (formerly titled "Feed Processing Plant Design and Analysis for Developing Countries")

This research is nearly completed. It is being conducted to develop a computer model of optimum feed mill design (equipment selection and arrangement) by considering operating costs, especially energy costs and initial investment costs.

8. Strength and Water Durability of Stabilized Clay Containing Lime, Rice-Hull Ash, Sodium Chloride, and/or Straw, Potential Construction Material for On-Farm Storage in Developing Countries (formerly titled "Construction Materials for On-Farm Grain Storage in Developing Countries")

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

Clay cylinders were prepared to test the effects of four additives on the strength and durability of clay. Lime, rice-hull ash, salt (sodium chloride) and straw were added to clay, respectively at four levels (2.0%-8.0%), four levels (2.5%-10.0%), three levels (0.5%-1.5%) and one level (2.0%). Moistened clay samples were compacted into a 2-inch diameter by 4-inch long cylinder, moist cured for 30 hours at 49°C, then dried for 72 hours at 49°C. Compression strength was tested by axially loading the cylinder, where tension strength was tested by using the split-tension test, in which the cylinder is placed horizontally in a compression machine. Durability was tested by immersing the cylinders of clay in water and noting either weight gain or loss after an allotted time period.

Compression and tension strength of the control clay cylinders were 417 psi and 50 psi, respectively. The optimum of the limed clay cylinders was at 4.0%, 640 psi in compression and 51 psi in tension. Rice-hull ash (2.5%) added to the 4.0% limed clay, produced 887 psi in compression and 97 psi in tension. Strength for the 4.0% limed clay cylinders with 1.0% salt added was 983 psi in compression and 98 psi in tension. Straw (2.0%) added to the 4.0% limed clay increased tensile strength of the cylinders to 81 psi but decreased compression strength to 603 psi. Straw (2.0%) added to 4.0% limed clay with 1.0% salt decreased both compression and tension strength to values of 570 psi and 89 psi, respectively.

Upon immersion in water, control, limed clay and salt-limed clay cylinders deteriorated. Cylinders prepared from the ash-limed clay were immersed for 560 minutes and did not deteriorate. Durability of all clay containers was increased when coated with a vinyl water sealer.

Specifications are given using clay containing 2.5% rice-hull ash and 4.0% lime to make bricks. Recommendations of types of silos using these bricks are suggested.

Authors include Mr. Dayn Cederstrom and Dr. Do Sup Chung.

9. Modeling for Dryer Selection and Simulation of Natural Air Drying of Rough Rice

This work has been completed and an abstract of the thesis follows:

Two subjects were studied; one was the mathematical modeling for dryer selection, and the other was simulation of natural air rough rice drying.

The objectives of the study of the former subject were to analyze the thermal efficiencies of several drying systems, to develop the mathematical modeling method for dryer selection, and to suggest an optimized shelled corn drying system for on-farm drying facilities.

The objectives of the study of the latter subject were to make reasonable modifications to the KSUDRYER (Maurer, 1977) to predict the drying results of rough rice by natural air, to investigate the drying characteristics of rough rice at various drying conditions, and to suggest the design parameters of natural-air drying systems of rough rice.

The steps taken for the former subject were: (a) collecting the specifications of dryers made in the U.S.A. and analyzing these specifications, (b) mathematical modeling of the dependent variables as the functions of the independent variables, (c) development of the dependent cost functions, and (d) optimization of the drying system requirements.

The approaches used for the latter subject were: (a) modifying the KSUDRYER for rough rice drying by natural air, (b) validating the modified simulation model using actual test data, (c) simulating rough rice drying using the official weather data (1962 through 1976) for Beaumont, Texas, (d) developing a fan model from the American Standard (Bulletin B-5121) for natural air drying of rough rice, and (e) analyzing the simulation results.

The following conclusions were drawn from the study:

- The thermal efficiency of natural air drying system is 63.8 per cent and better than any other drying system and that of a continuous-flow drying system is 31.3 to 36.3 per cent.
- The thermal efficiencies of drying systems have close relationships with annual drying costs which are usually low when thermal efficiency is high.
- A natural air dryer is an economical drying system at volumes below 2,700 bushels; a natural air dryer with supplemental heat is economical at 2,700 to 20,000 bushels, and a batch-in-bin dryer, from 20,000 to 70,000 bushels. Portable batch and continuous flow dryers, which are very similar in their characteristics, become economically competitive only at volumes of 70,000 bushels or more per year.
- The KSUDRYER (Maurer, 1977) can be applicable to rough rice once the properties of specific heat, equilibrium relative humidity, density, the appropriate mass transfer coefficient, and the dry matter loss equations are known.
- A modified model can predict the changes of moisture content of rough rice drying by natural air accurately.

• In general, natural air drying can be applicable to rice drying under Texas conditions with the following parameters: minimum airflow rates for 24, 22, 20, and 18 per cent initial moisture contents are 5.0, 3.0, 2.0, and 1.0 cfm per bushel; and maximum bed depths for those initial moisture contents are 3, 5, 7, and 8, respectively. These results show compatibility with the results given by Morrison (1954) and Sorenson and Crane (1960).

This investigation showed a definite potential for natural-air grain drying for rough rice in optimized drying systems using a simulation model.

Authors of this investigation included Mr. Dong Il Chang and Dr. Do Sup Chung.

10. Loss Assessment Techniques on Various Types of Cereal Grains

Work continues on the evaluation of the two commonly mentioned loss assessment methods, the count-and-weigh method and the volume/weight method. Losses due to Sitophilus zeamais are being measured in four grains (wheat, sorghum, maize and rough rice) to determine the degree of reliability of the two methods. Previous research has not reported how accurate these methods are in predicting losses.

Heat Transfer by Natural Convection in Stored Grains (formerly titled "Moisture Migration within Stored Grain")

This project has been completed and the following is an abstract of the dissertation:

This study was conducted to investigate experimentally the mechanisms of heat transfer by natural convection in stored grain in vertical cylindrical bins with a sinusoidal outside temperature profile. Two approaches were used: (a) a laboratory model of stored grain in a cylindrical bin using spherical beads and water, and (b) a field test in cylindrical bins holding wheat.

Laboratory results revealed evidence of heat transfer by natural convection in spherical packing immersed in water simulating stored grain in bins. The transport of heat in beds with 4.0 mm beads and larger was enhanced by natural convection while in 0.75 mm glass beads packing, conduction was the predominant mode of heat transfer.

Temperature gradient in bins of aspect ratio of 0.5 existed along the radial and axial directions, whereas in cylinders of aspect ratios of 1 to 2, temperature gradient was mainly along the radial path. This was particularly true when the cylinder had large-sized spherical packing. At high frequency of the sinusoidal bath temperature, heat transfer occurred only near the wall.

Outdoor storage tests with wheat in steel cylindrical bins indicated that the average grain temperature inside the storage bins followed the average outside air temperature profile. The time lag between a change in ambient air temperature and a change in grain temperature was approximately 7 to 10 days.

Temperature gradients in the radial direction were higher than in the axial direction, and were pronounced in bins with a high aspect ratio. Hence, heat flowed along the radial direction. Natural convection enhanced heat transfer in grain near the wall and at the top of the bin.

Grain moisture distribution indicated moisture gradients in both the radial and axial directions. Grain moisture reduction was more rapid at the top and near the wall of the bin where the effects of natural convection was more pronounced. Thus, in all bins, grain at the top and near the wall had lower moisture than in other parts of the bin. Moisture loss in all stored grain was partly due to the lower equilibrium moisture content of wheat at the observed average ambient storage conditions during the study.

It is recommended that in the future, flow visualization of natural convective heat transfer in stored grain and field tests be done under controlled conditions simulating the yearly seasonal periodic cycle.

This study was funded by the KSU/Philippine Contract. It was authored by Mr. Joselito Dela Cruz, Dr. Paul Seib and Dr. Do Sup Chung.

12. Some Properties of Cereal Grains, Food Legumes and Oilseeds (Hygroscopic, Thermal, Physical) Affecting Storage and Drying (dissertation formerly titled "Grain Properties Affecting Storage and Drying")

This manuscript has been edited and will probably be printed as a Research Report in the Grain Storage, Processing and Marketing series.

13. Alternative Food Grain Stability Programs for Central Asian Countries

Work continues on this project which includes the interests of those concerned with food grain stabilization programs and potentials for food security reserves in Bangladesh, India and Sri Lanka which prompted parallel analysis for these countries plus the Central Asian countries of Nepal, Pakistan and Afghanistan.

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

Work has begun on this research with the main objective being 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. Prediction of population growth of each species involved will provide a basic knowledge for setting up a more complex model for actual grain storage situations.

Two primary- and two secondary-feeding insects were selected for this study: the maize weevil, Sitophilus zeamais (Motsch.); lesser grain borer, Rhyzopertha dominica (F.); red flour beetle, Tribolium castaneum (Herbst) and sawtoothed grain beetle, Oryzaephilus surinamensis (L). These insects, either alone or in combinations of two, three and four species, will be used to infest milled rice of given quality and will be stored in cylindrical cells of PVC closed with wire mesh at both ends.

Observations and measurements will be made including number of dead and live adult, larvae and pupae of each species, dust frass recovered, moisture content and temperature of the grain. Samplings will be taken at 30-day intervals over a period of 270 days.

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

Work is almost completed on this study whose objectives are: (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.

16. A Straw-Fired Furnace for Grain Drying Purposes

This study has been completed and an abstract of the thesis follows:

The main objective of this study was to design and construct a direct-fired drier using loose wheat straw as fuel. Factors such as drying potential of the heated air, drying capacity, drying efficiency and quality of flue gas (evolution of carbon monoxide) were considered using different grain depths and frequencies of grain turning.

The furnace and drier were constructed using common red bricks (3 7/8" x 4 7/8" x 7 7/8") in favor of other materials because of its low heat conductivity, low price and availability. Clay was used as the cementing material for the bricks. For the drying floor area, a perforated sheet metal supported by angle bars was used.

Three preliminary tests were conducted to determine the rate of fuel feeding which will give a drying air temperature of about 130°F with minimum fluctuation. Results showed that with a 4-in. grain depth in the drier, continuous hand-feeding of loose wheat straw at 5 lb per hour was satisfactory. This gave a heat release rate of about 1075 BTU per hr per cu ft of furnace volume.

Sixteen drying trials using shelled corn at about 23 percent moisture content dried to about 14 percent (w.b.) were conducted to determine the drying performance of the furnace-drier unit. For the different grain depths used, grain turning did increase the drying rate except for 2-in. which was not affected. However, for 6-in. grain depth, turning was observed to be more prominent in the final few hours of drying than at the beginning of the drying process.

The highest drying efficiency of 18.38 percent (1.221 lb straw per lb water) was obtained at 6-in. grain depth turned every hour. On the other hand, the rate of drying in terms of lb of water evaporated per hr was highest at 2-in. grain depth followed by 4- and 6-in. in a decreasing order. The quality of the flue gas (evolution of carbon monoxide) was observed to be less for thinner grain beds and at more frequent grain turning.

It was also determined that the rates of drying and drying efficiencies obtained from this experiment were much lower than the modified A'Brook drier. It could be attributed to the loss of heat from the combustion chamber through the air inlet due to the big difference in the grain bed area of the two driers (6.25 vs 64 ft²). Also, to some extent, the difference in the heating values of the two types of fuel (6680 Btu/lb for wheat straw and 7100 Btu/lb for wood).

Due to the lower drying efficiency of the system used in this experiment though directly fired, the following recommendations were deemed necessary: (a) the slope of the combustion chamber leading to the chimney must be increased; (b) the design of the furnace-drier unit must be improved for better insulation; (c) grate must be used for better combustion; (d) the height of the chimney and the size of the grain bed must be increased; and (e) the quality of dried grain

(both color and taste) must be evaluated for economic purposes.

The authors of the paper are Mr. Apolonio V. Guevarra and Dr. Do Sup Chung. The study was funded by the KSU/Philippine Contract.

17. Post-Production Loss Assessment Methodology

This study continues by producing information on the accuracy of the Volumetric Weight Method of estimating dry weight loss due to insect activity in stored grains. It will also investigate some of the sources of error and ways to eliminate them.

18. Static Pressure Drop in a Fixed Bed of Grain as Affected by Grain Moisture Content

Determination of grain resistance to airflow is fundamental in the design of drying and aeration systems. Designers widely use Shedd's data on resistance of dry grains to airflow for fan selection. But grains such as corn and grain sorghum that are harvested at higher moisture levels do not follow Shedd's data which does not consider grain moisture as a variable. Our study was intended to determine the effect of grain moisture on airflow resistance. We determined resistance of corn, sorghum and wheat as affected by the moisture content.

The result shows that resistance to the airflow decreases with the increase in grain moisture. We analyzed the data statistically and obtained a non-linear regression model describing the mathematical relationship between grain moisture and static pressure drop. The model is:

$$P = AV + BV^2 - C (M.C.) V$$

where

P = pressure drop per meter depth of grain, pascal
V = air velocity, m/s
M.C. = grain moisture, % w.b.

and

A, B, C = product constants.

The values of the constants A, B, and C for corn, sorghum and wheat are given below:

Corn: A = 1611.719
 B = 4949.301
 C = - 55.116

Sorghum: A = 3253.100
 B = 7911.272
 C = -72.521

Wheat: A = 5573.950
 B = 9634.595
 C = -200.283

The results of this study are expected to help designers in conserving energy for high moisture grain aeration systems and to give us a better understanding of the effect of moisture on the airflow resistance of grains.

This study was authored by Yousef Assalimy, Dr. C. W. Deyoe and Dr. Ekramul Haque. It was funded by World Bank and the Government of Yemen.

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

Work has begun on this study. Pinto beans of the 1981 crop are being stored at 25°C and 75% relative humidity under the following conditions: continuous nitrogen flushing, continuous air flushing and static storage in cotton bags.

The main objective is to evaluate the influence of nitrogen on flavor, cooking quality and seed coat color. Samples will be taken at 2 month intervals and subjected to the following analysis: moisture content, water activity, texture, flavor, peroxide value, fat acidity, phytic acid and color.

Based on the results of this laboratory study, small scale field tests are anticipated with underground storage and/or above ground air-tight storage structures.

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

Nearing completion, this study uses the methodology developed in Special Report 9 which included the ASEAN countries of Indonesia, Malaysia, Philippines, Singapore and Thailand. The methodology is being applied to food security reserves for the Northeast Asia republics of Korea, Taiwan, Japan and Hong Kong and will include an integrated analysis with the countries of Australia and New Zealand.

Staff members of the Food and Feed Grain Institute have cooperated in studies with graduate students from developing countries with the following subject matter:

AGRICULTURAL ECONOMICS

- Feasibility of Selected Medium Irrigation Projects with Command Area Development (CAD) in Rajasthan, India.
- Fertilizer Distribution System in the Philippines
- Cassava Processing, Livestock Processing, Corn Desert Manufacture and Agricultural Credit Systems in the Philippines
- Food Reserves in Honduras
- Livestock and Poultry Schemes in Nigeria

- Projected Food Supply and Trade Balances for China
- Desert Irrigation Development Schemes in the Middle East
- Long-Term Trend in Food Supply Balances in Selected Developing Areas of the World
- Measurement of Benefits from Philippine Grain Stabilization Programs
- Feasibility of Food Security Reserves for Korea
- A Simulated Food Grain Security Reserve Program for Corn and Rice in Central America and Panama from 1960 to 1980.
- Simulating the Impact of Alternative Food Reserve Programs: The ASEAN Case
- Impacts of General Economic and Trade Policies by LDCs

AGRICULTURAL ENGINEERING

- Evaluation of Hygroscopic and Thermal Properties of Cereal Grain and Oilseeds
- Development of a Natural Convection Dryer for Use in Developing Countries
- Static Pressure Drop in a Fixed Bed of Grain Sorghum as Affected by Grain Moisture Content and Fines
- Postharvest Deterioration of Rough Rice, Milled Rice, Brown Rice
- Moisture Migration within Stored Grain Sorghums

ENTOMOLOGY

- Penetration and Reproduction Potential of Selected Stored Product Insects in Columns of Pearl Millet
- Effect of Threshing Methods on Infestibility of Pearl Millet (Pennisitum americanum (L.) Leeke) by Some Stored Product Insects.
- Factors Affecting the Storage of Pearl Millet (Pennisitum americanum (L.) Leeke)
- Damage to Pearl Millet (Pennisitum americanum (L.) Leeke) Under Simulated Traditional Storage Conditions by Sitophilus oryzae (L.)
- Crushed Pearl Millet Cobs as a Barrier to Sitophilus oryzae (L.) Infestation in Threshed Pearl Millet Storage: A Preliminary Study
- Comparison of Methods for Determining Internal Infesting Insects in Pearl Millet (Pennisitum americanum (L.) Leeke)

- Resistance to Three Geographic Populations of the Maize Weevil, Sitophilus zeamais Motschulsky (Coleoptera, Curculionidae), in Native Cultivars of Corn from the Yucatan Peninsula
- Olfactory Response of Red Flour Beetles, Tribolium castaneum (Herbst), to Various Forms of Wheat, Millet and a Fungus as Determined by a Light-Sensitive Apparatus
- Pneumatic Probe Sampling of Kansas Farm-Stored Sorghum
- Study of Dispersal and Population Development of Sitophilus oryzae in Fifty-Bushel Bins of Pearl Millet
- Effectiveness of Adding Threshing Debris Over Threshed Pearl Millet as a Barrier Against Stored-Grain Insects in Simulated Traditional Storage Units
- Effectiveness of Insect Growth Regulator, Methoprene, as a Protectant Against Stored-Grain Insects
- Resistance of Pearl Millet Lines to Stored-Grain Insects
- Damage to Pearl Millet (Pennisetum americanum (L.) Leeke) Under Simulated Traditional Methods for Storage by Sitotroga cerealella
- Biology and Behavior of Corcyra cephalonica

B. Slide File

As each of the teams under Contract AID/ta-C-1162 and Cooperative Agreement work in the field, we continue to build our file of colored slides showing 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 1980, 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 Senegal in September/October 1980 required the development of a training manual which was titled, "Training Course on Grain Conservation and Storage Management." The manual was translated into French and simultaneous translation was given during the course.

2. Work has begun on the development of a short course manual for the Nepal in-country course tentatively scheduled for November 1981.

3. 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 Programs

1. Seoul, Korea

Dr. Do Sup Chung traveled to Suweon August 18-23, 1980 to participate in the International Rice Postharvest Technology Workshop. Workshop activities included:

- Critical review of present rice post-production systems in Korea: technology and socio-economic aspects
- Mechanization of rice harvesting in Japan and other areas: process of development, present status and problem areas
- Present technology of threshing operation and direction of improvement in threshers and threshing system
- Grain drying: problem assessment and improved technology
- Grain losses: loss assessment and technology for reducing grain losses
- Grain storage: improved systems
- Grain processing: improved machines and systems
- General discussions: improved post-production systems

2. Panama City, Panama

Drs. Roe Borsdorf and Cornelius Hugo traveled to Panama August 9 through September 6, 1980 to conduct a marketing study for Instituto de Mercadeo Agropecuario (IMA) at the request of USAID/Panama.

As requested, the team investigated and assessed future public sector grain storage requirements and institutional needs as related to current operations and potential future. They reported that very little change has taken place in the last 5 years, either in terms of improvements in storage facilities or institutional capabilities.

A Working Paper was prepared and translated into Spanish and forwarded to USAID/Panama.

3. Tokyo, Japan

Mr. Norman Teter, technical team member of SEARCA, traveled from Manila, Philippines to Tokyo from October 26 through November 2, 1980 to attend the AACU's (Asian Association of Agricultural Colleges and Universities) 4th Biennial convention. The title of his presentation was "Grain Storage-A University Challenge" under the topic "Grain Storage Management and Prevention of Postharvest Waste."

4. Pakistan

Dr. Ulysses Acasio traveled to Pakistan from October 11 through November 11, 1980 at the request of the World Bank. The purpose of this travel was to appraise the national grain storage project.

5. Washington, D. C.

Dr. Ulysses Acasio traveled to World Bank headquarters to write an appraisal mission report as follow up to his trip to Pakistan in October/November. He was in Washington from November 19 through December 12, 1980.

6. Manila, Philippines

Drs. Do Sup Chung and Paul Seib attended the Grains Postharvest Workshop in Manila. Dr. Chung presented a paper entitled, "Construction Material for On-farm Grain Storage" authored by Dr. Dyan Cederstrom, Dr. Do Sup Chung and Dr. Paul A. Seib.

Dr. Seib presented a paper entitled, "Techniques for Holding Rice for Subsequent Testing" which was authored by Mr. Matri Naewbanij, Drs. Paul A. Seib and Do Sup Chung, Rosemary Burroughs and Larry Seitz.

The travel was from January 18 through 23, 1981.

7. Tegucigalpa, Honduras

Dr. Robert Julian traveled to Honduras at the request of IHMA to develop logistics for implementing a cooperative agreement for technical support of marketing and economic policies. The travel began January 31 and ended February 7, 1981.

8. London, England

Dr. John Pedersen traveled to London February 14 through 21, 1981 to attend the GASGA (Group for Assistance on Systems relating to Grains After-harvest) Seminar entitled Appropriate Use of Pesticides.

9. Seoul, Korea

"Grain Post-Harvest Technology Program in the U. S. for Developing Countries" was presented by Dr. Do Sup Chung at the Regional Workshop on Rural Development Technology. The paper was written by Drs. Chung, Charles W. Deyoe and Robert Julian.

The workshop was sponsored by the Korea Institute of Science and Technology and the German Institute for Technical Cooperation and was held from May 25 through 29, 1981.

10. Amsterdam, Netherlands

Dr. John Pedersen stopped in London, England to meet with GASGA secretariat personnel before traveling to the GASGA 10th annual meeting in Amsterdam. He presented a paper on KSU activities at the seminar on Postharvest Improvements for the 80's and 90's. The travel was from June 10 through June 21, 1981.

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 professional conferences and seminars.

1. Short Course Tour. July 1980

Dr. Valerie Wright, entomologist; Dr. Ekramul Haque, agricultural engineer; Dr. Ulysses Acasio and Mr. Carl Reed, grain storage specialists, conducted a short course tour for 32 participants from 15 countries who attended the 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 Agricultural Engineers. Kansas City, Missouri, September/October 1980

Dr. Ekramul Haque, agricultural engineer, attended meetings dealing with the National Energy Symposium.

3. National Agri-Marketing Association. Kansas City, Missouri, October 1980

Dr. Roe Borsdorf, agricultural economist, attended this Outlook Conference entitled "Agri-Marketing and the New Economy" to obtain data on marketing and transportation.

4. "Online '80" Conference. San Francisco, California, November 1980

Cherie Geiser, PHDS Coordinator, attended conference sessions on database creation including design and creation of files, bibliographic citations and abstracts, etc.

5. American Society of Agricultural Engineers. Chicago, Illinois, December 1980

Dr. Ekramul Haque, agricultural engineer, and Dr. Ulysses Acasio, storage engineer, attended the winter meeting to gain additional information for current and planned project development.

6. Entomological Society of America. Columbus, Ohio, March 1981

Dr. Valerie Wright, grain storage entomologist, attended this North Central Branch Conference and reported on work done through the Food and Feed Grain Institute as well as gaining valuable information on stored product entomology.

7. American Society of Agricultural Engineers. St. Joseph, Missouri, March 1981

Dr. Ekramul Haque, agricultural engineer, attended this Mid-central Regional meeting and presented a paper entitled "Static Pressure Drop in a

Fixed Bed of Grain as Affected by Grain Moisture Content."

8. National Agri-Marketing Association. New Orleans, Louisiana, May 1981

Dr. Roe Borsdorf, agricultural economist, attended this annual conference to obtain update on marketing developments in agribusiness.

9. Association of Operative Millers. St. Louis, Missouri, May 1981

Dr. John Pedersen, project grain quality preservation specialist attended 85th Annual Technical Conference and presented a paper entitled, "Extraneous Material in Wheat and Flour-Defect Action Levels." He also served as a member of the Food Protection Committee.

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. Pfof.
- *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).

*Denotes publication out of print.

- *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.
- *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 F. 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.
- No. 29 Rice Storage, Handling and Marketing Study for the Republic of Indonesia. February 1972. Prepared by Food and Feed Grain Institute, Manhattan, Kansas.
- *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.
- No. 34 Annual Report - 1971-1972.
- *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 No. 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.
- No. 62 Evaluation of Proposed Marketing Interventions for Chad. October 1976. Prepared by Dr. Roe Borsdorf.
- *No. 63 Foodgrain and Oilseed Storage in Pakistan: An Assessment of the Sector's Problems and Plans. November 1976. Prepared by Dr. Harry B. Pfof, Dr. Dale Anderson, William Briggs, and Cornelius Hugo.
- No. 64 Annual Report 1976-1977 (In Press)
- No. 65 Evaluation of Proposed "Rural Family Grain Storage" by CARE in Chad. February 1977. Prepared by Dr. Do Sup Chung.
- No. 66 Evaluation and Suggested Initiatives for the Development of Local Marketing of Agricultural Commodities in Paraguay. May 1977. Prepared by Dr. Roe Borsdorf, Cornelius Hugo, and Elwyn S. Holmes.
- No. 67 Annual Report 1977-1978 (In Press)
- 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. Pfof 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 Pfof.
- 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)
- (In Press) denotes publication in stages of being completed.

- 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.
- No. 76 Haiti Report (In Press)
- No. 77 Current Storage Situation for Domestic Grains in Senegal. March 1979. Prepared by Dr. Harry B. Pfost.
- *No. 78 Grain Policy Development and Implementation in Sri Lanka. March 1979. Prepared by Dr. Roe Borsdorf, Dr. Dale Anderson and Dr. Donald Anderson.
- No. 79 Annual Report 1978-79. October 1979 (Supply limited).
- No. 80 Assessment of the Need, Impact, and Proposed Uses of PL 480 Title I Rice Sales to Sierra Leone. December 1979. Prepared by Mr. Cornelius Hugo and Dr. Kenneth L. Casavant.

RESEARCH REPORTS

- 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).
- *No. 2 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. Fleska. (Technical Assistance Report No. 37).
- No. 3 Development of Equipment to Measure Wetting of Stored Grain. August 1973. Prepared by Edgard M. Breton Caneva and Dr. Harry B. Pfost. (In Press).
- No. 4 Rice Drying Rates. September 1973. Prepared by Jairo F. Robayo and Dr. Harry B. Pfost.
- No. 5 Equilibrium Moisture Content of Beans. October 1973. Prepared by Melquiades Guevara Guio and Dr. Harry B. Pfost.
- No. 6 Moisture Adsorption of Bulk Stored Grain Under Tropical Conditions. December 1973. Prepared by Axel Caro Greiffenstein and Dr. Harry Pfost.
- No. 7 Regeneration Capacity of Silica Gel for Grain Drying. April 1974. Gangadhar Vemuganti Rao and Dr. Harry B. Pfost.
- No. 8 Measurement of Maize Weevil and Fungi Damage to Stored Corn. May 1975. Prepared by Miguel A. Mora and John R. Pedersen.
- No. 9 Damage to Stored Maize Infested with Sitophilus zeamais Motsch. May 1976. Prepared by Miguel A. Mora and John R. Pedersen.
- No. 10 High Temperature and High Humidity Grain Storage. July 1976. Prepared by Gabriel Rengifo and Dr. Harry B. Pfost.

- No. 11 Design and Operation of Community Grain Storages in Rwanda. December 1976. Prepared by Robert Burke and Dr. Harry B. Pfost.
- No. 12 Development of Grain Standards in Developing Countries. June 1978. Prepared by Ken Steinke and Dr. Harry B. Pfost.
- No. 13 Design of Natural Air Grain Drying Systems. August 1978. Prepared by Sam Mauer and Dr. Harry B. Pfost.
- No. 14 Development of a Natural Convection Dryer for On-Farm Use in Developing Countries. December 1978. Prepared by Francis N. Bolduc and Dr. Do Sup Chung.
- No. 15 Hygroscopic Properties of Corncobs and Their Application for Small Scale On-Farm Grain Conditioning. May 1978. Prepared by Luis F. Moncada and Dr. Do Sup Chung. (In Press)
- No. 16 Modeling for Dryer Selection and Simulation of Natural Air Drying of Rough Rice. May 1978. Prepared by Dong Il Chang and Dr. Do Sup Chung. (In Press)
- No. 17 Development of a Natural Convection Dryer for Use in Developing Countries. August 1979. Prepared by Theophilus L. Adeyemo and Dr. Do Sup Chung. (In Press)
- No. 18 Grain Properties Affecting Storage and Drying. January 1980. Prepared by Vemuganti Gangadhar Rac and Dr. Harry B. Pfost. (In Press)

Listing of Reports

Printed Under Cooperative Agreement AID/DSAN-CA-0256
Improvement of Postharvest Grain Systems

- No. 19 Application of Transportation Linear Programming for Optimum Number and Location of Public Rice Warehouses in Sri Lanka. October 1980. Prepared by Cornelius Hugo, Dr. Roe Borsdorf and Dr. Richard Phillips.

SPECIAL REPORTS

- No. 1 Building Viable Food Chains in the Developing Countries. August 1973. Prepared by Dr. Richard Phillips and Dr. Samuel G. Unger.
- No. 2 User's Guide to Computerized System for Feasible Agribusiness Development Volume One: Text and Charts. May 1975. Prepared by Dr. Richard Phillips, Dr. Leonard W. Schruben, and Joe M. Tiao.
- *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.
- No. 5 LDC Wheat Imports in 1985 and the Impact of Development Assistance on LDC Wheat Imports. September 1977. Prepared by Dr. Patrick J. Gormely, Dr. Thomas E. Kennedy and Gurprit S. Chhatwal.

- *No. 6 Food Grain Reserves in Developing Countries. March 1978. Prepared by Dr. Richard Phillips and Dr. L. Orlo Sorenson.
- Les Réserves de Grains Alimentaires dans les Pays en Voie Développement. Mars 1978. Préparé par Dr. Richard Phillips et Dr. L. Orlo Sorenson.
- No. 7 Post-Harvest Losses in Grain Legumes: A Review and Annotated Bibliography. September 1978. Prepared by Fabian Osuji. (In Press)
- No. 8 Developing an Appropriate Grain Storage System. December 1978. Prepared by Dr. Dale Anderson.
- Developper un Systeme Convenable De Stockage du Grain. Decembre 1978. Par Dr. Dale G. Anderson.
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- No. 10 Food Security Reserves in Northeast Asia Republic. (In Press)
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Listing of Reports

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ANNUAL REPORTS

- Annual Report 1978-1979. Prepared by Food and Feed Grain Institute Staff.
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- Annual Report 1980-81. (In Press) This Annual Report is the first to be printed under the Cooperative Agreement AID/DSAN-CA-0256.

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