

Grain Storage, Processing and Marketing

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**FOOD & FEED GRAIN INSTITUTE  
KANSAS STATE UNIVERSITY**

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**MANHATTAN, KANSAS 66506**

ANNUAL REPORT

Review of Activities  
July 1, 1975 through June 30, 1976

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

at the

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

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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.

SCOPE OF WORK

It was originally agreed that technical assistance would include:

1. Assistance and consultation in review and evaluation of technical assistance projects related to post-harvest grain handling practices.
2. Advise and assist in the planning, organization, or reorganization and implementation of grain marketing\* programs and facilities.
3. Identification and analysis of problems in grain drying, storage, handling, and transportation and recommendations of means for solution.
4. Advise on planning, design, and construction of physical facilities required for grain marketing\* programs.
5. Planning and execution of grain drying, storage, handling, and transportation training seminars, courses, and/or conferences.
6. Functioning as an information center for questions and inquiries relating to grain marketing\* programs and technology.
7. Preparation, editing, and reproduction of written and illustrated instructional, informational, and reference publications on various aspects of grain marketing\* for use by AID.
8. Development of methodology and design criteria through research and review to minimize problems attendant to grain marketing\* programs.
9. Such other technical assistance as may be mutually agreed on by AID and Kansas State University.

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\* Grain marketing includes all operations of drying, storing, handling, and transporting of grains from time of harvest until consumed.

REVIEW OF ACTIVITIES  
July 1, 1975 through June 30, 1976

The following review summarizes Kansas State University's activities during fiscal year 1976 of its contract, AID/ta-C-1162, which provided Technical Assistance in grain storage, processing, and marketing and agribusiness development in developing countries.

This report is organized under the following major areas of assistance:

- I. Assistance to USAID Missions and Host Countries.
- II. General Assistance to USAID and Developing Countries.
- III. Additional Activities.

I. ASSISTANCE TO USAID AND HOST COUNTRIES

A. Technical Services Performed

AFRICA - Zaire - May through July 1975

Nature of Activity At the request of the Government of Zaire and USAID/Kinshasa, Dr. Richard Phillips of Kansas State University made a preliminary visit to Zaire in March 1975 to develop a proposed scope of work for the study of maize marketing in Zaire. Subsequently, a KSU team consisting of Dr. L. Orlo Sorenson, team leader and economist, Mr. John R. Pedersen, entomologist and grain quality specialist and Dr. Norton C. Ives, engineer, proceeded to Zaire to conduct the study.

The three man team was in Zaire from May 17 through July 3, 1975.

Objectives The overall objective of the study was to analyze the marketing system for maize in Zaire and formulate recommendations for balanced development of the system with emphasis on the specific needs of small peasant maize producers.

A number of specific problem areas were to be analyzed in sufficient depth to measure the impacts of alternatives and formulate sound and workable recommendations. They included (1) field harvesting and gathering, (2) transport from field to first assembly point, (3) village storage of maize for food, (4) village storage of maize for seed, (5) assembly point functions, (6) shipping point function, (7) road and transportation networks, (8) marketing logistics, (9) price policies, and (10) related factors such as processing, etc.

Summary of Activities Urban centers are expanding rapidly in Zaire creating a need for expanded commercialization of cereal grains. Zaire is striving for self-sufficiency and an improved marketing system will help achieve this goal.

The current maize marketing system is underdeveloped. Deficiencies exist in means of moving maize from villages into commercial channels, storage facilities are minimal, insect losses are high and facilitating functions (financing, market information and determining market quality) have only rudimentary development.

ONACER (National Office of Cereals), formed in 1974, has responsibility for improving the marketing system for cereals, participation in formulation of national policy for cereal production and marketing, price stabilization and cereal import control. It was recommended that involvement of private traders under close ONACER observation be continued and extended at a rate consistent with development of an orderly marketing system.

A harvesting-storage-transportation strategy for maize was recommended which included (1) crib-type storage at village selling stations, (2) a minimum of 10 collection station facilities for ONACER operation (bag storage initially with expansion to bulk later) and (3) facilities for storage of maize and flour stock at major mills.

Insect infestation is a major problem at all points in the marketing system. Detailed recommendations for quality preservation and maintenance were outlined in the report.

Short-run and long-run recommendations for ONACER involvement in the marketing of maize were outlined with an ultimate goal of less than 20-25 percent of the market supply each year. In the long-run, a buffer-stock policy was suggested.

Additional long-run recommendations included: (1) improved rural transportation, (2) improved credit availability for private traders and processors, (3) development of market information and (4) a market reporting system.

Priority needs for facilitating the marketing of maize in Zaire are (1) development of operating and management skills in marketing personnel, (2) development of information inputs for sound policy decisions, (3) provision of current supply, demand, and price information and (4) a system for inter-market communication, for the effective operation of a national marketing system.

Priority recommendations for technical assistance include provision of (1) technical and management consultants, (2) in-country training programs for ONACER personnel and private traders, (3) opportunities for attendance of selected Zairois at international short courses, and (4) long term graduate training of key personnel at foreign universities.

Reporting and Distribution Draft copies of the main report have been sent to USAID/Kinshasa and AID/Washington for review. Printing of the final report and translation into French are underway, final action pending review by USAID/Kinshasa. An Executive Summary has also been prepared and sent to USAID/Kinshasa and AID/Washington.

Recommendations and observations of the three-man team are recorded in Report No. 51, "Maize Marketing in Zaire", July 1975 of the Grain Storage, Processing and Marketing series.

AFRICA - Senegal - November 1975

Nature of Activity USAID/Dakar, through AID/Washington, urgently requested a KSU technical advisory team to review the grain storage and marketing system in Senegal with specific emphasis on the need for grain storage facilities to maintain a reserve stock of grains, and a program to train Senegalese in grain storage and preservation.

A three-man team consisting of Dr. D. L. Pfof, grain storage engineer; Dr. W. P. Spencer, grain marketing specialist; and J. R. Pedersen, entomologist/grain quality specialist traveled to Senegal, November 9, 1975 in answer to the request. The group returned November 27, 1975.

Objectives The objectives were to review:

- GOS grain stabilization policy.
- Relationship of storage elements to the policy.
- ONCAD's system of warehousing and its relationship to the buying, transporting, and marketing system.
- ONCAD's ability to meet the purchase price for buying and storage of grain.
- Evaluation of other donor activities.
- Analyze the need for additional storage facilities.
- Role of farm/village storage within the entire marketing system.
- ONCAD's engineering plans for warehouse construction and make recommendations.
- Role of private dealers in buying agricultural products from farmers and selling to the consumers.
- Analyze the pricing structure for cereal grains.
- ONCAD's marketing efforts in purchasing cereals from 1970 to 1975.
- Grain preservation training program of I.T.A.

Summary of Activities Background information was obtained from Senegal and USAID/Dakar officials and visits to areas for review were made to determine the existing situation.

A general agricultural survey was made in regard to millet and sorghum production, consumption of millet and sorghum and marketing of millet and sorghum. Rice consumption, importation and production was also reviewed.

A part of the study was directed at evaluating storage facilities and methods. Recommendations were made in regard to storage facility requirements, planning and construction costs. A cost and efficiency comparison between the ONCAD warehouse design and prefabricated steel construction was made.

A review was made of storage and handling of grains in regard to bag versus bulk storage, conditioning of grain, the grading systems and future equipment needs.

A major part of the study involved grain preservation and quality maintenance. This included a storage review from farm to market.

It was determined that there was a serious need for more quality trained personnel in the area of grain storage and preservation. Recommendations were made for both in-country and overseas training.

Reporting and Distribution Draft copies of the main report have been sent to USAID/Dakar and AID/Washington for review. The team's comments are reported in the Grain Storage, Processing and Marketing Report No. 54 entitled, "Recommendations for Grain Storage and Preservation in Senegal", November 1975.

#### LATIN AMERICA - Ecuador - July 1975

Nature of Activity Upon request Kansas State University, under the technical assistance contract AID/ta-C-1162, supplied a consultant to review farm storage and handling of rice, corn and soybeans in the Guayas River Basin of Ecuador.

Mr. Elwyn S. Holmes, Extension Agricultural Engineer at Kansas State University, served as consultant to this review. Mr. Holmes traveled to Ecuador July 20, 1975 and returned on August 30, 1975.

Objectives The major objectives of the Guayas River Basin review were in making recommendations to:

- improve operational efficiency of existing facilities.
- determine training requirements for personnel.
- explore types of adaptive research on grain storage farms and cooperatives.
- recommend methods of quality presentation such as insect and rodent control, proper drying against molds and other micro-organisms and proper maintenance.

Summary of Activities and Conclusions In Quito, the situation was reviewed with Mr. Palricis Maldonado (USAID/Quito), Francisco Lopez and Fred Hubig (Guayaquil), Renan Bucheli (Assistant Business Manager, ENAC) and Eduardo Velarde (Coordinator for special programs, Ministry of Agriculture).

After reviewing farm and government storage situations, the following conclusions were presented.

Farm storage for rice, corn and soybeans is justified to supplement government storage.

There is drying equipment available for all crops.

Ministry of Agriculture extension workers must help farmers select proper mechanized equipment and train them on its proper use. Training programs for farmers must also be initiated in regard to proper grain storage methods. There is also a great need for extension training in marketing practices.

A demonstration farm using the most efficient farming and storage methods demonstrating crop production from planting to market is recommended as a training method. This would serve as an example for farmers to study and copy.

Storage and handling plans for rice, corn and soybeans are included in the report.

Reporting and Distribution The review assessment of Mr. E. S. Holmes was reported in Grain Storage, Processing and Marketing Report No. 52 July 1975, entitled "Farm Storage and Handling of Rice, Corn and Soybeans in the Guayas River Basin of Ecuador."

Draft copies of the report were left with officials in USAID/Quito and copies were also sent to AID/Washington.

LATIN AMERICA - Ecuador - July 1975

Nature of Activity At the request of USAID/Quito Kansas State University, under contract AID/ta-C-1162, supplied a consultant to review the current position of soybean production, processing and utilization under the Equadorian Programme Development and Diversification Agricole Agency (PDDA).

Mr. Donald F. Shimon, Technical Services Engineer for Archer Daniels Midland Company, served as consultant for the review. Mr. Shimon traveled to Ecuador on June 23, 1975 to evaluate the current soybean situation and develop recommendations for their soybean program. Mr. Shimon returned on July 11, 1975.

Objectives The major objectives of the review were to:

- Evaluate the current position of the agricultural development and diversification program as it pertains to soybeans.
- Establish a projection of production requirements of soybeans as a function of present and future demands.
- Evaluate existing facilities for oils and fats.
- Give a perspective on equipment requirements and other requirements for the soybean industry.
- Develop recommendations concerning the agricultural development and diversification program with special emphasis on soy.

Summary of Activities A deficient supply of food oil in Ecuador has given impetus to soybean production with the general trend for soybean production upward. Demand for oil has encouraged planting, however, the enthusiasm has been dampened by a lack of demand for soybean meal and a lack of credit to farmers for seeds, herbicides and equipment. Soybean production has increased from approximately 1,700 M.T. in 1973 to an estimated 7,500 M.T. in 1975. Projections for 1976 are 15,000 M.T. of soybeans. Farmers are organizing as associations in an attempt to establish a credit base and for industrial development.

The demand for vegetable oils in Ecuador has exceeded the domestic supply requiring an import program for a number of years. Based on current per capita consumption and projected population increases oil demands for 1975, 1980 and 1985 respectively are 40,000, 47,730 and 56,965 M.T. Quantities required at 150 and 200 percent of current demand are also projected. Required production of soybeans to meet soy oil requirements for 1980 and 1985 are estimated to be 170,475 and 239,740 M.T. respectively assuming per capita consumption at 150 percent of current.

The available total oil extraction capacity is 365 M.T./day. It is reasonable to expect that no more than one-half of the capacity will be used for soybean extraction. This represents approximately 11,000 M.T. of soybean oil per year. On this basis, extraction capacity in Ecuador is adequate until 1980 at present consumption levels. An additional 240 M.T./day are required to supply 1985 needs. Additional extraction capacity at the 150 and 200 percent per capita consumption levels is needed.

There appears to be an interest in soy flour fortification of bread. This will require import of soy flour until installation of soy flour production capacity at extraction plants can be developed if demand is demonstrated.

In general the soy production program appears to be sound and recommendations are made to make the operation of the program more efficient.

Reporting and Distribution The review assessment of Mr. Donald E. Shimon was reported in Grain Storage, Processing and Marketing Report No. 53, July 1975, entitled "Evaluation of The Current Soybean Situation in Ecuador."

Draft copies of this report were sent to USAID/Quito as well as to AID/Washington.

LATIN AMERICA - Uruguay - August 1975

Nature of Activity Mr. Kenton L. Harris had traveled to Uruguay at the request of USAID/Montevideo and assessed the grain storage insect problem. As part of assistance provided, Mr. Harris suggested a reference manual be prepared for grain handlers. Mr. John R. Pedersen, Food and Feed Grain Institute, KSU assisted in preparation of the manual.

Objectives The primary objective in preparing a training and reference manual for grain handlers in Uruguay was to provide a background of information from which Uruguayans could draw in training personnel and in solution of indigenous problems.

Summary of Activities A manual was prepared which included sections on:

Fundamentals of Grain Storage  
Moisture, Grain Drying and Moisture Measurement  
Principal Stored Grain Insects  
Control of Stored Grain Insects  
Rodents and Their Control  
Micro-organisms and Grain Losses  
Birds  
Grain Cleaning  
Grain Sampling, Inspection and Grading.

Reporting and Distribution Draft copies of various sections of the manual were sent to Mr. Kenton Harris for final editing and disposition. Tentative title for the publication was "Control of Losses During Grain Handlers" by Kenton L. Harris and John R. Pedersen.

LATIN AMERICA - Paraguay - February 1976

Nature of Activity At the request of the Government of Paraguay and USAID/Asuncion, Drs. Richard Phillips and Roe E. Borsdorf, Agricultural Economists, traveled to Paraguay February 1 through 28, 1976 to assist in evaluation of the marketing system and potential for agricultural products in Paraguay.

Objectives The objectives of this study were to assess the future marketing potential of agricultural products, current market channels, and margins and prices in relation to domestic and export markets within Paraguay. This was an integral segment of an overall analysis of the small farmer agricultural subsector.

Specific goals included:

- 1) Development of projections for agricultural production potentials by department through 1985.
- 2) Development of projections for market volumes and distribution patterns.
- 3) Assessment of marketing channels, margins and prices in relation to domestic and export markets.

Summary of Activities The current and future situation was assessed with regard to (1) projected production potentials, (2) projected market volumes and distribution patterns, (3) current market structure, and (4) constraints unique to the agricultural market of Paraguay.

While Paraguay has an abundance of land available for crop production and rapid studies have been made in increasing hectarage under crop production, the need for market development imposes a constraint upon increasing production in the future. Available domestic and export markets are restricted due to features unique to Paraguay.

Improvement in the market system can not be accomplished by one best solution to the overall problem. Attention must be given to altering the market system by concentrating on the effectiveness of the system. Development of system-wide commodity directed plans with preliminary in-depth planning will be required to solve current problems.

Reporting and Distribution Observations and recommendations of Drs. Phillips and Borsdorf were reported in "Evaluation of the Market System and Potential for Agricultural Products in Paraguay" Grain Storage, Processing and Marketing Report No. 59, February 1976.

Draft copies of the report were sent to Dr. David Peacock, USAID/Asuncion Rural Development Officer, for review. The final report was printed and distributed through AID Washington.

#### LATIN AMERICA - Dominican Republic - March 1976

Nature of Activity A Kansas State University grain storage team under contract AID/ta-C-1162 was requested by the InterAmerican Institute for Agricultural Sciences (IICA) through USAID in conjunction with the IICA/SEA integrated marketing project to study certain problems related to grain marketing in the Dominican Republic.

A two-member team consisting of Dr. Harry B. Pfost, grain storage engineer and Cornelius Hugo, agricultural economist, arrived in the Dominican Republic on March 10, 1976 and departed March 24, 1976.

Objectives The major objectives are in two sections as follows:

#### Engineering

- To set up inspection procedures for receiving new silos.
- Procedures for first run inspection of new silos.
- To review proposed new port facilities.
- To inspect uneven silo settling at Santiago.
- To review silo safety practices.
- To study design and need of proposed new purchasing centers.

#### Economics

- To review proposed rural marketing center concept and make recommendations.
- To make recommendations in regard to operating procedures of a rural marketing center.
- To develop guidelines for a structured survey questionnaire for producers.

Summary of Activities Upon arrival in the Dominican Republic, consultations were held with USAID/AGR, IICA, SEA (Secretary of Agriculture of Dominican Republic) and INESPRES (Institute for the Establishment of Prices for Agricultural Products).

The USAID/Kansas State University team primarily reviewed and studied problems in receiving new silos, the proposed new port unloading facilities, problems associated with the Santiago silos which encountered some settlement when first loaded, and proposals for new agricultural products marketing centers. A few visits to other INESPRES facilities and possible areas for improvements and changes are discussed.

Consultation with INESPRES engineers should have provided them with procedures needed to be taken to rationally test and prove new elevators before accepting them from the contractor. Details are provided in this review.

Proposed unloading facilities at one of the ports may bear further study and several alternatives and costs are presented for consideration. Some modification of present operating and purchasing procedures, unloading facilities and/or storage facilities is needed.

The settlement of the silos at Santiago has been of great concern. Soil test data will be reviewed by other engineers and it may be desirable for a soil or structural engineer to visit the site, review existing recommendations or suggest other steps to be taken.

Some minor suggestions regarding other operating and maintenance procedures are covered.

The proposed new agricultural marketing centers should contribute to increased efficiencies in the overall marketing system. They should provide well financed and managed facilities which will provide higher prices and lower transport costs to the farmers and reward farmers for improved product quality and help maintain that quality. They may simultaneously increase supply of agricultural products, reduce import requirements and reduce consumer prices.

Studies to date have been well planned and well executed but additional work is required to evaluate the feasibility of the centers.

Many questions need to be resolved. Where should they be located and what volume of business will they expect? Should they be combined with other farm services such as farm inputs and custom services? What prices should they charge and pay if they are not subsidized? Are farmers now tied to joint credit-marketing sources?

Experience in many other developing countries has shown that centers such as the ones proposed do benefit particularly small farmers, and lead to overall marketing efficiency improvement.

Reporting and Distribution The review assessment of Dr. Pfost and Mr. Hugo will be reported in Grain Storage, Processing and Marketing Report No. 57, March 1976 in Parts I and II.

Report distribution in draft form has been made to AID/TAB/Washington and USAID/Dominican Republic. The draft report sent to USAID/Dominican Republic was translated by Mr. Hugo.

LATIN AMERICA - Dominican Republic - April 1976

Nature of activity Upon the recommendations to USAID/DR by Dr. Harry B. Pfof, grain storage engineer, Kansas State University, Mr. Donald Jack, a consulting structural engineer from Kansas City, Missouri was requested through the KSU contract AID/ta-C-1162 to investigate a reinforced concrete grain elevator which was constructed in the city of Santiago in the Dominican Republic. The grain elevator had been financed in part by Alliance for Progress assistance in 1967-69. It had been reported that uneven settling had taken place during full capacity operations and that wall cracks were occurring and causing questions as to its further usefulness to the owners, the Institute de Estabiligacion de Precios (INESPRE). The elevator had been taken out of usage as a storage unit in mid-1974 and had not been in use since that time.

Mr. Jack arrived in the Dominican Republic on April 7, 1976 and departed on April 16, 1976.

Summary of Review and Recommendations The slipformed concrete storage unit had a 3'0" thick mattress foundation slab (63 feet by 110 feet) placed on undisturbed soil with top of slab at grade. The unit's discharge conveyors and structural framing holding the outside manlift were rigidly attached to the adjacent headhouse.

Recent soil borings revealed that a thin layer of potentially compressible soil exists immediately below the bottom of the foundation slab. No shear failure of this soil is anticipated at the maximum loads which can be imposed but considerable settlement has taken place and may continue.

Reportedly the storage unit settlement was not noticeable during the first 3½ years of operation. In December of 1973 rapid settlement of the storage unit became evident through bending of those rigidly connected members noted above. Reportedly at this time corn, of greater unit weight than rough rice, was being stored for the first time in this facility. It is more than probable that some settlement had taken place under rice loading but highly conceivable that the corn loading drove the structure down rapidly.

Considerable investigation established that the storage unit had settled uniformly and, since it is more than likely that it will continue to do so, it has been recommended that the unit be put back into use without any foundation treatment but that settlement be monitored to insure its uniformity. Repair of all machinery and isolation of all framing such that more settlement can take place is a mandatory prerequisite.

Reporting and Distribution Report No. 57 in the Grain Storage, Processing and Marketing series dated April 1976 will report Mr. Jack's review and assessment of the grain storage unit in Part III of the publication.

Draft copies of this portion of Report 57 were sent to USAID/Dominican Republic for review.

LATIN AMERICA - Ecuador - April 1976

Nature of Activity USAID/Quito through AID/Washington requested a technical assistance marketing team, under contract AID/ta-C-1162, to make an assessment of agricultural marketing needs of the soybean and grain sector in Ecuador.

The two-man team consisted of Dr. Roe Borsdorf and Dr. Walter G. Heid, Jr., who traveled to Quito, Ecuador on April 24, 1976 and returned May 10, 1976.

Objectives The major objectives were to review:

- Current soybean situation.
- Soybean market development.
- Future planning and needs.
- Identify and make recommendations in determining specific future soybean and grain marketing needs.

Summary of Activities The existing marketing patterns were reviewed with Ecuadorian officials and USAID/Quito personnel in determining the current soybean and grain market situation. The strengths and weaknesses of the existing marketing system were identified and discussed.

Projections were made on current soybean market development in regard to production, oilseed processing and future demands. "The Marketing Concept" and "The Systems Concept" were discussed.

Future needs were centered on market systems development, human resource development and storage and quality control systems.

Specific future needs considered were a professional training system, analysis of assembly functions, market planning and research, auxiliary services and USAID's role in the overall development.

Reporting and Distribution The recommendations of Dr. Borsdorf and Dr. Heid, Jr., were reported in Grain Storage, Processing and Marketing Report No. 58, April 1976 entitled "An Assessment of Agricultural Marketing Needs of the Soybean and Grain Sector in Ecuador."

Distribution of draft copies included USAID/Quito and AID/Washington.

ASIA - Philippines - July-December 1975

Nature of Activity At the request of the South Asia Regional Operations Division, Kansas State University (under Contract AID/ta-C-1162) agreed to provide technical services for Agribusiness Development in the Bicol River Basin in the Philippines over the period January through December 1975. Two

primary team members, Dr. Richard Phillips and Dr. Roe E. Borsdorf, were designated as major contributors for intermittent services during the period. Other contributors of services were designated on an "as needed" basis.

Objectives: The overall objectives of the technical services were:

- To provide technical assistance in planning and implementing agribusiness development programs based upon feasible modular units in viable food chains extending from farm inputs through production, marketing and processing to final consumers.
- To plan and execute general and specialized training in Agribusiness Development for A.I.D. and cooperating country, agency and institution personnel, and to prepare instructional, informational and reference publications and materials on the several administrative and technical aspects of Agribusiness Planning and Development.
- To develop methodology, establish criteria and design systems and technology through adoptive and development research to support the technical assistance and training efforts.

Summary of Activities Over the designated period of time KSU provided technical services, assistance and guidance to the Bicol River Basin Council (BRBC) agribusiness development team in accomplishing the following tasks:

- Establish market potentials for Camarines Sur and Albay province and greater Manila metropolitan area for 1975 through 1980.
- Establish production potentials for rice, corn, abaca, poultry, swine, cattle and fish for 1975 through 1980 by municipality and production types (if applicable) for Camarines Sur and Albay provinces.
- Established input requirements corresponding to production projections for rice seed, fertilizers, and agri-chemicals.
- Developed agribusiness prototypes as guides to possible investments as well as for development guidelines. Prototypes developed for rural banks, rice milling, and storage, livestock and fishery produce warehouse, fertilizer and agrichemical distribution, farm machinery manufacture, farm machinery distribution, farm fuel distribution, abaca production and processing, slaughter house, ice plant.
- Developed a model of rice market channels and flows.
- Enlisted the assistance of the entrepreneurial rice milling section.
- Published a four-volume manual of feasible agribusiness development.

- Held seminars for senior technicians on "application of BRBC Computer system for Agribusiness Development to the grains industry."
- Developed a 5-year program to up-grade and improve the efficiency of the rice milling industry starting with first stage milling at the local level. Program included a time phase work plan to match overall development. Input requirements and output goals constructed to fit with overall development plan. This program, because of the level at which it can be initiated, will have a large beneficial economic impact on small farmers. It will also bring farmers and/or farmer groups into the marketing process, which, if nothing more, will improve the integrity of the system and aid in an equitable distribution of economic gains to all sectors.
  - (1) Establish two demonstrator mills to test technical feasibility of basic concept and all alternatives.
  - (2) Held a 1-week prototype training session for 10 selected small millers (included two cooperative leaders) in better mill management and techniques as well as new equipment availability.
  - (3) Tested the economic feasibility of the program, including the private miller, farmer, and industry benefit/cost analysis.
  - (4) Prepared a draft report of findings.
  - (5) Discussed the programs with financial institutions interested in providing necessary funds for development.

In addition, the KSU team provided the following assistance:

- Economic and financial analysis of Libmanon-Cabuso Irrigation and Drainage Project (BRBC)
- Assisted BRBC staff with economic and financial analysis of farm-to-market road project (BRBC)
- Installed Agribusiness Computer programs at the Department of Agriculture Computer Service Center. This included training a core staff of systems analysts and programmers (six) on the programs (content and use of programs, how programs operate, and data requirements)
- Trained BRBC agribusiness staff on use of agribusiness computer programs

- Miscellaneous work such as developing prototype manual form for storage of necessary data, writing interface computer programs to link agribusiness computer programs together, developing a step-wise regression computer program for DACSC, etc.
- Conducted a one-half day seminar for senior technicians of BAECON, DA on Agribusiness Computer programs.

Reporting and Distribution A four-volume manual for feasible agribusiness development was published in the Philippines for distribution at the discretion of USAID/Manila and BRBC.

B. Follow-up on Previous Overseas Requests

AFRICA - Tanzania

Nature of Activity As a result of KSU technical assistance provided by Dr. D. S. Chung during the period April-May 1975 (Review of On-Farm Grain Storage in Tanzania, Grain Storage, Processing and Marketing Report No. 49, May 1975), Mr. A. N. Mphuru, Senior Lecturer in the Faculty of Agriculture, University of Dar es Salaam, Morogoro, Tanzania, spent 4 months at Kansas State University under a Fullbright-Hayes Fellowship, sponsored by the Council for International Exchange of Scholars. He was hosted at Kansas State University by the Food and Feed Grain Institute under Contract AID/ta-C-1162, Technical Assistance in Grain Storage, Processing and Marketing and Agribusiness Development.

Prior to visiting Kansas State University, Mr. Mphuru had been active in grain storage work in Tanzania. He was principal investigator in a study to investigate the traditional grain storage methods in the rural Morogoro and Iringa Regions of Tanzania in which loss assessment was a major consideration. He also served as Director for the Second Course of the FAO/SIDA/Tanzania Sub-regional Training Center on Storage Pest Control held at the Faculty of Agriculture and Forestry of the University of Dar es Salaam, Morogoro, Tanzania May 26 - July 4, 1975.

Summary of Activities During the time Mr. Mphuru was at Kansas State University, he devoted most of his time to developing a bibliography on losses which occur during harvesting and storage of grains. He also took part in the 1976 AID Grain Storage and Marketing Short Course held at Kansas State University June 21 through August 6, 1976.

Over the past several years, considerable emphasis has been placed on increasing the production of the world's food supply to meet the needs of our growing population. Only recently has there been a realization, on a broad scale, that we need to increase our efforts in the area of harvest and post-harvest food loss reduction as a means of increasing the total available food supply.

Since the late 1940's, there have been various loss estimates published for various parts of the world. Some of these estimates are based merely on guesses, others on limited observations, and a few on well-designed studies.

To put the harvest and post-harvest loss picture in proper perspective, there is a need to assess the information that is currently available. This Bibliography is an attempt to bring together in one publication a listing of the available literature on "Losses Which Occur During Harvesting and Storage of Grains." This effort should be of value to others pursuing the subject of food losses.

Reporting and Distribution The bibliography developed by Mr. Mphuru was published as "Losses Which Occur During Harvesting and Storage of Grains: A Bibliography, Grain Storage, Processing and Marketing Special Report No. 4, July 1976. Copies of the report have been sent to AID/Washington, TAB/AGR for distribution and are also available at KSU.

### C. Potential Areas for Technical Assistance

#### 1. AFRICA

a. Senegal - An extensive training program is incorporated in "Recommendations for Grain Storage and Preservation in Senegal," Grain Storage, Processing and Marketing Report No. 54, November 1975. It is anticipated that KSU, under Contract AID/ta-C-1162, will be involved in development and implementation of the training program.

b. Zaire - Continued consultation on maize marketing, grain preservation and training is expected in conjunction with the AID North Shaba Maize Project. One Zairian has attended the AID Grain Storage and Marketing Short Course and others are expected in the future.

#### 2. ASIA

a. Philippines - It is anticipated that KSU will provide the team leader/storage engineer for a multi-national post-harvest technical team to be headquartered at the South-east Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), University of Philippines, Los Banos. The team will work throughout the South-east Asian area identifying post-harvest technology problems. In addition to providing the team leader, we expect to provide backup assistance to the team as required.

#### 3. LATIN AMERICA

a. Ecuador - Continued input on the part of KSU is expected as follow-up to technical assistance provided during this reporting period. We anticipate additional assistance will be required in implementing the operation of grain collecting stations proposed in previous studies.

b. Paraguay - There are indications that additional assistance will be requested by USAID/Asuncion in development of the grain marketing system with special emphasis on development, location and operation of grain collection centers.

c. Uruguay - A potential exists for KSU involvement in the area of training in conjunction with the manual prepared by consultant, Kenton L. Harris and John R. Pedersen of KSU. The draft manual was prepared to guide personnel in the Ministry of Agriculture, GOU in organizing training, however, additional input in presentation of training sessions is expected.

4. NEAR EAST

a. Egypt - Consultants fielded by KSU at the request of USAID to work on recommendations for expanded grain storage at Cairo and Alexandria indicate potential additional assistance under the KSU contract with respect to implementation of increased bulk handling of grains in Egypt.

D. Technical Training

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 is considered to be one of the most significant contributions of the contract. 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, but as yet, full advantage of this capability has not been totally utilized. 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.

Other on-campus training includes degree program training and special training programs for AID sponsored participants. In addition, project staff members have taken part in a U.S. industry co-sponsored Feed Manufacturing and Technology Short Course at Kansas State University which was attended by participants from several of the developing countries.

In-country training was also provided during the past year in conjunction with the Bicol River Basin Project in the Philippines as well as in Thailand.

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

1. AID Grain Storage and Marketing Short Course - 1975

The fifth annual AID Grain Storage and Marketing Short Course was held June 16 through August 8, 1975.

One week's orientation in Washington, D.C. was provided by the USDA/AID International Training Office. Five weeks of intensive lecture, discussion, laboratory, workshop and field trip training was provided on the Kansas State University campus June 23 through July 26, 1975.

A 2-week extended field trip included the Kansas City area to observe grain storage facility manufacturing, river storage facilities and the

Board of Trade marketing functions; and the Houston/Beaumont, Texas area to observe rice production, storage, handling and processing and export facilities.

On the basis of recommendations made in participant evaluations of the 1974 Short Course, an attempt was 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; Micro flora 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; Micro flora; Insect identification; Biology and methods of detecting contamination; Rodent and bird biology; Pest control - inspection, housekeeping, physical and mechanical methods; Insecticides and fumigation practice; Grain drying and aeration; Storage structure design; and Grain grading and inspection practices.

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.

This approach seemed to work quite well in that the total group was about equally split between the technical and economic groups based on participant preference.

This was the first year that the Short Course had been offered with both French and Spanish simultaneous translation. Lecture outlines are now available in French, Spanish and English.

The 1975 Short Course had the greatest attendance of any Grain Storage and Marketing Short Course to date. There were 32 participants from 12 different countries including Egypt (1), Ethiopia (1), Rwanda (6), Tanzania (5), Uganda (6), and Zaire (1); Dominican Republic (5), El Salvador (2), Panama (2), and Paraguay (1); Korea (1) and Thailand (1). A group picture is shown in figure 1.

"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. We have had some 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. Unfortunately, we are not receiving notification of which missions are



1975 AID GRAIN STORAGE AND MARKETING SHORT COURSE

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

June 23 - August 8, 1975

Figure 1.

FIRST ROW (Left to Right): J.M. Kedi (Uganda), B. Rukirande (Rwanda), P.M. Kadama (Tanzania), J.M. Chamba (Tanzania), A.S. Mbia (Tanzania), K. Kagoda (Uganda), D.D. Lukombo (Zaire), O.J. Kakili (Tanzania), J. Arosemena (Panama).

SECOND ROW (Left to Right): T. Manzano (Interpreter), J.I. Chun (Korea), S. A. Medina (Dominican Republic), B. Rutembesa (Rwanda), R. Avelar (El Salvador), V.M. Baez (Dominican Republic), M.S. Naga (Egypt), E.A. Wakuganda (Tanzania), M.M. Kasaija (Uganda), S. Prohmtong (Thailand), S. Pascal (Rwanda), M. Borchardt (Interpreter), R. DeLacain (Interpreter).

THIRD ROW (Left to Right): E. Gutierrez (Interpreter), D.P. Gomez (Dominican Republic), J.J. Joe (KSU), K. Philippe (Rwanda), I. Karamage (Rwanda), P.A. Mercedes (Dominican Republic), M.O. Bakole (Uganda), R.D. Veras (Dominican Republic), T. Melaku (Ethiopia), L.K. Bagada (Uganda), A. Habyarimana (Rwanda), Mr. J. Pedersen (KSU).

FOURTH ROW (Left to Right): H. Melgar (El Salvador), J.L. Loor (Uganda), Dr. R. Borsdorf (KSU), Dr. E. Mader (KSU), Dr. R. Phillips (KSU), C. Hugo (KSU), Dr. D. Chung (KSU).

FIFTH ROW (Left to Right): A. Stanley (Paraguay), L.E. Alvarado (Panama).

sending participants with enough lead time so that manuals can be sent. Participants without the benefit of the Manual are at somewhat of a disadvantage in presenting their "country reports" and in certain other workshop activities.

"Grain Storage and Marketing Short Course Evaluation Questionnaires" are completed by each participant at the end of the 5 weeks' intensive training at Kansas State University. A verbal critique is also held with participants. A composite summary of responses to the written questionnaire is as follows (economic and technical group responses are evaluated separately in planning for the next year's Short Course):

1975  
GRAIN STORAGE AND MARKETING  
SHORT COURSE EVALUATION QUESTIONNAIRE  
QUESTIONARIO PARA LA EVALUACION DEL CURSO INTENSIVO  
QUESTIONNAIRE POUR L'EVALUATION DU COURS ACCELERE SUR  
LE STOCKAGE ET LA COMMERCIALISATION DES GRAINS.

To help us evaluate the Grain Storage and Marketing Short Course in which you have just participated, we ask that you complete this questionnaire honestly and objectively.

Para ayudarnos en la evaluación del curso intensivo sobre almacenamiento y mercadeo, que Ud. acaba de terminar; le pedimos que responda este cuestionario honesta y objetivamente.

Pour nous aider à évaluer le Cours accéléré sur le stockage et la Commercialisation des Grains, nous vous demandons de remplir ce questionnaire avec franchise et objectivité.

Please indicate if you were in the Economic Group I (16) ; or Technical Group II 16.

Por favor indicar si usted es del grupo Economico I \_\_\_\_\_ el Tecnico Grupo II \_\_\_\_\_.

Veillez indiquer si vous étiez dans le groupe I (economique) \_\_\_\_\_ ou le groupe II (technique) \_\_\_\_\_.

Short Course Content  
Contenido del Curso Intensivo  
Contenu du Cours accéléré

	Too Much Demasiado Trop	Too Little Muy Poco Trop peu	OK Correcto Bien
How was time devoted to course material Relacion del tiempo dedicado al curso Que pensez vous du temps consacré aux sujets traités			
Structure of Cereal Grains I & II (3) Estructura de los cereales Structure du grain de céréales	(2)	3 (2)	13 (12)

	<u>Too Much</u> Demasiado <u>Trop</u>	<u>Too Little</u> Muy Poco <u>Trop peu</u>	<u>OK</u> Correcto <u>Bien</u>
Chemical, Nutritive and Physical Changes in Storage I & II (3) Cambios quimicos, nutritivos y fisicos con el almacenamiento Changements chimiques, nutritifs et physiques durant le stockage	—	<u>8 (5)</u>	<u>8 (11)</u>
Moisture Measurement I (1 1/2) II (4 1/2) Medida de la humedad Mesure de l'humidité	—	<u>3 (8)</u>	<u>13 (8)</u>
Microflora I (1 1/2) II (4 1/2) y/microflora Microflore	<u>1</u>	<u>1 (10)</u>	<u>14 (6)</u>
Mold-Moisture Relationships I (1 1/2) II Relaciones entre humedad y mohos Relation entre l'humidité et les moisissures	—	<u>8 (2)</u>	<u>8 (12)</u>
Grain Standards Standards para granos Normes des grains	—	<u>5 (4)</u>	<u>7 (10)</u>
Grain Grading I (1 1/2) II (7 1/2) Clasificación de granos Classification des grains	—	<u>6 (6)</u>	<u>9 (9)</u>
Grain Handling Equipment I & II (1 1/2) Equipos para la manipulacion del grano Equipement pour la manutention du grain	—	<u>11 (3)</u>	<u>5 (12)</u>
Methods of Handling Grain I & II (3) Metodos del manipuleo de granos Méthodes de manutention du grain	—	<u>7 (2)</u>	<u>9 (13)</u>
Types of Storage Structures I & II (6) Tipos de estructuras para almacenamiento Types de structures de stockage	<u>1</u>	<u>4 (3)</u>	<u>11 (12)</u>
Aeration of Grain I (1 1/2) II (4 1/2) Ventilacion de granos Ventilation du grain	<u>(1)</u>	<u>4 (7)</u>	<u>12 (7)</u>
Grain Drying I (1 1/2) II (4 1/2) Secamiento de granos Séchage du grain	—	<u>4 (8)</u>	<u>12 (7)</u>
Causes of Grain Losses I & II (1 1/2) Causas de peridas en granos Causes des pertes de grains	<u>(2)</u>	<u>5 (3)</u>	<u>11 (10)</u>

	Too Much Demasiado <u>Trop</u>	Too Little Muy Poco <u>Trop peu</u>	OK Correcto <u>Bien</u>
Sanitation and Pest Control I & II (1 1/2) Sanidad y contrarrestar plagas Mesures sanitaires et lutte contre les insectes nuisibles	<u>(1)</u>	<u>8 (12)</u>	<u>8 (4)</u>
Insect Identification and Biology II (7 1/2) Identificación y biología de insectos Identification et Biologie des insectes	<u>(2)</u>	<u>4 (7)</u>	<u>12 (3)</u>
Methods of detecting contamination in Grain II (4 1/2) Detección de contaminantes de granos Méthodes pour détecter la contamination	<u>1 (1)</u>	<u>3 (5)</u>	<u>12 (4)</u>
Sanitation: Inspection & Housekeeping II (4 1/2) Sanidad: Inspección y limpieza Assainissement: Inspection et nettoyage	<u>1 (1)</u>	<u>1 (4)</u>	<u>14 (4)</u>
Physical and Mechanical Methods of Pest Control II (1 1/2) El Control de plagas Méthodes physiques et mécaniques de Lutte contre les insectes nuisibles	<u>(1)</u>	<u>7 (5)</u>	<u>9 (3)</u>
Insecticides II (3) Insecticidas Insecticides	<u>---</u>	<u>7 (8)</u>	<u>9</u>
Fumigation II (9) Fumigación Fumigation	<u>1</u>	<u>1 (6)</u>	<u>14 (2)</u>
Fumigation Safety II (1 1/2) Medida de seguridad en fumigación Mesures de sécurité en fumigation	<u>---</u>	<u>6 (8)</u>	<u>9 (1)</u>
Rodent Control II (1 1/2) Control de roedores Lutte contre les rongeurs	<u>---</u>	<u>7 (8)</u>	<u>9 (1)</u>
Storage Methods and Procedures I & II (3) Metodos y procedimientos de almacenamiento Méthodes et procédures de stockage	<u>(1)</u>	<u>4 (1)</u>	<u>12 (13)</u>
Storage Costs and Alternatives I & II (3) Costos de almacenamiento y alternativas Frais de stockage et autres solutions	<u>(1)</u>	<u>6 (4)</u>	<u>10 (11)</u>
Principles of Management I & II (3) Principios de administración Principes de gestion	<u>(1)</u>	<u>4 (6)</u>	<u>12 (9)</u>

	Too Much Demasiado <u>Trop</u>	Too Little Muy Poco <u>Trop peu</u>	OK Correcto <u>Bien</u>
Principles of Operation I & II (3) Principios de operación Principes d'exploitation	<u>      </u>	<u>4 (1)</u>	<u>8 (7)</u>
Organization of the Grain Business I (4 1/2) Organizacion del negocio de granos Organisation du commerce des céréales	<u>(1)</u>	<u>3 (4)</u>	<u>6 (9)</u>
Bookkeeping, Accounting and Inventory Control I (3) II (1 1/2) Tenencia de libros, contabilidad y control de inventario Tenue des livres, comptabilité et contrôle de l'inventaire	<u>(1)</u>	<u>6 (7)</u>	<u>7 (7)</u>
Transportation I (9) II (1 1/2) Transportación Transport	<u>(3)</u>	<u>6 (1)</u>	<u>8 (11)</u>
Facilitating Market Operations I (3) Facilitando operaciones de mercadeo Faciliter la commercialisation	<u>(1)</u>	<u>1</u>	<u>(13)</u>
Analysis of Marketing Systems I (3) Análisis del sistema de mercadeo Analyse des systèmes de commercialisation	<u>(1)</u>	<u>1 (3)</u>	<u>(11)</u>
Data Preparation I (3) Preparación de la Data Préparation des données	<u>(2)</u>	<u>1 (4)</u>	<u>(9)</u>
Feasibility analysis of grain projects I (12) Análisis de factibilidad de proyectos para granos Analyse de possibilité de projets de céréales	<u>(1)</u>	<u>2 (3)</u>	<u>(11)</u>
Master projections of grain data I (9) Proyecciones maestras de datos de granos Modèle de previsions pour les donées portant sur les grains	<u>(1)</u>	<u>1 (3)</u>	<u>(11)</u>
Sizing Facilities and Equipment I & II (3) Estimación del tamaño de Elevadores (silos y maquinaria Dimensions des installations et équipement	<u>      </u>	<u>9 (7)</u>	<u>7 (8)</u>

Are there other subjects that should have been included in the Short Course?  
Indicate subject and time.

¿Hay otras materias que se debieran haber incluido en el curso intensivo?  
Indique la materia y el tiempo debido.

Y a-t-il d'autres sujets qui auraient dû être traités dans le cours accéléré?  
Indiquer le sujet et le temps nécessaire.

PARTICIPANT COUNTRY REPORTS  
INFORMES DE PARTICIPANTES SOBRE SUS PAISES  
RAPPORTS SUR LES PAYS DES PARTICIPANTS

1. How would you rate the work sessions and presentations made by participants?  
¿Como clasificaria Ud. el trabajo y las presentaciones hechas por los participantes?  
Comment évaluez-vous les réunions de travail et les rapports faits par les participants?

<u>Valuable</u> <u>Valiosas</u> <u>De valeur</u>	<u>OK</u> <u>Acceptable</u> <u>Passable</u>	<u>No Value</u> <u>Sin Valor</u> <u>Sans valeur</u>
<u>9 (11)</u>	<u>5 (5)</u>	<u>2</u>

2. Was the amount of time for preparation of the reports sufficient?  
¿El tiempo para preparar los reportes era largo suficiente?  
Le temps prévu pour la préparation des rapports était-il suffisant?

Yes (Si) (Oui) 14 (15) No (No) (Non) 1 (0)

3. How much time should be allowed for presentation of each country report?  
¿Cuanto tiempo le debieramos permitir para las presentaciones?  
Combien de temps devrait être consacré à la présentation de chaque rapport?

1 Hour (Hora) (Heure) 10 (9); 2 Hours (Horas) (Heure) 5 (5); 3 Hours (Horas) (Heure) 2; More (Más) (Plus) \_\_\_\_\_

INSTRUCTION  
ENSEÑANZA  
ENSEIGNEMENT

Please rate the following:                      Good                      Average                      Poor  
Por favor califique lo siguiente:            Bueno                      Regular                      Malo  
Veuillez évaluer les points suivants:        Bien                      Moyen                      Mauvais

1. Quality of Instruction                      16 (15)                      1                      \_\_\_\_\_  
Calidad de la enseñanza  
Qualité de l'enseignement

	<u>Good</u> <u>Bueno</u> <u>Bien</u>	<u>Average</u> <u>Regular</u> <u>Moyen</u>	<u>Poor</u> <u>Malo</u> <u>Mauvais</u>
2. Methods of Instruction Metodos de ensenanza Méthodes d'enseignement	<u>14 (12)</u>	<u>2 (3)</u>	<u>(1)</u>
3. Answers to Questions Respuestas a las preguntas Réponse aux questions	<u>15 (7)</u>	<u>1 (9)</u>	—
4. Use of Visual Aids Uso de ayuda visual Utilisation de méthodes visuelles	<u>15 (16)</u>	—	<u>1</u>
5. Use of Examples Uso de Ejemplos Utilisation d'exemples	<u>12 (10)</u>	<u>3 (6)</u>	<u>1</u>
6. Demonstrations Demonstraciones Démonstration	<u>13 (10)</u>	<u>3 (5)</u>	—
7. Lectures Clases Conférences	<u>15 (10)</u>	<u>1 (5)</u>	—
8. Laboratory Sessions Sesiones de laboratorio Heures de laboratoire	<u>12 (6)</u>	<u>3 (4)</u>	<u>1 (2)</u>

Field Trips  
Giras  
Déplacements

1. How would you evaluate the stops made on field trips to Clay Center and Topeka, Kansas? ¿Como evalua Ud. las paradas hechas en Clay Center y Topeka, Kansas? Evaluation des visites faites à Clay Center et Topeka, Kansas?	<u>Valuable</u> <u>Valioso</u> <u>De valeur</u>	<u>OK</u> <u>Acceptable</u> <u>Passable</u>	<u>No Value</u> <u>Sin Valor</u> <u>Sans Valeur</u>
	<u>9 (13)</u>	<u>5 (3)</u>	—

Clay Center Trip  
Viaje a Clay Center  
Clay Center

Hutchinson-Royal Company	<u>8 (11)</u>	<u>6 (5)</u>	<u>1</u>
Farmers Union Coop Assn.	<u>11 (13)</u>	<u>2</u>	—
Gilmore-Tatge Company	<u>7 (8)</u>	<u>4 (4)</u>	<u>1 (1)</u>

	<u>Valuable</u> <u>Valioso</u> <u>De valeur</u>	<u>OK</u> <u>Acceptable</u> <u>Passable</u>	<u>No Value</u> <u>Sin Valor</u> <u>Sans Valeur</u>
<u>Topeka Visit</u> <u>Viaje a Topeka</u> <u>Topeka</u>			
Kansas State Control Lab.	<u>6 (10)</u>	<u>5 (5)</u>	_____
Kansas State Grain Inspection Office	<u>4 (11)</u>	<u>5 (2)</u>	<u>1</u>
FARMARCO Elevator	<u>5 (11)</u>	<u>2 (1)</u>	_____
2. <u>Local Field trips in Manhattan</u> <u>Viajes en Manhattan</u> <u>Visites à Manhattan</u>			
Farmers Co-Op Elevator	<u>9 (10)</u>	<u>4 (5)</u>	_____
Manhattan Milling Company	<u>8 (8)</u>	<u>3 (3)</u>	_____
U.S.D.A. Grain Marketing Research Center	<u>12 (9)</u>	<u>2 (4)</u>	_____
Agronomy Farm (Fumigation) (Fumigación) (Fumigation)	<u>8 (1)</u>	<u>(1)</u>	_____
3. With respect to field trips, would you prefer: Con respecto a las excursiones usted prefiriere: En ce qui concerne les visites, préférez vous:			
	<u>More</u> <u>Mas</u> <u>Plus</u>	<u>Some</u> <u>Igual</u> <u>Même nombre</u>	<u>Fewer</u> <u>Menos</u> <u>Moins</u>
Local trips (Manhattan) Viajes Locales (Manhattan) Les visites sur place (Manhattan)	<u>4 (5)</u>	<u>12 (7)</u>	<u>(2)</u>
Long trips (Clay Center, Topeka) Viajes Largos (Clay Center, Topeka) Les déplacements (Clay Center, Topeka)	<u>7 (8)</u>	<u>9 (6)</u>	<u>(1)</u>

DISCUSSION GROUPS  
DISCUSION DE GRUPOS  
GROUPES DE DISCUSSION

1. Do you feel scheduled sessions where participants can discuss specific grain storage and marketing problems would be valuable? Yes 13 (15) No 3

¿ Usted cree que reuniones fijas donde los participantes discutir temas específicos sobre el almacenamiento y mercadeo de granos seran de algun valor? Si \_\_\_\_\_ No \_\_\_\_\_

Estimez-vous qu'il serait utile de prévoir des séances où les participants pourraient discuter des problèmes spécifiqués de stockage et de commercialisation des céréales? Oui \_\_\_\_\_ Non \_\_\_\_\_

2. If yes, how many hours should be scheduled? 24 (5), 44 (10) 61 (1), 8 \_\_\_\_\_, 10 \_\_\_\_\_, more 2.

¿En caso de que Usted prefiera estas discusiones fijar, cuantas horas se le debieran dar? 2 \_\_\_\_\_, 4 \_\_\_\_\_, 6 \_\_\_\_\_, 8 \_\_\_\_\_, 10 \_\_\_\_\_, más \_\_\_\_\_.

Dans l'affirmative, combien d'heures devraient être prévues? 2 \_\_\_\_\_, 4 \_\_\_\_\_, 6 \_\_\_\_\_, 8 \_\_\_\_\_, 10 \_\_\_\_\_, Plus \_\_\_\_\_.

GENERAL

- |  |            |            |
|--|------------|------------|
|  | Yes        | No         |
|  | Si         | No         |
|  | <u>Oui</u> | <u>Non</u> |
1. Would you recommend this Short Course to others in your country?  
 ¿Recomendaría Ud. este curso intensivo a otros en su país?  
 Recommanderiez-vous ce Cours Accéléré à d'autres personnes dans votre pays?
- |  |                |          |
|--|----------------|----------|
|  | <u>15 (16)</u> | <u>1</u> |
|--|----------------|----------|
2. Do you think the Short Course was:  
 Cree Ud. que el curso fue:  
 Estimez-vous que le Cours Accéléré
- |                            |                          |                            |
|----------------------------|--------------------------|----------------------------|
| Too long _____             | Demasiado Largo _____    | Trop long _____            |
| Too short <u>9 (13)</u>    | Demasiado corto _____    | Trop court _____           |
| Proper length <u>7 (3)</u> | Longitud apropiada _____ | De la bonne Longueur _____ |
3. Was the Short Course:  
 Como fue el curso:  
 Le Cours Accéléré était-il:
- |                             |                       |                           |
|-----------------------------|-----------------------|---------------------------|
| Difficult <u>1</u>          | Difícil _____         | Difficile _____           |
| Easy <u>4 (2)</u>           | Facil _____           | Facile _____              |
| Proper Level <u>11 (15)</u> | Nivel apropiado _____ | Au Niveau approprié _____ |
4. Do you think it would be better to present the Short Course in different parts of the world (i.e. Latin America, Africa, East Asia, etc. rather than Kansas State University)?
- ¿Usted cree que sería más valioso presentar este curso en diferentes partes del mundo (i.e. America del Sur, Africa, Este Asia, etc.)?
- Estimez-vous qu'il serait préférable de donner le Cours Accéléré dans différentes parties d'i monde (c.-à-d. Amérique latine, Afrique, Asie de l'Est, etc.) plutôt qu'à Kansas State University?
- |                             |                            |
|-----------------------------|----------------------------|
| Yes (Si) (Oui) <u>7 (9)</u> | No (No) (Non) <u>9 (7)</u> |
|-----------------------------|----------------------------|

5. How long do you feel a regional Short Course as above should be?  
1 week \_\_\_\_\_, 2 weeks 1, 3 weeks \_\_\_\_\_, more 10 (13) (1 comment - 3 months maximum)

¿Cuanto tiempo se le debiera dedicar a un curso regional como mencionado e la pregunta N° 4? 1 semana \_\_\_\_\_, 2 semanas \_\_\_\_\_, 3 semanas \_\_\_\_\_, más \_\_\_\_\_

Quelle devrait être la durée d'un tel cours accéléré régional? 1 semaine \_\_\_\_\_, 2 semaines \_\_\_\_\_, 3 semaines \_\_\_\_\_, plus \_\_\_\_\_.

#### ADDITIONAL REMARKS

In the remarks section of the questionnaire, participants were asked to indicate any additional comments they wanted to make, especially with respect to improving future Short Courses. Remarks were as follows:

##### Economic Group

The course was well planned except my personal feelings is that some participants in either groups missed some important things. I am of the opinion that since most of the participants are very much concerned with grain handling a uniform program be drawn for all. It is important for example for the manage to have some knowledge of pest control, insect identification and use of pesticides at least. My other suggestion is that some written work be done once or twice in the week to stimulate and make course more interesting. Lastly, I cannot forget to thank the organizers, lecturers and KSU staff who worked very hard to make this course a success.

No activities appear to have been allocated for the weekends. Public holidays like 200th independence anniversary participants should have been given opportunity to attend as organized group. Participants should be given an opportunity to attend to all the subjects in the course.

This should be of three months length and every participant should take all subjects. No divisions. This gives a basic knowledge to executives in the grain industry. The follow-up courses should then be of specialized type i.e. Economic (Administrators) and technical ( pest-control personnel). The University should establish a proper syllabus for 3 month and 6 month courses and offer recognized certificates after testing the participants. Attendance certificates do not hold much water. Short 3 month courses should be held in regions so that local conditions can be discussed and remedies suggested and tried. University of Kansas (KSU) should look into a possibility of offering a diploma course in grain management or pest control officers.

Since this training is given only for five weeks, it seems to be that dividing the group into two us unnecessary. For specialization we need to take longer period of time than is shown in the schedule. We find subjects in the manual that are of interest to some of us but were not discussed in class. I don't think we have covered 50% of the subject matter that was in the various handouts. To have two or more people as lecturers is better than assigning one person to deal with little economic or technical group. Time for breaks need some adjustment since 1½ hours of lecture seem a little bit long.

communications between trainees from non-English speaking countries and the instructor. However, a trip to the USA in the program is absolutely necessary in order to get acquainted with the most modern techniques.

The course was good but the time was too short. The time should be extended to two or three months so that the two groups could have taken the same course. It would have been very helpful for the economists to have had some technical instruction and for the technicians to have some instruction in economics.

The students from non-English speaking countries should learn to speak English before taking the course.

It would be desirable if the two groups could take the same course. Also the participants should have their program in a state that has the same realities as their own (economic problems, climate, crops, etc.) There should also be a final examination so that the participants will take the program more seriously and they will benefit more, because actually, the program is excellent but there is a lack of excitement.

It would have been better if there could have been at least 2 hours of technical instruction in the economic group.

#### Technical Group

The course conducted was a very good one but the main trouble was time. There wasn't enough time for the teachers to cover all their syllabi well. If they did it was just a mere rushing to much with time available. Such rush had left some of the participants with less understanding. In case of Technical group, I think the teacher dealing with storage pest control should be given more time.

The country report information was not available for all countries, hence, participants should be informed before coming into Kansas so that they come fully equiped with up to date and accurate data. The division of participants should have been made after all subjects have been covered. It would only be best if learned lecturers would conduct their subjects. This is in connection with the beggining of this particular course where some lecturers were perhaps poorly represented.

In my opinion, I feel that although the course was short; I have enjoyed it because of gaining more and new techniques which some of these will be of some help to me when I go back home. The course wouldn't have been very difficult if we had more time to study difficult parts. Slowly and more detailed. Also it is my opinion that such a course when future participants are being selected, the countries concerned should give priority to people with basic knowledge of agriculture and also those who are engaged in grain handling directly. The first 2-3 months we would have covered all for Tech. & Economic groups. Then specialise for 2-3 months (6) months altogether I feel it would have been ideal.

More field trips because every one want to know the technical work in addition with academic knowlignes.

This course should be 6 weeks in the class and 2 weeks field trip.

I would like to suggest that such a course should have a longer duration so that one can have enough time to go through both groups (technical group & economical group). In some parts of the subjects one finds that it becomes impossible for the lecturer to go into deep because the time to cover up the materials is limited and therefore it makes the lecturer go faster than what he should I gather.

Presenting the short course in different parts of the world would have been helpful because Kansas State does not have all the conditions to efficiently present the course.

The short course was offered under good conditions, but there was not enough time to go into detail. However, it was negligible because we learned a lot in a very short time.

It would be desirable if a minimum technical or economical background be required for the trainee selection, they would benefit more.

It would be desirable if the period for the course could be extended to include more hours for lab work.

There should be more recreational activities during the weekend.

The splitting of the groups into two; namely economics and technical was not good.

It would have been very desirable to have had some technical instruction on fumigation, control of rodents and grain damage. Although Kansas State has a good training program, they do not have all the materials necessary to present efficiently the short course. It appears, therefore, that involving other parts of the world would be appropriate, besides, this would hopefully solve the language problems which are a very important obstacle to the course.

## 2. AID Grain Storage and Marketing Short Course - 1976

Participants for the 1976 Grain Storage and Marketing Short Course arrived on campus June 20, 1976 after a one-week orientation in Washington, D.C.

Participants will spend 5 weeks of intensive training on the KSU campus as in previous short courses. The training for the 1976 Short Course will follow the same general format as the 1975 Short Course with a core of instruction being given to all participants with specialized training for economic and technical groups. This type of approach provides greater opportunity for participant involvement. As a result of comments made during the 1975 Short Course evaluation, the core curriculum material was expanded for the 1976 Short Course.

Mr. Robert Doan, Program Specialist, Foreign Economic Development Service, 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 the short course.

Participants for the 1976 Grain Storage and Marketing Short Course included twenty-seven individuals from thirteen different countries and are listed below:

AFRICA

Ethiopia - Tibebu TESSEMA

Liberia - Joseph N. BOAKAI

Senegal - Mademba DIAGNE  
Algor DIONGUE  
Mor Sadio FALL  
Moctar KANE  
Amadou Sakhir KHOUMA  
Adama N'DIAYE  
Mboye NDIR

Tanzania - Marika A. N. MPHURU

ASIA

Korea - Doyle JEON

Taiwan - Suei-cheng CHANG

CENTRAL AMERICA

Dominican Republic - Pedro Guarionex ESTRELLA V.

El Salvador - Jose Luis MARTINEZ  
Mario Oscar MOISA  
Rodolfo A. OLIVARES

Honduras - Neftali CASTILLO  
Jose E. FOSTER  
Jose Faustino LAINEZ  
Amilcar Antonio DUARTE Sandoval  
Julio A. SOSA L.

SOUTH AMERICA

Brazil - Adelaide BELETA

Ecuador - Rene Mendoza ANDRADE  
Carlos CABRERA  
Jose L. ZEA

Uruguay - Roberto MARTINELLI

NEAR EAST-SOUTH ASIA

Pakistan - Muhammad Ismaeel MIAN

Evaluation and summary of the 1976 Grain Storage and Marketing Short Course will be included in next year's annual report.

3. Short Term On-Campus Training

a. Thailand - Training was provided over a 10-week period (April 19-June 18, 1976) for the following two Thai Ministry of Agriculture and Cooperatives personnel:

Miss Charoenkul Vilailuck  
Miss Chirabhummintara Angkana.

The training was designed to familiarize the participants with programming; planning and annual budget processes; project analysis and management net worth analysis; project scheduling; monitoring and evaluation. Participants were also taught the methodology of project preparation and strategies for better project design in the area of grain storage and marketing.

b. Taiwan - Two weeks' intensive training was provided for Mrs. Chen, a member of the Ministry of Agriculture. The training consisted of development and maintenance of a system for management of grain stock management.

4. 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 below with the area of study indicated:

a. Grain Science

Ulysses Acasio - Philippines  
Adelaide Beleia - Brazil  
Frank Bolduc - Former Peace Corp, Dahomey (Benin)  
Adilson Kososki - Brazil  
Miguel A. Mora - Costa Rica

V. G. Rao - India  
Gabriel Rengifo - Colombia  
Avtar Sachdeva - India  
Kenneth Steinke - Former Peace Corp, Iran

b. Agricultural Engineering

E. Haque - Bangladesh  
H. K. Koh - Korea  
L. Moncada - Colombia  
K. H. Ryu - Korea

c. Agricultural Economics

J. I. Chun - Korea  
Cornelius Hugo - Venezuela  
Doyle Jeon - Korea  
Jung Je Joe - Korea

5. Off-campus Training

During the period reported here, off-campus training was provided in the Philippines in conjunction with the Bicol River Basin Council Project.

On-the-job training was provided in use of the master projection computer model, the feasibility analysis model, the market channel selector model and the transportation model.

Training was provided for personnel from various organizations within the Government of the Philippines and extended over varying lengths of time. Following is a summary of organizations, numbers of persons, and length of training provided:

- Bicol Basin Agribusiness Staff; 4 persons; 4 weeks
- Computer Program Staff, Computer Program Center; Bureau of Agricultural Economics ; 6 persons; 4 weeks
- Market Research Staff, Bureau of Agricultural Economics ; 10 persons; 1 week.

In addition, intermittent training was provided to many other persons in the course of consultation sessions throughout the reporting period.

E. Responses to Technical Inquiries

As a part of the technical assistance provided under Contract AID/ta-C-1162, project staff members reply to numerous requests for information on specific items. Some of the 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.

During the period reported here, KSU responded to the following inquiries:

Requests for information on specific items

Mexico - Information and a series of references were supplied to Antonio Rivera H., FAX Rio Bravo, S.A. on fumigation of grain in boxcars.

USIA - Slides were provided to assist in illustrating an article being prepared on post-harvest problems due to rodents.

Requests for reports: (Report numbers refer to reports prepared under this contract. Full title, author, etc. are given at the end of this report.)

AFRICA

Liberia - M. Hoppe Report Nos. 1,2,8,11,12,18,20,21,25,29,31,35,44

Tanzania - A. N. Mphuru Report Nos. 3,6,7,8,21,26,44,47

Nigeria - International Institute of Tropical Agriculture Report Nos. 31,32,33,35,38,39,41,46

Dr. R. E. Aijuwa Special Report No. 3

Ethiopia - Mr. T. Tibebe Report No. 33.

ASIA

Sri Lanka - K.H. Satyapal (UNDP) Report Nos. 1,6,21,30,31,48

Philippines - Josepina Dimatulac Special Report No. 3

Dr. Marnelli Special Report No. 1

Taiwan - Ms. Chen Special Report No. 2.

NEAR EAST

Isreal - M. Cohen - Embassy Research Report No. 7.

LATIN AMERICA

Guatemala - ROCAP Report Nos. 1,3,4,5,6,7,8,10,11,12,13,14,15,16,17,18,20,21,24,25,26,28,29,30,31,32,33,35,36,38,39,40,41,42,43,44,45,46,47,48,50; Research Report No. 6,7; Special Reports 1,3

Brazil - M. Moriatti Special Report No. 2

E. Missiaen Special Report No. 3

Mexico - Ramon Rodriguez Research Report Nos. 7,8; Special Report No. 3  
Costa Rica - Turrialba (J. Pablo) Report No. 24.

CANADA

- University of Alberta (M. Shapka) Report Nos. 20,33,39,42,43,46; Special Report No. 1
- Peter McLaughlin Report Nos. 21,25,35,39,42,44,47,48
- Simon Fraser (British Columbia) Special Report No. 1
- Laval University (Quebec City) Report No. 35.

EUROPE

Russia - Central Scientific Agricultural Library (Moscow) Report Nos. 3, 8,29,46.

England

- Commonwealth Bureau of Agricultural Economics, Oxford Report Nos. 20, 22,36,39,42,43,46
- Marjorie Sperry Report Nos. 20,39,42,43,46
- Blackwells AOB Department Report No. 21
- M. Rogers, Sussex Report Nos. 35,36,38,39,40,41,42,43,44,45,46,47, 48,49,50
- Tropical Products Institute (M. Adams) Research Report No. 9
- H. K. Lewis Special Report No. 1.

West Germany

- Munkgaards/Boghandel Report No. 16
- Robert Meines, University of Berlin Report No. 21
- H.W.W.A. Institute Report Nos. 45,47
- Museirschmidt Buchhandlung Special Report No. 3.

FAO/Rome

- G.G. Corbett Report No. 6; Special Report No. 3
- H. Shuyler Report No. 47
- S. Aziz (Commerce and Trade Division) Special Report No. 3.
- Mr. Shastry Report No. 38
- UN/New York Report No. 47; Special Report No. 3.

UNITED STATES

Commercial

N. C. Ives (Consultant) Report Nos. 4,13,20,29,31,35,37,42,43,53;  
Research Report No. 6

D. Pfost (Consultant) Report Nos. 8,15,24,26  
International Systems and Controls (Houston) Report Nos. 7,31,50  
Almquist and Weksell (N.Y.) Report No. 47.  
Gulf Oil Special Report No. 1  
Black Economic Research (N.Y.) Report No. 21

GOVERNMENT

General Accounting Office Report Nos. 8,13,14,20,21,31,35,38,39

USDA.

ERS (J. Parker) Special Report No. 3

ARS (H. Highland) Special Report No.3

ARS (R. Davis) Special Report No. 3

AID (Consultant-M. Bourne) Report Nos. 1,3,49,50,53; Research Report  
No. 6; Special Report No. 1.

UNIVERSITIES

Central Connecticut State College (I. Kopf) Report Nos. 29,35,39,40,  
41,44,45,46; Special Report No. 1

Harvard Business School (Boston) Report No. 39; Research Report No. 7

International Soybean Program (INTSOY) Report No. 53.

INDIVIDUAL

Mr. Belotti (California) Report Nos. 13,14,15,24,25,26,45.

F. Visitors Under USAID Sponsorship and Others

1. ASIA

a. Japan

- (1) Japanese Wheat Milling Industry Team (Oct. 9-10, 1975). A five-man team consisting of flour mill managers and executive officers visited the Food and Feed Grain Institute and Department of Grain Science and Industry as part of a program to observe and study grain marketing, storage, transportation and processing.
- (2) Japanese Agricultural Extension Team (Oct. 20-24, 1975) - Seven cereal storage, processing and management specialists visited the Food and Feed Grain Institute, Department of Grain Science and Industry and Department of Agricultural Economics to discuss the various aspects of extension involvement in cereal (rice) production, management, marketing, storage and processing.
- (3) U.S.-Japan Seminar on Stored Product Insects (January 5-9, 1976) - This joint seminar held at Kansas State University brought together top stored product-entomologists from the U.S. and Japan to present specific papers and discuss problems of mutual concern.

2. AUSTRALIA

a. New South Wales

The president and an active member of the Grain Elevators Board of New South Wales visited the Food and Feed Grain Institute, Department of Grain Science and Industry and Department of Entomology to discuss grain preservation with emphasis on fumigation, insecticides, etc.

3. EUROPE

a. Benelux Wheat Team (March 31-April 2, 1976)- A five-man team of grain processing executives visited the Food and Feed Grain Institute and the Department of Grain Science and Industry. Discussions centered around grain processing, quality improvement programs, economics and preservation.

b. Soviet Union (December 8-9, 1975) - Nine representatives of various organizations related to grain activities visited the Department of Grain Science and Industry to discuss mutual items of concern with respect to grain processing, marketing and preservation. One of the main objectives of the team's visit was to arrange for fumigation of shipload quantities of export wheat destined for the U.S.S.R.

4. LATIN AMERICA

a. Brazilian Wheat Team (August 6, 1975)- A four-man team of government executives and technical representatives visited the Food and Feed Grain Institute and Department of Grain Science and Industry to discuss grain storage, marketing and preservation.

b. Chilean Wheat Trade Mission (October 1-2, 1975)- Six members of this team represented milling associations, universities and government marketing organizations. During the two-day visit to the Food and Feed Grain Institute and Department of Grain Science and Industry, the group discussed grain processing, marketing and storage.

c. Colombian Wheat Team (July 18, 1975)- The team consisted of five individuals representing various areas of the grain trade in Colombia. Discussions in the Department of Grain Science and Industry included quality improvement, processing and marketing.

## 11. GENERAL ASSISTANCE

This section of the annual report is devoted to describing activities under Contract AID/ta-C-1162 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 USADI Missions such as: (1) Adaptive and Developmental Research, (2) Library and Information Retrieval, (3) Development of Slide Series, (4) Preparation of Grain Storage and Marketing Manuals, and (5) linkages with other U.S. and foreign technical assistance programs.

### A. Adaptive and Developmental Research

#### 1. Master Projection Model for Estimating Future Requirements for Grain Storage and Marketing Facilities and Functions

Considerable effort has been devoted to the development of a computer program for use in estimating future requirements for grain storage and marketing facilities and/or functions in developing countries.

The following paragraphs briefly describe the reasons KSU project personnel felt the development of such a program would benefit developing nations as a whole and would fill a void in the "box of tools" now available to work on grain storage and marketing problems. An explanation is also given as to how the master projection model is utilized.

Planners in the developing countries must anticipate the need for handling, storage, processing, transport and distribution facilities. Usually facilities of the proper type and size must be planned for the right locations several years before they are needed in order to provide time to arrange financing, let the contracts, complete construction and machinery installation, and start up the facilities.

Accurate anticipation of facility needs is a difficult task in the development setting. Changes accompanying the "green revolution," rapid urbanization and other elements of development make it difficult to make accurate projections of future food production and consumption. The problem is aggravated by the lack of base data for projections in most developing countries. It is not surprising that one frequently finds either (1) inappropriate and under-utilized "white elephant" facilities, or (2) depressed prices, product losses, monopoly profits and other indicators of inadequate facilities.

Realistic projections of domestic patterns of production and consumption represent an essential ingredient in the "recipe" for development of appropriate marketing facilities. The computerized "master projection model," developed at Kansas State University, is a working tool for building the best possible projections of food product production and consumption for several years into the future. It is designed to make maximum use of limited base data and to permit estimation where necessary to supplement available data. It is designed to create a file of actual plus estimated data which can be improved and up-dated as basis for more accurate projections as additional data become

available. In the process of use for making projections, the model helps to specify additional data needs and serves as an aid for establishing priorities for studies to produce needed base data.

The logic of the "master projection" model is based on recognition of development as an evolutionary process, not a revolutionary one. Future production and consumption patterns are recognized as reflections of past trends in the specific country or area of concern. It is recognized that past trends may accelerate or decelerate, and even may change direction, but that they will continue as trends rather than jump up or down irrationally. Seasonal or cyclic sometimes found in agricultural production and consumption figures can be reflected in the model to develop "net" trends for the projections. The logic of the model is implemented through what is sometimes called "time series analysis"--analysis of past data for a period of years in order to determine the nature and magnitude of changes which can be expected in future years.

The "master projection" model is somewhat complex because of its versatility. For example, the alternative statistical models for fitting trends include linear, logarithmic, exponential and specified rate, and these alternatives may be specified for both the "master" projection and for the component parts (e.g., provinces or sub-products) which are pro-rated from the "master" projection. Still, it is believed that economists or statisticians with a minimum of computer training can learn to use the model effectively in a few weeks of applied training. With the tool, specialists from the developing countries often can make more accurate projections of domestic production and consumption than can be developed by foreign experts, because of their greater knowledge of local conditions affecting the trends.

In addition to continuous updating of the "master projection" model, the program has been used on case studies in Thailand and the Philippines during the period reported here.

## 2. Rice Mill Feasibility Analysis

Developmental work in the area of rice mill feasibility analysis led to the development of a practical manual for use in developing countries. The basic purpose of this manual is to facilitate the gathering, organizing, and processing of necessary information and data for feasibility analysis studies of rice storage and milling operations. The step-by-step procedures outlined in the manual represent a systemized process for making realistic analysis and subsequent useful deductions about the economic viability of a proposed project. Besides determining the economic feasibility, it should be helpful in the timing of construction and start-up of operations, determining manpower needs and other important factors.

The manual itself is subdivided into different sections containing the methods of analysis and application of the essential data and the computerized and manual determination of the internal rate of return. A rice mill case from Panama is used to illustrate the process. A listing of the fortran program deck with documentation is provided at the end of the manual.

The primary objective of feasibility analysis is to measure the potential of a proposed project or integrated series of projects, normally measured as the projected rate of return on capital investment. The accuracy of feasibility analysis depends upon the quality of the technical and economic data used in the analysis, and the precision with which these data are analyzed and evaluated. The feasibility analysis computer program provides analytical precision; the user must exercise the quality control for the basic input data supplied.

The basic manual, "Rice Mill Feasibility Analysis," Grain Storage, Processing and Marketing Manual No. 3 was published in June 1975. Subsequently, a companion manual, "Rice Mill Feasibility Worksheets," Grain Storage, Processing and Marketing Manual No. 3A was published. Both Manual No. 3 and 3A have also been translated into Spanish and are used routinely in the conduct of the annual AID Grain Storage and Marketing Short Course.

### 3. High Temperature-High Humidity Storage Conditions-Effect on Grain Quality

Tropical areas of the world pose special problems in the safe storage of cereal grains and the answers to many questions regarding maintenance of grain quality under these conditions are not known. Emphasis has been focused on post-harvest losses of cereal grains since the World Food Conference in Rome in 1974. The recommendations to build grain reserves on a large scale to prevent the disastrous results of the Sahelian drought from reoccurring may pose additional problems. To investigate the effects of high temperature-high humidity on grain quality, laboratory studies were initiated under controlled conditions.

The tropical belt is the area which lies between the Tropic of Cancer and the Tropic of Capricorn and contains above one quarter of the land surface of the earth and more than one third of the world's population. Seven types of climate are distinguishable, each of which has its impact on the pattern of food supply and consumption in the areas and particularly on grain drying and storage problems after harvest. These climates may be defined as equatorial, tropical, desert, humid tropical, mediterranean, temperate and highland, which have characteristic natural and cultivated vegetation potentials.

Perishable and semi-perishable foods spoil because of chemical and physical changes brought about through the activity of one or more of the following groups of spoilage agents: molds, yeasts, bacteria. Under proper conditions of humidity, temperature and oxygen supply the various members of these groups attack certain compounds in food material and can convert them into toxic compounds which render the food unfit for human consumption.

Grain is stored at common or normal temperatures or is refrigerated or cooled to preserve it. Moisture content or temperature slows the activity of all spoilage agents. In humid areas it is very common to find regions with more than 75 percent relative humidity. Temperature varies with altitude; at 1,800 meters (mt), the variation may be 17 degrees centigrade. Rigid classification of an area into one of these main climate regions is not always possible. Coastal low, for example, may have the main characteristic of hot dry areas (38 to 44°C) but high relative humidity.

This study is projected for the areas where the ambient relative humidity never falls below 70 percent. Relative humidity in these studies was lowered by raising the temperature of the air (for our case the temperature was 43°C, with the humidity reduced to 60 percent). At this temperature, most of the species of insects are inhibited. According to these general comments, we are going to determine the "commercial condition" of grain to predict its future storage behavior. Whereas mold count and viability tests are good indexes of incipient deterioration, test weight, cracking and breakage (handling), milling-baking, fat acidity and visual aspects indicate physical indexes of deterioration present in the grain. Corn, wheat, rice, sorghum, pinto beans and soybeans were used for the study. These grains were stored in sacks and bins. The bins were aerated during the experiment. For one lot A, corn was rewet and dried by natural and artificial methods.

The temperature of 43°C and relative humidity of 60 percent were selected because these conditions correspond to the same absolute humidity as 35°C and 90 percent relative humidity - a typical tropical condition. If dry grain, say 12 percent moisture, is stored at 35°C and 90 percent relative humidity, it picks up moisture from the atmosphere and the moisture increases to the point where many molds grow. It was hoped that aerating with heated air at the lower humidity would keep the grain dry and prevent mold growth.

Results of the work mentioned here are in the process of being published as "Effect of High Temperature and High Humidity Conditions on Grain Quality," Grain Storage, Processing and Marketing Research Report No. 10 by Gabriel Rengifo and Harry B. Pfost.

#### 4. Development of a Grain Grading System for Developing Countries

Initial background work has been done on reviewing the need for and existence of simple grain grading systems in developing countries. A proposal has been prepared to outline a project to study existing grading systems and it is hopeful the expanded project will be initiated the next budget period.

An operating grain grading system will protect consumers through assurances of purchasing a stated quality at an agreed price. Grain standards will award producers of quality grains by higher prices which will, in turn, act as an incentive to quality production.

This study will seek to determine those factors most consistent with a practical grain grading system adaptable to local environments and applicable to existing field conditions. Post-harvest damage, a factor to be considered in determining grain grades, also will be surveyed.

Specifically the project will:

1. Determine what factors influence consumers at a local level when purchasing grains;
2. Determine other factors which may be measurable and which affect grain value;
3. Study existing grading standards in various countries;

4. See how well these standards are being applied;
5. See when the grain is graded and who benefits from the grain grading process;
6. Find out how the standards are set and used when grains are being traded between countries;
7. Develop grain grading standards which will be appropriate to local conditions and needs based upon qualities which significantly affect the value of the commodity and which can be measured under practical field conditions; and
8. Study crop losses.

#### Plan of Work

Two technicians will be assigned to this project. One of the technicians will have 7 years experience in the grain storage field and speaks Spanish.

The technicians will spend a total of about 90 days in four Latin American countries (Colombia, Costa Rica, Dominican Republic, and Ecuador). They will: (1) determine what grain grading standards exist in the country; (2) travel to determine how these standards are being applied in normal marketing operations; (3) determine what influences the consumer in the smaller local markets and how these factors relate to any standards that may be in effect.

Local officials connected with establishing and using grading standards will be contacted. Also, if it is the custom to have weekly markets in the country, when and where these are held will be determined. Two commodities will be emphasized: corn and beans.

#### 5. Modification of the "Brook" Grain Dryer for Farm Use in Developing Countries

The "Brook" grain dryer was developed in Africa in conjunction with AID programs. Although the dryer can be made of indigenous materials (i.e. mud brick, etc.) and is adaptable to small farm situations, its efficiency can probably be increased by minor design modifications.

Work was initiated during this report period to modify the design of the dryer to improve its performance yet retain the simple construction features and materials. Once the design principals are worked out, two full-size dryers will be constructed, one original design and one modified, to field test the modifications.

#### 6. Evaluation of Insect Damage and Losses to Stored Maize

Work to date has involved comparison of methods of damage assessment with respect to possibilities and suitability of the methods to measure weevil damage under different storage situations. Moderate size lots of

maize (50 Kg) under controlled and variable conditions of storage were evaluated. The purpose was to study (1) the effectiveness of several methods to assess weevil damage in maize, (2) the effect of environment, location of infestation in containers and initial moisture content of maize on degree of weevil damage, and (3) the relationship between methods used in assessing weevil damage.

Results of the investigations are reported in "Damage to Stored Maize Infested with Sitophilus zeamais Motsch," Grain Storage, Processing and Marketing Research Report No. 9, May 1976, prepared by Miguel A. Mora and John R. Pedersen.

## B. Library, Information Retrieval and Slide File

### 1. Library and Information Retrieval

One objective of the Food and Feed Grain Institute under Contract AID/ta-C-1162 is to build a center for the collection and dissemination of information related to the various aspects of grain storage and marketing. To this end we have, over the past few years, been accumulating reprints and publications and have been feeding references to publications and articles into a retrieval system on the various aspects of grain storage and marketing.

The purpose of this activity is to have at hand an up-to-date source of reference material on which staff members may draw in response to technical inquiries in preparation for field activities and in preparation for training activities.

Collecting information, literature and references on the various aspects of grain storage and marketing on a world-wide basis is a time consuming task and requires searching large numbers of publications. Additional time is required to obtain copies of reprints for the library and to put the desired information into the retrieval system.

As an aid in reducing the time to search for pertinent articles on grain storage and marketing, the Food and Feed Grain Institute has subscribed to a weekly publication called "Current Contents" published by the Institute for Scientific Information. This is a service that publishes the tables of contents of over 4,000 periodicals with specializations in various fields. The special copy subscribed to is "Agricultural, Food and Veterinary Sciences." This publication allows us to "search" the world literature for information related to grain storage and marketing in a minimum of time.

### 2. Slide File

As each of the teams under Contract AID/ta-C-1162 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, 1971, 1972, 1974, 1975 and 1976 and in discussing grain storage and marketing with visitors and students under USAID sponsorship.

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. Status of Grain Storage in Developing Countries, Contract AID/otr-C-1331

In July 1974 an agreement between the Food and Feed Grain Institute, KSU and the Agency for International Development was reached for the review of the status of grain storage in developing countries. A major emphasis was to assemble information on the available storage in developing countries, world-wide. The review provided a summary of the information available on grain storage facilities and methods world-wide and a cataloging of capacities for grain storage, by country, in the developing countries.

Findings of the review were published in "Status of Grain Storage in Developing Countries," Grain Storage, Processing and Marketing Special Report No. 3, July 1975, prepared by John R. Pedersen.

D. Group for the Assistance on the Storage of Grain in Africa (GASGA)

In 1973, Kansas State University under Contract AID/ta-C-1162, (formerly AID/csd-1588) was invited to join a group of international organizations who had grain storage and marketing assistance efforts in the African area. KSU was invited to act as AID's representative in this capacity.

Other members of GASGA included the Tropical Products Institute (TPI) in London, the Institut Recherches Agronomique Tropicale (IRAT) in Paris, the International Institute of Tropical Agriculture (IITA) in Ibadan, the International Development Research Centre (IDRC) in Canada, and F.A.O. in Rome.

Dr. Do Sup Chung attended the 1974 meeting of GASGA and formally accepted the invitation to join GASGA as a working member. He further extended an invitation to GASGA to hold the next annual meeting at Kansas State University. The invitation was accepted and the meeting held on the campus at Kansas State University. The invitation was accepted and the meeting held on the campus at Kansas State University in July 1975. Following is a condensed version of the minutes of the 1975 GASGA Meeting.

GASGA MEETING

KSU

July 10-11, 1975

The 6th GASGA Meeting was held at Kansas State University, Manhattan, Kansas, July 10-11, 1975. Two days of tours preceded the formal meeting (see Appendix A). In attendance were: (see Appendix B).

Future Functions of the GASGA Secretariat and Restrictions of GASGA Interest in Africa

In the past, IRAT and TPI have shared jointly secretariat responsibilities. TPI has agreed to function alone in that capacity until other arrangements can be made.

The major functions of GASGA were re-identified as follows:

1. GASGA is a voluntary association of organizations with a major involvement in research, the application of research and training.
2. GASGA aims to stimulate improvement in the help given to developing, primarily African, countries regarding storage and transport of grain and other durable products.
3. GASGA seeks to identify gaps in national and regional research, development and training and will consider how these could be filled and then GASGA would make recommendations.
4. GASGA is prepared to give technical advice on projects or ideas for projects and will respond to requests from African countries or donor bodies for information, advice and services in the storage field.
5. GASGA hopes to encourage study of the constraints on the extension of known technology and of the ways of organizing effective extension.
6. GASGA considers information that can usefully be disseminated, storage development work in the field and training of developing countries' personnel.
7. GASGA will hold special technical seminars.
8. GASGA has no funds and does not function in any sense as a donor body, but, seeks to stimulate financial support in projects which it recommends.
9. GASGA is essentially advising and catalytic in relation to practical activities and hopes to have contact on specific problems with projects of many organizations.

List of potential donor agencies would include:

Common Market  
Federal Republic of Germany (FRG)  
SIDA (Sweden)  
DANIDA  
NORAD  
CIDA (Canada)

Hoover, of KSU, pointed out that if GASGA activities expanded beyond Africa then the liaison would probably be the KSU project manager in the Technical Assistance Bureau of AID. This position is also subject to frequent change of personnel.

Further discussion indicated that donor agencies should probably not become members of GASGA but at a later stage might designate Institutes such as the Food and Feed Grain Institute at KSU directly involved in the technical aspects of grain storage to be their representative.

The question of membership of donor agencies was discussed further with the possibility of associate or liaison membership suggested.

No formal action was taken on this item, however, it was a general consensus that closer liaison between GASGA and international donor or funding agencies was needed. The exact mechanism for accomplishing the liaison was not decided. FAO has indicated a willingness to assume a coordinating role in this effort and to develop a list of donor agency liaison persons.

It was proposed by David Dichter and Associates to form an extension type service in Africa. Dr. Dichter, with the backing of the International Secretariate of Volunteer Services (a private volunteer organization) conducted a "West African Seminar on the Role of Volunteers in Farm and Village Level Grain Storage" in Cotonou, Dahomey December 13-23, 1974 and has proposed seminars in other areas of the world.

Technology is probably available to guide the small farmers in their storage problems if it is properly extended. At this point, the extension activity becomes a main problem. This is no simple task. There has to be continuous contact with the extension services to maintain programs once they are initiated. In many countries extension services are not well developed and perhaps could be assisted by private voluntary organizations (PVO's).

Dr. Dichter has also proposed other seminars in countries such as the Philippines. A general concern was expressed by several members that before seminars or workshops on storage are held, that the need for and location of them should be given considerable thought. Dr. Shuyler indicated that three steps should be involved in the analysis and solution of grain storage problems:

1. Make an evaluation of the farm and village storage situation - if necessary enlist the aid of FAO, USAID or other agencies.
2. Involve top officials and research workers to discuss the evaluation and define the problems and then agree on action programs.

### Expansion of GASGA

A number of member representatives at the meeting were in accord that GASGA activities should not be limited only to Africa.

It was generally agreed that GASGA should maintain its technical orientation and informal nature and that this could be maintained on a worldwide basis as well as in Africa. Further, that other donor agencies not now represented in GASGA are active in Africa at present and that if it was felt the international centers, other than IITA, should be represented, a member of the consultative group could represent all centers.

### IDRC and IITA

IDRC activities currently has a mission operating in Senegal which will be moving to East Africa (probably Tanzania) looking at the post-harvest production system rather than strictly grain storage. Two workshops will be held in conjunction with this mission: one in early November in Dakar, Senegal and a second about one week later in Nairobi. GASGA member representations are invited to attend. Purpose of the workshops is to bring information that IDRC has gathered on post-harvest technology to the attention of various African countries and to obtain their views on whether post-harvest technology teams should be established in East and/or West Africa. This is in conjunction with a request from the Technical Advisory Committee (TAC) of the Consultative Group on International Agricultural Research (CGIAR) to IDRC to explore this area.

IDRC has formed an advisory committee on post-harvest technology in S.E. Asia along the lines being considered for Africa. There are five IDRC projects being considered for coordination by the committee which includes representatives from Indonesia, Malaysia, Singapore, Philippines and Thailand. Projects include farm level drying, milled rice storage, and a complete post-harvest system to deliver better quality grain.

### FAO Activities:

#### Training Programs Include:

NIGERIA - the FAO/DANIDA African Rural Storage Center at IITA, Ibadan conducted a training/study tour in Feb/Mar 1975 for 12 participants from Sierra Leone, Tanzania, Ghana, Dahomey, Comeroon and Togo. Training concentrated on practical aspects of loss assessment, crib construction and infestation control.

TANZANIA - the second Sub-Regional East African Storage Pest Control Training Course was held at the Faculty of Agriculture, University of Dar-es-Salaam, Morogoro 26 May-2 July 1975. Participants were from Botswana, Ethiopia, Kenya, Lesotho, Malawi, Somalia, Tanzania, Uganda and Zambia.

#### Study/Assistance Projects Include:

EGYPT - A Food Security Assistance Programme (FSAP) mission in March/April 1975 will recommend a policy and action plan for strengthening national food security and facilities required for reserve grain storage.

UGANDA - A storage specialist has been appointed for one year to advise the Produce Marketing Board on improved storage management and storage pest control.

MALI AND MAURITANIA - A consultant to the Office for the Sahelian Relief Organization (OSRO) was provided to study storage conditions and infestation levels of food and commodities and to arrange for fumigation of stocks.

SUDAN AND CHAD - A consultant for FAO/WFP studied storage and handling of WFP commodities March-May 1975.

TANZANIA - A proposal for a three-year project on "Evaluation of Grain Storage Systems for Cooperatives" was prepared for consideration by the Government of Tanzania.

GHANA - A project financed by the Australian FFHC will be started during 1975 to investigate and extend information on chemical insect control to farmers in the principal areas where maize is stored on farms.

IRAT Activities:

Seminars and meetings included:

- International Conference on Stored Product Entomology Oct. 7-11, 1974 at Savannah, Georgia, USA.
- West African Seminar on the Role of Volunteers in Cereal Storage on the Farm and Village, Dec. 13-21, 1974, Contonou, Dahomey.
- UNDP/FAO Training Course on Control of Crop Pests and Desert Locusts Feb. 17-Mar. 21, 1975, Dakar, Senegal.
- GASGA Training Seminar on Grain Storage, Apr. 29-30, 1975, Dakar, Senegal.

The IRAT paper describes evaluation of certain pesticides, storage methods and treatment methods for insect control in groundnuts in cooperation with the Office National de Credit et d'Aide au Developpement (ONCAD) and the National Agricultural Research Centre (CNRA) in Senegal.

KSU Activities:

KSU staff members described involvement in Technical Seminars as follows:

- West African Seminar on the Volunteer Role in Farm and Village-Level.
- Grain Storage, Dec. 13-21, 1974, Contonou, Dahomey (paper on "Fundamentals of Farm and Village Level Grain Storage").
- GASGA Seminar on Training in Grain Storage, Apr. 22-25, 1975 Dakar, Senegal. (Paper on "Graduate Training in Grain Storage").

KSU studies and assistance in Africa included the following countries:

Tunisia - A four man team prepared a "Study of the Tunisian Grain Marketing System." August 1 - September 7, 1974.

Tanzania - One storage engineer prepared "A Review of On-farm Grain Storage in Tanzania" April 28 - May 2, 1975.

Zaire - A three-man team conducted a "Study of Maize Storage and Marketing in Zaire" May 19 - June 30, 1975.

Egypt - A consulting engineer reviewed several proposals for expanding bulk storage facilities at Alexandria and Cairo and as a result AID will finance the expansion of bulk storage.

Tropical Products Institute (TPI) Activities:

Activities were in three major categories, continuing long-term programs, short-term programs and research. Continuing long-term programs include:

Swaziland - an FFHC/Christian Aid financed "Farmer Grain Storage Project."

Zambia - ATPI officer continues as Officer in Charge of the Food Conservation and Storage Unit, Ministry of Rural Development, carrying out research, training and advisory work on grain storage problems throughout Zambia. A report on storage losses of maize on small farms is being completed and losses at the central storage depot level are being surveyed.

Kenya - A three-man Overseas Development Ministry storage team is due to terminate in December 1975.

Ghana - A TPI advisor assisting the Grains Development Board built up its technical management ability in operation of bulk storage facilities and will complete his assignment July 1975.

Ethiopia - A fumigation and pest control specialist is attached to the plant Protection and Production Division of the Ministry of Agriculture and is responsible for introducing correct pest control procedures for treatment of import and export grains and for training local staff.

Malawi - A Crop Storage Officer attached to the Department of Agricultural Research is carrying out advisory and training work in grain storage from the farm to the central storage level.

Short-term programs include:

Tanzania - A consultant to FAO assisted with the organization and implementation of two six-week Sub-Regional Storage Pest Control Training Courses, July/Aug. 1974 and May/July 1975.

Ghana - A two-man team spent one month (Nov/Dec) to assist the Ministry of Agriculture in formulation of a policy for storage of buffer stocks of cereals.

Nigeria/Ghana - A consultant to FAO assessed the feasibility of implementing a project on farm level insect control in maize.

Malagasy Republic - A specialist spent three weeks studying export handling of butter beans and made recommendations for improving the quality of the export product.

Kenya - An advisor installed and tested the suitability of moisture sensors for remote measurement of moisture in grain silos.

Nigeria - A TPI representative attended the first meeting of the "Federal Grain Storage Project Committee" established to formulate a project for famine reserve and price stabilization storage.

Mali - Two consultants assisted OSRO in the inspection, implementation of insect control and training of local personnel in storage of food aid commodities.

Gambia - A two man team assessed the need for a famine reserve grain stock in June.

Sierra Leone - A specialist determined the training needs for grain storage staff.

Research projects with application to Africa grain storage problems were also reviewed.

USAID Activities (other than KSU):

Mr. Harold Kugler, USAID Africa Bureau, reported on activities related to grain storage and marketing problems in Africa other than those reported by KSU. Many of AID's activities in Africa do not involve storage components, however, some do and they are summarized as follows:

Tanzania - AID has provided \$2 3/4 million in emergency relief to supplement external seed grain purchases, to procure port handling equipment for Dar-es-Salaam and for village grain storage structures. The National Milling Corporation has proposed a five year \$48 million plan to provide reserve grain storage capacity. Some AID funds may be used for a portion of the 1976 planned construction.

Ethiopia - The Government of Ethiopia has proposed a grain marketing and storage project to provide 355 buying stations backstopped by 19 secondary and terminal storage facilities with capacity of 109,000 M.T. Recent changes in government have resulted in suspension of IBRD, AID and GOE loan negotiations.

Niger and Upper Volta - Development and operation of viable national grain marketing agencies is one of the goals of a grain production and marketing project planned for these countries. In addition, two

sizeable storage facilities are under consideration for Niger/Upper Volta (30,000 M.T. bag storage) and Mauritania (15,000 M.T. bulk storage).

Ivory Coast - As part of an Entente States' food production and agricultural credit project, a grain storage program for corn and other grains is being considered.

Rwanda - AID is financing the construction of six warehouses throughout the country to provide storage for foods purchased by the Government during periods of low price and resold at controlled prices during periods of scarcity.

#### Grain Storage and Its Relationship to the Agri-Business Sector

Dr. Richard Phillips, Kansas State University

Dr. Richard Phillips presented a concept for visualizing food systems for economical development in developing countries. He pointed out that potentially greater accomplishments can be realized through more broadly-viewed and more systematic approaches to economic development of agriculture and agricultural business. Dr. Phillips pointed out the implications the "systems" approaches can have in food production, marketing, processing and utilization in developing countries.

The total complex of production, marketing, processing, and distribution functions for grain products or for other food products can be viewed as a commodity system of linked steps through which products flow to final consumers. The basic systems concept, although complex, can be visualized in simple terms as a chain of direct in-line functions, extending from development of technical farm inputs to the utilization of the food products for human consumption. The "Food Chain Concept" uses a chain to illustrate the direct linkage among the separate functions--input development and production, supplying inputs, farm production, farm product marketing, food processing, food product marketing and utilization for consumption.

It was further pointed out that food systems must do more than physically move the products through the chain to the final consumer. They must also perform the associated economic activities such as pricing, merchandising, and financing through the system. This concept was visualized as a series of two-way circular flows.

Each of the links in the chain of a commodity system can further be viewed as a bracelet of 19 smaller links. The smaller bracelet links represent the key activities required for effective performance of each of the production and marketing functions. Three of the links represent research and development activities. The next four represent mobilization activities. Four more links represent implementation activities. The last seven represent operational activities. Storage falls within the last seven activities.

In a dynamic development setting, Dr. Phillips indicated, the entire chain represents a continuous circular flow. A weak or missing link anywhere in the chain can interrupt this flow and prevent achievement of the overall development goals. Similarly, the weakest bracelet becomes the weakest link in the commodity system. Further, each of the 19 links in the bracelet can be further broken into sublinks. The performance of the master chain is ultimately limited to the capability of the weakest link in the bracelet sublinks.

Dr. Phillips pointed out that for analysis, the key activities making up the bracelet can be arranged in columnar fashion and related to specific functions, operations or products to form a check sheet for finding the specific links in the chain requiring emphasis for effective development. The check sheet approach can be used by individuals or teams for preliminary evaluation of existing systems and discovery of "weak links", perhaps storage, which need improvement.

Copies of Food and Feed Grain Institute Special Report No. 1, "Building Viable Food Chains in the Developing Countries," Aug. 1973, a report which discusses the food chain concept in greater detail, were provided for persons attending the GASGA Meeting.

John Pedersen described the contract KSU has with AID to provide technical assistance in grain storage, processing, marketing and agri-business development. Activities to date have fallen under four major categories (1) response to specific technical assistance requests, (2) pre- and post-feasibility studies, (3) training and (4) adaptive and developmental research. Activities under each of these categories were illustrated with examples selected from accomplishments since the contract was initiated in 1967.

#### Co-operation of GASGA with Bilateral AID Agencies

It was suggested that GASGA must have closer contact with the major donor AID agencies. The minimum contact with the donor agencies should be through a list of liaison persons of the agencies maintained by the GASGA Secretariat. At least one person in each donor agency should be designated a liaison and receive selected or specially written GASGA documents and be encouraged to ask for comment on other areas of concern. It was suggested that this type of contact would help in keeping GASGA members and donor agencies aware of each other's activities in countries such as Mali, Mauritania, etc. and tend to prevent duplication of effort.

To be effective the liaison must be of benefit to the agencies or the association will not be continued. GASGA must be ready and willing to respond to agencies promptly.

FAO is willing to assume a coordinating role in this effort but must be supplied a list of liaison persons in the donor agencies.

3. Action programs that are established could include seminars and workshops for disseminating extension type information.

Dr. Hoover mentioned a series of week-long Food Storage Seminars being conducted by AID under the Food For Peace program. Three seminars have been held to date, one each in Jamaica, Dakar and Manila. The seminars have been conducted by U.S. industry and government personnel. It appears that KSU will be involved in future seminars of this type. KSU feels that quick training programs of this type would be helpful in emergency situations.

It was indicated that TPI has a contract with the World Food Program for training World Food Program officers. This program is to provide technical advice and consultancy to countries receiving AID food once it has reached the developing country and may be deteriorating. Advice is also provided on packaging standards for WFP commodities.

It was commented that FAO has also been involved in the WFP training programs and feels that this type of training is very essential. He also indicated that as a result of the World Food Conference held in Rome in November 1974, FAO's Industry Cooperative Programme industry members have formed a task force on food losses and it is felt they will be asking for assignments first, in the area of determining food losses in AID foods and then domestic production. Rather large scale fundings for this project have been indicated from private industry for this program. FAO would attempt to guide the program and recommends that industries, within specific countries, contact knowledgeable organizations, i.e. in the U.S., Kansas State University and the USDA at Savannah and Manhattan; in the U.K., TSPC; in Canada, IDRC; and in France, IRAT.

Industry membership on the task force was not specifically known, however, companies that have shown considerable interest in this effort are Tate and Lyle in the U.K.; St. Regis Paper and Cargill in the U.S.; and an unnamed French firm. Dr. Shuyler indicated he would try to inform GASGA members of the task force membership. Drs. Spensley and Hoover indicated a link between GASGA and the task force should be established.

#### Future Technical Seminars

Mr. Wheatley indicated that so far GASGA has sponsored three (3) technical seminars. The original concept was for GASGA to act as a catalyst in bringing together invited experts (GASGA members and others) to explore research needs, development needs and to stimulate action when a need was defined in a particular technical subject area.

Dr. Shuyler proposed a title for a seminar, citing a particular need for a discussion of "Design of Grain Storage Structures for, and Storage Management of, Reserve Grain Stocks in the Sahelian/Sudanian Zone." There is a concern in this area because there is no experience with long term storage in tropical regions. The Sahelian region may be better suited for an initial study of this type than the humid tropics.

How On-Farm Storage Fits Into the Overall World Food Problem

Hoover brought out the subject matter of how on-farm or village storage fits into the overall world food problem for discussion.

Pedersen mentioned that for the World Food Conferences, Kansas State University was asked to bring together information on the type, capacity and location of the existing grain storage in developing countries. Literature and publications from various sources were reviewed to compile information. Though some information on commercial and government storage facilities may be available in certain countries, no information on the extent of on-farm storage is available. The concensus was that in most countries information was not readily available regarding the type, capacity and location of grain storage facilities.

In summary, it seemed to be the concensus that a strategic grain storage or food security stock management should be under some type of government control in order to maintain the quality of grain storage reserves. The importance of on-farm storage or village storage should not be overlooked in developing countries. The programs for improving on-farm storage should be an integral part of the overall agricultural production and marketing policies in developing countries.

APPENDIX A

Agenda for GASGA Meeting

Kansas State University  
Manhattan, Kansas

July 8-11, 1975

Tour: July 7-8, 1975

July 7 (Monday)	Pick up guests at airport Check in at Ramada Inn Distribute "Welcome Folder"
July 8 8:30 a.m. (Tuesday)	Waters Hall Room 135. Welcome remarks by Dr. W. J. Hoover, Director, Food and Feed Grain Institute and Introduction of Attendees.
9:00 a.m.	Brief visit to a classroom where a short course on "Grain Storage and Marketing for Developing Countries" is held.  Short remark by Dr. Peter E. Wheatley, Secretariat, GASGA to short course participants.
9:15 to 11:00 a.m.	Tour of Grain Science Department
11:00 to noon	Tour of Entomology Department
Noon	Lunch break
1:30 to 3:30 p.m.	Tour of U.S. Grain Marketing Research Center, Manhattan, Kansas.
4:00 to 5:00 p.m.	Visit "Coop" grain storage facility, Manhattan, Kansas
July 9 8:00 a.m. (Wednesday)	Leave Ramada Inn for Salina, Kansas
10:00 to 11:00 a.m.	Tour of Salina Board of Trade
11:00 to 12:30 p.m.	Tour of Morrison Grain Company, Salina, Kansas
12:30 to 1:30 p.m.	Lunch Break
1:30 to 2:30 p.m.	Tour of on-farm storage and wheat harvest at farms near Salina
2:30 p.m.	Leave Salina for Abilene, Kansas
3:00 to 5:00 p.m.	Tour of Eisenhower Museum and Library, Abilene, Kansas
6:00 p.m.	Return to Manhattan

APPENDIX B

GASGA MEETING - JULY 10-11, 1975  
Kansas State University  
Manhattan, Kansas

GASGA Meeting Participants

William J. Hoover Meeting Chairman	Director, Food & Feed Grain Institute Kansas State University
Peter J. Wheatley GASGA Secretariat	Head, Tropical Stored Products Center Tropical Products Institute Slough, England
Phillip C. Spensley	Director, Tropical Products Institute London, England
Harlan Shuyler	Crop Storage Pest Control Officer FAO, Rome, Italy
Robert S. Forrest	Agricultural Engineer, Post-Harvest International Development Research Center, Edmonton, Canada
Jean-Gorges Pointel	Entomologist IRAT Paris, France
Harry Pfof	Grain Storage Engineer Kansas State University
Do Sup Chung	Agricultural Engineering - Storage Engineer Kansas State University
John R. Pedersen	Grain Storage Entomologist - Scientist Kansas State University
Harold L. Kugler	Agriculture Marketing Specialist AFR/ESA USAID Washington, D.C.
Vernon C. Larson	Director, International Agricultural Programs Kansas State University
Glenn H. Beck	Senior Research Specialist USAID TAB/AGR Washington, D.C.
Richard Phillips	Economist, Food & Feed Grain Institute Kansas State University

Observers

Truman Hackett	Auditor, U.S. General Accounting Office Washington, D.C.
Natalie Hurlbrink	Auditor, U.S. General Accounting Office Washington, D.C.
Hugo W. Wolter, Jr.	Auditor, U.S. General Accounting Office Washington, D.C.
William H. Johnson	Head, Agricultural Engineering Department Kansas State University
Robert B. Mills	Stored-Product Entomology Kansas State University
Robert J. Robinson	Associate Professor, Grain Science & Industry Kansas State University

### III. ADDITIONAL ACTIVITIES

#### A. Conferences and Seminars

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

1. National Academy of Science ad hoc Steering Group Meeting. Boston, Massachusetts, July 1975

Mr. John Pedersen, grain quality/preservation specialist, participated as a member of the ad hoc steering committee on post-harvest food losses. The committee drafted a statement on the status of information available on food losses and recommended that a study be undertaken to document what is currently known about the extent of food losses.

2. Rice Production - field trip. Texas and Louisiana, August 1975

Dr. Harry B. Pfost, grain processing and storage engineer, accompanied a group of two U.S. and two international students on a week long tour of rice production, storage, handling, processing and marketing facilities in Texas and Louisiana. Students on the tour are working toward post-graduate degrees in Grain Science and Industry and Agricultural Engineering.

3. AOM Food Protection and Sanitation Committee Meeting. Winnipeg, Canada, September 1975

Mr. John Pedersen, grain quality/preservation specialist, and member of the Food Protection and Sanitation Committee, attended the fall meeting held in Winnipeg, Canada. The committee is currently devoting considerable emphasis toward the safe use of pesticides in grain storage and processing plants and pesticide regulations.

4. American Association of Cereal Chemists, Annual Meeting. Kansas City, Missouri, October 1975

Dr. Richard Phillips, project grain marketing economist, presented a paper on the lack of economic incentive as a limiting factor to expanded world food production at the annual national meeting of the AACC.

5. National Academy of Science/AID personnel meeting. Washington, D.C. December 1975

Mr. John R. Pedersen, project grain quality/preservation specialist met with Dr. Malcolm Bourne, AID consultant, and Dr. Max Milner to draft a guideline for AID involvement in the assessment of post-harvest food losses.

6. Grain Standards Meeting. Houston, Texas, January 1976

Dr. Ernest Mader, Department of Agronomy, consulted with USDA Grain Supervisors on new grain standards for sorghum and oats and especially grading techniques and standards for wheat and rice. Dr. Mader's consultations were in conjunction with the AID Grain Storage and Marketing Short Course held at KSU annually.

7. AID/University Conference. Washington, D.C., January 1976

Dr. Richard Phillips, project marketing economist, took part in a conference on cooperative agreement grants with land-grant universities dealing with an expanded program of economic analysis for agricultural and rural sector planning in Lesser Developed Countries.

8. Policy Research Workshop. Washington, D. C., January 1976

Dr. Richard Phillips, project marketing economist, took part in a workshop related to public agricultural and food price and income policy research sponsored by AID.

9. Rice Technology Meeting. Lake Charles, Louisiana, February 1976

Ulysses Acasio, Assistant Instructor, attended the meeting of the Working Group on Rice Technology in Lake Charles which included discussions on production, processing and storage of rice.

10. Conference on Post-Harvest Food Storage Losses. Washington, D.C. May 1976

Dr. Richard Phillips, project marketing economist, and Mr. John Pedersen, project grain quality/preservation specialist, took part in a joint NAS/AID meeting on the status of food losses to discuss a possible NAS study to assess the status of post-harvest food losses and provide AID with guidelines for future direction relative to post-harvest food loss efforts.

11. Rice Drying Project. Beaumont, Texas, May 1976

Dr. Harry B. Pfof, grain processing and storage engineer, consulted with engineers at Texas Rice Experiment Station regarding the possibility for cooperation on natural air drying project for rice.

12. American Feed Manufacturers Association, Annual Meeting. New Orleans, Louisiana, May 1976

Dr. Harry B. Pfof, grain processing and storage engineer, attended the AFMA annual meeting in Louisiana and discussed grain storage.

13. Feed Manufacturing Technology Short Course. Kansas State University, June 1 - June 17, 1976

The American Feed Manufacturers Association in cooperation with the Department of Grain Science and Industry at Kansas State University periodical-

ly sponsors a Feed Manufacturing Technology Short Course for U.S. and international feed manufacturers. Dr. Harry B. Pfost, project storage engineer, and John Pedersen, project grain quality/preservation specialist, presented lectures and laboratory sessions during the Short Course.

B. Reports

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

- No. 1 Rice Drying Technology and Equipment Which Might be Applicable to Tropical Developing Countries. June 1968.
- No. 2 Brief Description for a Corn Handling Facility in Tropical Areas. June 1968.
- No. 3 Structural Requirements of Grain Bins. July 1968.
- No. 4 Report on Food Grain Storage, Marketing, Handling and Transportation in Jordan. July 1968.
- No. 4A Photographic Supplement, Food Grain Storage, Handling and Transportation in Jordan. July 1968.
- No. 5 A Proposal to Equip Metal Silos in Jordan with Aeration and Temperature Monitoring Equipment. August 1968.
- No. 6 Review of Grain Storage, Handling, Processing and Distribution Problems and Proposals in the Republic of Korea. September 1968.
- No. 7 Assessment of Food Grain Storage Facilities, West Pakistan - 1968. October 1968.
- No. 8 Implementation of Grain Storage Operations, Marketing Services and Price Stabilization in Honduras. October 1968.
- No. 9 Annual Report - 1967-1968 (November 1968).
- No. 10 Review of Grain Storage, Handling and Distribution - Morocco 1969. April 1969.
- No. 11 Report on Grain Sanitation Workshop - July 7-12, 1969. Central Food Technological Research Institute, Mysore, India. July 1969.
- No. 12 Annual Report - 1968-1969.
- No. 13 Observations and Recommendations Concerning the Corn Marketing System in Guatemala. August 1969.

- No. 14 An Analysis of Grain Storage and Price Stabilization Problems in El Salvador. September 1969.
- No. 15 Review of Elevator Project in Honduras. October 1969.
- No. 16 A Review of Rice Drying and Storage Problems in Ecuador. January 1970.
- No. 17 Cereal and Dry Edible Bean Marketing and Warehousing in the States of Piaui and Paraiba, Brazil. February 1970.
- No. 17A Warehousing and Marketing Cereal and Beans in the State of Piaui, Brazil. February 1970.
- No. 17B Warehousing and Marketing Cereal and Beans in the State of Paraiba, Brazil. February 1970.
- No. 18 Annual Report - 1969-1970.
- No. 20 Observations and Recommendations for Improving Grain Storage and Marketing in Colombia.
- No. 21 A Study and Plan for Regional Grain Stabilization in West Africa. December 1970.
- No. 22 Observations and Recommendations for Improving Grain Storage and Marketing in Bolivia. May 1971.
- No. 23 Annual Report - 1970-1971.
- No. 24 Recommendations for FECOAGROH Grain Storage and Handling Facilities in Honduras. July 1971.
- No. 25 Observations and Recommendations for Construction of Feed Mills in Senegal, Mali and Mauritania. August 1971.
- No. 27 Observations and Review of Regional Grain Storage and Purchasing Facilities in Guatemala. September 1971.
- No. 28 Improved Grain Marketing in Panama During the Decade Ahead. October 1971.
- No. 29 Rice Storage, Handling and Marketing Study for the Republic of Indonesia. February 1972.
- No. 30 Tour of Some U.S. Grain Storage Facilities for Entente Fund Officials. May 1972.
- No. 31 Progress Report on Development of a Simple Storage Unit and Method Applicable to Humid Areas. June 1972.
- No. 32 An Evaluation of INDECA's Role in the Guatemala Rural Development Program (Loan Paper Compliance and Organization Efforts). February 1972.

- No. 33 Supply and Demand Projections for Food Grains in Ethiopia, 1970-1980. December 1972.
- 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.
- No. 36 Needs and Opportunities for Improved Grain Marketing in Panama. Executive Digest. March 1973.
- 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.
- No. 38 Recommendations for Technical and Managerial Assistance - Rice Modernization Project - Guyana. May 1973.
- No. 39 Priorities for Improving Grain Marketing in Indonesia. May 1973.
- No. 40 Report on the Storage of Imported Corn in Indonesia. May 1973.
- No. 41 Survey of the Quality of Imported Corn Stored in East Java, Indonesia --(Supplement to Report No. 40, June 1973). July 9 - July 21, 1973.
- No. 42 Study of Grain Storage and Marketing in Bolivia. September 1973.
- No. 43 Grain Marketing and Market System Development in Haiti. December 1973.
- No. 44 Evaluation of the Grain Management Program Simulation Model -- Being Developed for Korea by Michigan State University-Contract AID/csd-2975. February 1974.
- No. 45 Implicit Exchange Rate Criterion Applied to Policies Regarding Foreign Investment in Korea. February 1974.

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.
- No. 47 Study of the Tunisian Grain Marketing System. August 1974.
- No. 48 Recommendations for Drying and Storage of Grain in Peru. December 1974.
- No. 49 Review and Recommendations for On-Farm Grain Storage in Tanzania. May 1975.
- No. 50 Evaluation and Cost Estimates for Grain Unloading, Storage and Distribution Facilities in Egypt. May 1975.

- No. 51 Maize Marketing in Zaire. July 1975.
- No. 52 Farm Storage and Handling of Rice, Corn and Soybeans in the Guyayas River Basin of Ecuador. July 1975.
- No. 53 Evaluation of the Current Position of Agricultural Development and Diversification Program as Pertaining to Soybeans. July 1975.
- No. 54 Recommendations for Grain Storage and Preservation in Senegal. November 1975.
- No. 55 Evaluation of Grain Storage and Handling Aspect of Proposed Agricultural Marketing Capital Assistance Program. April 1975.