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THIRD ANNUAL REPORT

**Review of Activities
July 1, 1969 through June 30, 1970**

**Prepared for the
AGENCY FOR INTERNATIONAL DEVELOPMENT
AID/csd-1588
Technical Assistance in
Food Grain Drying, Storage, Handling, and Transportation
at the
FOOD AND FEED GRAIN INSTITUTE
KANSAS STATE UNIVERSITY
MANHATTAN, KANSAS 66502**

**Dr. William J. Hoover, Director
Dr. Leonard W. Schruben, Associate Director
Dr. Richard Phillips, Agricultural Economist
Dr. Harry B. Pfost, Agricultural Engineer
John R. Pedersen, Entomologist**

THIRD ANNUAL REPORT

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THIRD ANNUAL REPORT

TECHNICAL ASSISTANCE IN FOOD GRAIN DRYING, STORAGE, HANDLING AND TRANSPORTATION

AID/csd-1588
FOOD AND FEED GRAIN INSTITUTE
KANSAS STATE UNIVERSITY, MANHATTAN, KANSAS

On July 1, 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.

The Food and Feed Grain Institute was charged with carrying out the University's responsibilities under the contract as requested and authorized by AID.

SCOPE OF WORK

It was 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.

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

REVIEW OF ACTIVITIES
July 1, 1969 - June 30, 1970

The following review outlines activities during the third year of the contract. It is divided into three major sections as follows:

- I. Foreign Travel Assistance
- II. Foreign, Non-Travel Assistance
- III. Domestic Activities

Each activity is discussed briefly indicating the problem, personnel involved, summary of the activity, and reports submitted.

I. Foreign Travel Assistance

A. INDIA - July 1969

USAID/India requested a consultant to supply technical assistance through the War on Hunger contract with Kansas State University, AID/csd-1588, "to introduce the subject of Grain Sanitation to India as a means of furthering technical interest and competence in grain protection."

The scope of technical services outlined indicated the requirements of the consultant were, in general, as follows:

1. To lead a seminar on grain sanitation in cooperation with the Academy of Pest Control Sciences (APCS) and the Central Food Technological Research Institute (CFTRI), Mysore.
2. To recommend an agenda for the seminar workshop.
3. To provide laboratory and inspection worksheets for participants.
4. To present lectures and demonstrations on inspection and control techniques, laboratory analytical techniques, rodent and insect control, etc.
5. Visit representative Indian urban and rural grain handling and storage locations to observe grain losses due to rodents.
6. Discuss rodent control with USAID officials.

In response to this request, the services of John R. Pedersen were offered through Kansas State University's contract as a biologist-entomologist experienced in food plant sanitation, grain storage inspection and sanitation, laboratory testing of cereal grains for rodent and insect contamination, and presenting food sanitation workshops.

The grain sanitation workshop extended over a period of seven days and was held at the Central Food Technological Research Institute at Mysore. There were 24 official participants from Indian industry, government, and academic institutions in attendance. In addition, approximately

50-70 persons from several Southeast Asia countries attending other short courses were present at lecture sessions of the workshop. Although programming difficulties were encountered, a meaningful workshop was conducted. Lectures illustrated with color slides were given on various aspects of grain sanitation. Laboratory exercises and demonstrations were presented to illustrate methods used in identification and isolation of grain contaminants. A laboratory manual, "Outlines of Grain Sanitation Inspection and Analysis," was prepared and provided for each of the workshop participants.

Facilities for the workshop were provided by CFTRI. Some of the lectures and laboratory sessions were presented by Mr. S. K. Majumder and his CFTRI personnel. In addition, lectures and laboratory sessions were presented by Mr. Kenton L. Harris, USAID/India Biologist Rodent Control. Mr. Harris was also primarily responsible for the Grain Sanitation Workshop being undertaken.

In addition to the workshop, grain storage facilities were observed in urban and rural areas. Government grain storage facilities appear to be well maintained and managed. Grain observed in village markets and storage is not adequately protected from contamination by rodents, insects, or birds. Grain and milled products at flour mills are subject to contamination and infestation by rodents, insects, and birds from the time grain is received at the mill until the finished cereal product is shipped from the mill.

Rodent control aspects of grain sanitation were an integral part of the workshop, grain storage inspections, and discussions with USAID personnel.

Food Grain Drying Storage, Handling and Transportation Report No. 11, "Report on Grain Sanitation Workshop, July 7-12, 1969," discusses the workshop and includes copies of the agenda and laboratory manual used at the workshop.

Reports were distributed as follows:

USAID/India
 Agricultural Inputs Development
 (Plant Protection) - 20 copies
 USAID/Washington
 Mr. O. L. Mimms; NESA/ID - 20 copies
 Mr. Carl F. van Haeften, WOH - 10 copies

B. GUATEMALA - July 1969

USAID/Guatemala requested the assistance of a grain marketing specialist to discuss and make recommendations concerning corn marketing problems.

Dr. L. Orlo Sorenson, Department of Economics at Kansas State University, was selected to make an initial visit to Guatemala, consult with AID agricultural personnel on problems of marketing corn, and suggest ways in which technical assistance could be made available through the Food and Feed Grain Institute at Kansas State University to aid in solving corn marketing problems in Guatemala.

Work in Guatemala between July 28 and August 9, 1969, consisted of study of reports and statistics related to corn production, marketing, and consumption; extensive discussions with USAID/Guatemala agricultural personnel; discussions with Guatemala Ministry of Agriculture representatives; field trips to visit sites of marketing operations; and discussions with active participants in the marketing of corn. On one field trip, Dr. Sorenson was accompanied by Mr. Milton Lau and Mr. Phillip Church of AID and Mr. Victor Velasquez, Chief of the Office for Agricultural Planning, Guatemala Ministry of Agriculture. On a second trip, he was accompanied by Mr. Phillip Church. Trips included visits to government-owned (INFOP) and privately owned elevator facilities in Guatemala City, on the South coast, and in the highlands. Two public markets (Antigua and Guatemala City) were visited.

Recommendations included initiating Kansas State University assistance in preparation of a loan proposal for agricultural development purposes and initiating a program of technical assistance in developing an improved corn marketing system in Guatemala. Recommended modification in the original PIO/T (PIO/T No. 520-194-3-90123) included separate specifications of (1) assistance needed to prepare data to support an international loan request and (2) technical assistance in development of a corn marketing system. Personnel changes from the initial request were also recommended.

As a result of Dr. Sorenson's work with the AID mission in Guatemala, Kansas State University was called on later in the year to secure or recommend an individual for a one-year assignment in Guatemala to assist in development of a corn marketing system (See Section II of this report for further details) and to provide backup technical assistance for this individual under KSU's existing contract.

In addition to Food Grain Drying, Storage, Handling and Transportation Report No. 13, "Observations on the Corn Marketing System in Guatemala," July 1969, Dr. Sorenson discussed his observations and recommendations with Mr. Carl van Haeften, Mr. Donald Fiester, and other Department of State personnel in Washington, D. C., on his return trip from Guatemala.

Printed reports were distributed as follows:

USAID/Guatemala

Mr. Alphonse Chable - 20 copies

USAID/Washington

Mr. Donald Fiester, Bureau for Latin America - 20 copies

Mr. Carl van Haeften, WOH - 10 copies

AID Central Retrieval System - 10 copies

C. EL SALVADOR - July 1969

The mission in San Salvador requested technical assistance on PIO/T No. 519-11-110-012-3-90063 with two main goals in mind:

1. To estimate future storage needs (especially for corn, grain sorghum, and rice) for El Salvador based on future production as indicated by the results of an ongoing sector analysis.

2. To study management and operational activities of the Government Grain Storage, Retailing, and Price Stabilization Agency (IRA) and recommend innovations for greater efficiency.

In addition, recommendations for use of plastic film for temporary corn storage were necessary.

Drs. John H. McCoy and Floyd F. Niernberger, from the Department of Economics, Kansas State University, conducted the requested study between August 25 and September 14, 1969.

Observations and recommendations made are summarized as follows:

Projected 1975 (and later period) production of the four basic grains (corn, grain sorghum, rice, and beans) were available from an ongoing agricultural sector analysis. Estimates were made of the quantities of each grain that would enter commercial market channels and of the quantities that IRA would need to purchase to perform its price stabilization objective. The latter quantities were (in metric tons): corn, 52,000; grain sorghum, 26,000; rice (rough), 20,000; and beans, 5,000. Based on a projected monthly schedule of purchases and sales and using an estimated turnover rate of 1.6, minimum grain storage capacity needed by IRA by 1975 was estimated to be 62,790 metric tons. By 1980, the estimated capacity requirements were 84,700 metric tons.

Recommended sites for storage facilities were Santa Ana, San Martin, and San Miguel-Usulután. Considering facilities already in existence, the additional needed capacity by 1975 would be (metric tons): Santa Ana, 12,240; San Martin, 11,680; and San Miguel, 11,150.

Other recommendations were that: (1) vigorous efforts be made to encourage and assist expansion of on-farm grain storage, (2) efforts to provide an atmosphere for private commercial storage be encouraged, (3) technical training be supplied general and junior management personnel through Kansas State University assistance, (4) a grading system for grains in conjunction with licensed warehouses be developed along with the necessary regulatory and enforcing agencies, and (5) a grain storage technical assistant be directly assigned to El Salvador to aid in developing public and private grain storage and marketing interests.

It was determined that storage of corn for short periods of time is feasible using plastic sheets for protection from weather if adequate checks for quality maintenance are followed.

Probably as a result of the recommendations made in El Salvador, at least one individual was scheduled to attend the "Grain Storage and Marketing Short Course" scheduled for July 1970, at Kansas State University.

The study was reported in "An Analysis of Grain Storage and Price Stabilization Problems in El Salvador," Food Grain Drying, Storage, Handling and Transportation Report No. 14, August 1969. Report distribution was as listed on following page:

USAID/El Salvador

Mr. Ronald A. Wilherall - 30 copies

USAID/Washington

Bureau for Latin America, El Salvadorian Affairs - 20 copies

Mr. Carl F. van Haeften, WOH - 10 copies

AID Central Retrieval System - 10 copies

D. HONDURAS - October 1969

This is the third request for assistance from USAID/Honduras regarding grain storage. The first request was for the review of a report "Evaluation of Banco Nacional de Fomento," prepared by Mr. Norman M. Ward, August 22, 1967, with special emphasis on the section dealing with grain storage and marketing facilities in Honduras (Annual Report, 1967-1968). The second request was for assistance and consultation: (1) in developing recommendations for the training of personnel for the operation of grain storage facilities and the marketing of grain, (2) in developing a plan for the Government of Honduras for the use of technical assistance in grain storage marketing and price stabilization, and (3) in developing general recommendations for more efficient administration and operation of the proposed grain storage and marketing system.

The current request was to review the proposed elevator project in Honduras with particular reference to the engineering design and cost estimates. Dr. Harry B. Pfof, Department of Grain Science and Industries, made the review, October 2-10, 1969.

Based upon a detailed study of the grain storage needs in Honduras made by Weitz-Hettelsater and published in September 1965, engineering designs and cost estimates had been prepared for two major elevators: one at San Pedro Sula and one at Tegucigalpa. Following the completion of these designs, the National Bank for Development requested bids for the construction of these two facilities. The bids for the structures were made by three firms and were reasonably close to the engineer's estimate. The bids for the equipment came from only one United States firm and were considerably above the engineer's estimate and the bank rejected the bid.

Advice of a United States consulting engineering firm were used to assist in reviewing the project.

The study resulted in the following conclusions. The overall design for the project appeared to be satisfactory and to conform to the original proposals contained in the Weitz-Hettelsater report. In general, the engineering designs were sound, adequate, and represented standard engineering practice. The cost estimates were, perhaps, low and should be reviewed before bids for the project are received again.

Complete results of Dr. Pfof's review were presented in "Review of Elevator Project in Honduras," Food Grain Drying, Storage, Handling, and Transportation Report No. 15, October 1969. Distribution of the report was as listed on the following page:

USAID/Honduras

Mr. Carroll Deyoe - 20 copies

USAID/Washington

Bureau for Latin America, Hondurian Affairs - 20 copies

Mr. Carl F. van Haeften, WOH - 10 copies

AID Central Retrieval System - 10 copies

E. ECUADOR - January 1970

The Government of Ecuador requested technical assistance from USAID/Quito in:

1. Selection of sites best suited for rice processing and storage installations according to areas of production, transportation, road facilities, exports, etc.
2. Review of proposals made by various companies and countries and guidance on modifications, if necessary, for the most functional installations.
3. Determining size of desirable installations for present and future needs.

To initiate assistance on this rather broad request, Dr. L. Orlo Sorenson, Economist, traveled to Ecuador January 12-24, 1970, to review rice marketing problems with AID missions personnel and with officials of the GOE and to make recommendations concerning technical assistance to be provided under Kansas State University's AID contract csd-1588.

To gain some understanding of rice marketing problems, discussions of various aspects of the problem were held with Mr. Lee Winters, Food and Agricultural Officer, USAID/Ecuador, Mr. Ralph Van Dixhorn, USAID, and Mr. Lewis Townsend, Director of CLUSA in Quito. Brief discussions were held with Mr. Robert Minges, AID Mission Director, and with Mr. Arturo Ganpotena, Sub-secretary Ministry of Agriculture. Rice marketing problems were discussed also with Mr. Harold Kramer and Mr. Felix Kasamatu, both of whom were participating in a grain marketing study for FAO/BID.

During a six-day stay in Guayaquil, Dr. Sorenson consulted with Mr. George Salkeld of AID, Mr. Theodoro Landin of the National Rice Commission, and Mr. Victor Zambrano, Executive Director, National Rice Commission. Mr. Carlos Zevallos assisted in Guayaquil as interpreter and gave invaluable assistance in arranging field trips and other contacts. Mr. Gustavo Riofrio, CLUSA in Babahoyo, also provided useful information and very useful observations.

Dr. Sorenson's report, "A Review of Rice Drying and Storage Problems in Ecuador," Food Grain Drying, Storage, Handling, and Transportation Report No. 16, January 1970, contains three parts:

- I. A recommendation that technical assistance under contract AID/csd-1588 not be undertaken at this time and that need for further study be reconsidered after the report of the current FAO/BID study is completed.

II. Discussion of rice marketing problems in Ecuador supported by available statistical and documentary evidence.

III. Observations on problems of changing the structure of rice marketing in Ecuador.

Reports were distributed as follows:

USAID/Ecuador

Mr. Lee Winter, Food and Agriculture Officer,
USAID/Quito - 20 copies

USAID/Washington

Mr. Donald Fiester, Bureau for Latin America - 20 copies

Mr. Carl F. van Haeften, WOH - 10 copies

AID Central Retrieval System - 10 copies

F. BRAZIL - February 1970

The AID Mission in Recife, Brazil, received requests from the Secretaries of Agriculture of the States of Piaui and Paraiba for technical assistance in regard to drying, warehousing, and marketing of cereals and dry edible beans in these States. In addition, the Deputy Administrator of the Public Law 480, Food for Development Program, requested investigation and recommendations with regard to storing of food products under this program.

To provide the assistance requested, a consultant, Mr. Dwight S. Tolle (warehousing and marketing specialist) traveled to Brazil January 5 through February 11, 1970.

Mr. Tolle's observations indicated the following:

Farms in the two States are very small, with many farmers producing on a bare subsistence level. There is no real organized marketing system. The government price support program is of limited effectiveness due to the lack of adequate warehouses where crop loans can be made. There is no bulk storage in either State and warehouses storing bagged grain are plagued by rodents and insects. There is no market information available to farmers.

There is a serious imbalance in this area's agricultural economy. To improve his farm technology, a farmer in northeast Brazil must buy inputs exemplified price-wise by a \$3,000 Volkswagon, but his production must be purchased, to a large extent, by consumers whose income is comparable to an \$8-per-month schoolteacher. Hence, machinery, fertilizers, pesticides, and herbicides are priced out of reach of most farmers.

Mr. Tolle's recommendations were directed primarily toward increased knowledge of proper storage and marketing procedures. The licensing and bonding of warehouses is also strongly recommended.

The Food for Development Program is experiencing losses due to rodents and insects in warehouses. Losses were particularly bad in warehouses of the voluntary agencies. It was recommended that: (1) all products given by the U. S. to distributing agencies be stored in the same warehouse

wherever possible and (2) any agency not controlling insects and rodents in their warehouses should be served notice that their portion of the program would be terminated.

Mr. Tolle's observations and recommendations were presented in his report "Marketing and Warehousing of Cereals and Dry Edible Beans in Piaui and Paraiba, Brazil," Food Grain Drying, Storage, Handling, and Transportation Report No. 17, February 1970. In addition to this report, separate reports (20 copies each) of observations and recommendations for each of the States (Piaui and Paraiba) were prepared and sent directly to the Mission for use.

Report distribution was as follows:

USAID/Recife

Mr. Elbert B. Bowen, Agr. and Rural Dev. Div. - 20 copies

USAID/Washington

Mr. Donald Fiester, Bureau for Latin American - 20 copies

Mr. Carl F. van Haeften, WOH - 10 copies

AID Central Retrieval System - 10 copies

II. Foreign Non-Travel Activities

A. Potential Areas for Technical Assistance

At the start of the period covered by this report, there were indications of interest in technical assistance from the KSU/AID contract csd-1588 from West Pakistan, Indonesia, Thailand, Laos, Dominican Republic, Panama, Guyana, and CWAORA/Dakar which covers a number of West African countries.

Of the above listed countries, a formal request for assistance was received from West Pakistan and preliminary work was initiated, as indicated below. In addition, a request was received from Colombia for assistance and preliminary work was initiated.

1. West Pakistan - On April 24, 1970, Kansas State University was called on to assist the Bureau for Near East and South Asia in obtaining the services of a three-man agricultural marketing team to be hired under a contract other than AID/csd-1588. The three-man team was to work on Project 291-295 Agricultural Marketing in West Pakistan. The team was to consist of a:

1. Grain marketing consultant
2. Storage and handling equipment specialist
3. Financial management specialist

A rough budget for the team was prepared and potential candidates for the team were contacted. It was estimated the team could start June 1, 1970. Actual fielding of the team was delayed pending the receipt of two other reports in preparation by Swedish and Canadian teams in West Pakistan. Although the KSU team was not called prior to the end of the

fiscal year, it is anticipated they will proceed to West Pakistan in 1970-71.

It should be pointed out that this is our second request for assistance from West Pakistan. The first request was for emergency grain storage recommendations and was reported in the Annual Report for 1968-1969.

2. Colombia - On January 23, 1970, USAID/Bogota requested the assistance of KSU in making a preliminary survey of grain marketing facilities and practices in order to develop a program of technical assistance in grain marketing in Colombia. It was proposed that the preliminary survey should identify and diagnose the major problems in grain marketing and then recommend a plan of action, including technical assistance, leading to the eventual solution of the problems.

A two-man team composed of an economist and an engineer was proposed, and it is anticipated they will visit Colombia in late 1970 for a preliminary survey of the grain storage and marketing situation.

This request for assistance is a result, in part, of a visit by a Colombian grain marketing team to Kansas State University during November 1969. The visit is reported in another section of this report.

B. Follow-up on Previous Overseas Assignments

1. Morocco - There was follow-up correspondence on the work done in Morocco by Mr. Alden Ackels and John Pedersen in April 1969. The Mission in Rabat indicated that the report submitted under the KSU contract had been translated into French and was widely distributed within the GOM. Inconsistencies in basic data which were pointed out in the report led to the discussion of this problem at length between officials in the Moroccan Ministry of Agriculture and Ministry of Plan and USAID/Morocco. On or about November 14, 1969, AID financed a contract with an American firm to create a new planning section within the Ministry of Agriculture. A primary responsibility of the firm will be to establish a modern, effective system of gathering and analyzing agricultural economic data.

2. Jordan - A report prepared by John R. Pedersen, "Report on Food Grain Storage, Marketing, Handling and Transportation in Jordan," July 1968, recommended "a formal feasibility study should be made of the grain marketing, storage, handling, and transportation problems of Jordan to guide the GOJ and USAID/Jordan in development of a grain marketing and storage program." On August 6, 1969, the Development Board of the Hashemite Kingdom of Jordan issued a notice to be published in the Commerce Business Daily to seek consulting services for a Grain Storage and Handling Study to be undertaken in Jordan.

3. Guatemala - As a follow-up on work done in Guatemala in July 1969 (reported earlier in this report) by Dr. L. Orlo Sorenson, additional assistance was requested.

Four consultants were requested for a period of from two to four months each with special experience as indicated below:

1. Market management specialist
2. Market information specialist
3. Grain handling storage engineer
4. Grain marketing regulatory specialist

It was later decided that a consultant versed in all aspects of grain marketing, quality, storage, etc., backed up with technical assistance in specialized areas, on a one-year assignment could best fulfill the requirements of the Guatemala request. Backstop technical assistance was to be provided by KSU under contract AID/csd-1588 whereas the one-year consultant was to be hired on a separate contract. Considerable time was spent in preparing a budget proposal for the one-year consultant and in finding a suitable candidate for the position.

C. Correspondence with Non-AID Foreign Individuals and Organizations

1. Mexico - A letter requesting information on various aspects of grain sorghum storage was received from:

Dr. Heino Naelapaa
 Director of Nutrition and Research
 Fabrica y Laboratorios de Alimentos
 para Granaderia y Avicultura, S.A.
 Poniente 146 No. 900
 Mexico 16, D.F.

Various aspects of mold development and toxin production in grain were discussed. Methods of preventing mold development by means of house-keeping, moisture and temperature control, etc., were outlined. Insect control by means of insecticides and fumigants was pointed out. The use and hazards in aeration of grain under tropical conditions were also discussed. References pertaining to the various subjects were also cited.

The second letter from Mexico requested information on laboratory techniques for detecting insects in flour. It was from:

Mr. Genero Cordenas
 Galletera Mexicana, S.A.
 Apartado 1714
 Monterey, N. L.
 Mexico

The methods requested were discussed in a three-page reply sent March 13, 1970.

2. Israel - A letter requesting information on the relationship between infested grain and live infestation in flour was received on November 13, 1969, from:

Mr. Amen Even
 Manufacturers' Association of Israel
 13 Montefiori Street
 Tel-Aviv, Israel

The subject of insect infestation in grain, flour mills, storage facilities, and flour was discussed at some length in a three-page reply to Mr. Even.

3. Dominican Republic - A request for information on drying and storage of oilseeds was received on February 19 from:

Mr. Avelino Gonzalez
 Granera Nacional, SA
 Avenida Luperon, Parque Industrial Herrera
 Santo Domingo, Dominican Republic

The various aspects of drying and storage of grains and oilseeds under tropical conditions were discussed and references cited that pertained to the questions asked.

III. Domestic Activities

A. Travel and Conferences

1. Twenty-fifth Annual Meeting of the North Central Branch, Entomological Society of America, Hotel Radisson, Minneapolis, Minnesota, March 25-27, 1970.

An invited paper entitled "Stored-Product Insect Problems in Certain Developing Countries," was presented at this meeting by John R. Pedersen. The thirty-minute presentation was illustrated with slides accumulated during the trips to various countries under the AID/csd-1588 contract. Problems encountered in two tropical countries (Guyana and Dominican Republic) were contrasted with those in relatively dry countries (Jordan and Morocco).

2. Conference on Research of Corn Quality held at the University of Illinois, Urbana, Illinois, April 28-29, 1970.

John R. Pedersen, technical assistance team member, attended the conference sponsored by the Departments of Agricultural Economics and Agricultural Engineering at the University of Illinois. Technical papers presented at the conference which have a direct and immediate application to work of the grain storage technical assistance team members included:

- a. Evaluation of Some Grain Quality Tests for Corn
- b. Physical Damage of Grain Caused by Various Handling Techniques
- c. Progress Report on Study of Corn Harvesting and Drying
- d. Corn -- Its Value, Standards, and Quality
- e. Test Weight Changes During Drying

- f. Screw Conveyor Damage to Shelled Corn During Transport
- g. The Use of Contracts in Corn Marketing

B. Activities at Kansas State University

1. Grain Storage and Marketing Short Course - The first of what is hoped may be an annual Grain Storage and Marketing Short Course was planned for presentation during the latter half of July 1970.

Planning for the short course, which is being undertaken as a part of Kansas State University's contract AID/csd-1588 to provide technical assistance in food grain drying, storage, handling, and transportation, was started in late 1969.

One of the initial steps was to develop the following prospectus on the scope and content of the short course:

The Food and Feed Grain Institute, Kansas State University, is offering a Grain Storage and Marketing Short Course for AID participants under contract csd-1588 to provide technical assistance in food grain drying, storage, handling, and transportation.

The short course is tentatively scheduled to be held on the KSU campus from July 12-31, 1970. The three (3) week long course will have a limited enrollment of twenty (20) participants. Instruction will be in English with simultaneous Spanish translation. Participants will be accepted on a preregistration basis only.

Instruction will be directed at the warehouse and elevator manager or operator level rather than the administrator and will consist of lectures, discussions, laboratory work sessions, and field trips. Areas covered in the short course are shown on the attached outline (approximately 150 class hours).

Outlines, laboratory worksheets, manuals, and other materials and equipment needed for the short course will be provided; however, participants will be required to bring with them data and information on climate, topography, modes of transportation, crops, production, storage, and marketing as it exists at present in their specific countries. The information is requested so that participants can present a brief description of existing grain storage and marketing in their country to the group and provide for an exchange of ideas in group discussion. AID missions should help the participants in assembling the required information.

Participants are required to provide transportation to and from Manhattan, Kansas, via Washington, D. C. Housing will be provided for participants in University dormitories. Meals will be provided and served cafeteria style. The charge for dormitory and three (3) meals per day (except Sundays--no evening meal) is \$7.00 per day (2 men/room) or \$8.75 per day (one man/room). Linen and soap are provided. Participants are responsible for their own toilet articles. Appropriate per diem should be provided participants for approximately three (3) days orientation in Washington, D. C.,

the three (3) week short course in Manhattan, travel to and from the U. S. and any additional time the participant may spend in the U. S.

AID Missions desiring to send participants to the short course must send biodata on the prospective participant (by May 1, 1970) and receive approval for enrollment in the short course from the Food and Feed Grain Institute, Kansas State University, Manhattan, Kansas, 66502. Attention: Grain Storage and Marketing Short Course.

Tentative Outline

- I. Introduction to Course
 - A. Importance of Proper Grain Storage and Marketing
 1. Prevent Loss of Food and Feed Grains
 2. Provide Stable Prices for Food and Feed Grains
 - B. Purpose and Scope of the Course
 1. Provide Basic Fundamentals of Grain Drying, Storage, Handling, Marketing, and Transportation
 2. Provide Practical Knowledge and Techniques Needed in Grain Storage and Marketing
- II. Review of Grain Production and Utilization (in participant's country)
 - A. Production
 1. Grains Produced
 2. Production Areas
 3. Quantities Produced
 - B. Utilization
 1. Consumption - Food and Feed
 2. Export
 3. Import
 - C. Basic Information
 1. Population
 2. Climate and Topography
 3. Transportation
- III. Fundamentals of Grain in Storage
 - A. Structure of Cereal Grain Kernels
 - B. Moisture and Its Measurement
 - C. Chemical, Physical, and Nutritive Changes in Grain During Storage
- IV. Grain Inspection
 - A. Grain Standards
 - B. Grain Sampling

- C. Grain Grading
 - 1. Grading Factors
 - 2. Methods

V. Grain Handling

- A. Movement of Grain
 - 1. Hand Methods
 - 2. Mechanical Methods
- B. Methods and Facilities for Conditioning Grain
 - 1. Cleaning Equipment
 - 2. Temperature Monitoring Systems
- C. Aeration
 - 1. Air Properties
 - 2. Air-Grain Temperature Relationships
- D. Grain Drying
 - 1. Principles of Grain Drying
 - a. Temperature-Moisture Relationships
 - b. Effect of Drying on Quality
 - 2. Types of Drying
 - a. Natural Drying
 - b. Unheated Air Drying (Aeration)
 - c. Heated Air Drying
 - 3. Types of Driers
 - a. Bagged Grain
 - b. Batch System
 - c. Continuous Flow
 - 4. Drier Operation
 - a. Heat Source
 - b. Air Flow Rates
 - c. Air-Grain Temperature Relationships
 - d. Weight Loss in Moisture Removal
- E. Equipment Maintenance

VI. Storage

- A. Type of Structures
 - 1. Farm Storage
 - 2. Warehouse Storage
 - 3. Elevators
- B. Structural Maintenance
- C. Storage Methods and Procedures
 - 1. Warehousing
 - 2. Elevators
 - a. Binning
 - b. Blending

VII. Sanitation Program

- A. Housekeeping
 - 1. Warehouse and Elevator Perimeters
 - 2. Warehouse and Elevator Interior
 - 3. Warehouse and Elevator Equipment
- B. Insect Control
 - 1. Biology and Identification of Insects and Their Importance
 - a. Biology of Major Pest Insects
 - b. Identification of Stored Grain Insects
 - c. Insects in Relation to:
 - (1) Grain Temperature and Moisture Content
 - (2) Fumigants
 - (3) Grain Condition
 - 2. Control Methods
 - a. Housekeeping
 - b. Residual Sprays
 - c. Protectants
 - (1) Bags
 - (2) Grain
 - d. Fumigation.
 - (1) Warehouse
 - (2) Elevator
 - e. Inspection
 - 3. Pesticide Safety
- C. Rodent and Bird Control
 - 1. Biology and Identification
 - a. Rodents
 - b. Birds
 - 2. Importance of Rodents and Birds in Relation to Grain
 - 3. Control Methods
 - a. Structural Condition
 - b. Traps
 - c. Baits and Poisons
- D. Microbial Control
 - 1. Importance of Micro-organisms in Grain
 - a. Development of Micro-organisms on Damp Grain
 - (1) Molds (Fungi)
 - (2) Yeasts
 - (3) Bacteria
 - b. Mycotoxins
 - (1) Production
 - (2) Effect on Man and Animals
 - 2. Control Methods
 - a. Drying
 - b. Cooling
 - c. Proper Management

VIII. Economics of Marketing Management and Operations

- A. Principles of Management

1. Organization Within Firm
 - a. Assignment of Responsibility
 - b. Training of Personnel
 2. Organization to Provide Customer Service
 - a. Importance of Consumer
 - b. Educational Services
- B. Principles of Operation
1. Exchange
 - a. Buying
 - b. Selling
 2. Economics of Physical Handling
 - a. Storage
 - (1) Cost of Alternatives
 - (2) Location
 - (3) Type
 - b. Transportation
 - (1) Local
 - (2) National
 - (3) Export
 - c. Processing
 3. Facilitating Operations
 - a. Financing and Risk Taking
 - b. Information
 - (1) Price and Demand
 - (2) Crop Production
 - (3) Supplier
 - (4) Procedures for Informing Public
 - c. Standardization
 - (1) Establishing Grades
 - (2) Licensing Procedures
 - (3) Arbitration
 4. Bookkeeping, Accounting, Inventory Control
- C. Government and Grain Marketing
1. Commercial Regulations
 2. Legal Environment
 3. Action Programs
 - a. Farm
 - b. Non-farm
 4. International Programs and Policies
- D. Form of Business Organization
1. Individual Proprietor
 2. Partnership
 3. Corporation
 4. Cooperative
 5. Government
- IX. Tours of Local Facilities to Point Out and Demonstrate Course Material
- X. Laboratories to Compliment Lectures
- A. Grain Inspection Methods

- B. Tours, in Part, to Observe Handling Equipment
- C. Models of Driers and/or Demonstration of Effects of Improper Drying
- D. Inventory Control for Warehouses and Elevators - Bookkeeping, Etc.
- E. Insect Identification
- F. Demonstration of Pest Control Methods
- G. Business Procedures and Market Analysis Methods

Original inquiries indicated considerable interest from Latin American countries so it was decided to conduct the short course in English with simultaneous Spanish translation.

One of the chief goals of the short course, which was aimed at the elevator or warehouse operator level, was to get as much participant involvement as possible. To do this, each prospective participant was required to bring with him certain information regarding his country (climate, topography, population, etc.), grain production (crops, areas, amounts, etc.), and grain storage and marketing (warehousing, transportation, etc.). To assist the participant in compiling the necessary information, a "Participant Country Information Summary" was prepared outlining the required information with worksheets for accumulating pertinent data.

This "Information Summary" was developed to also be used in conjunction with a research undertaking within AID/csd-1588 to develop a "Grain Marketing Checklist" for assessment of grain marketing systems and structures within developing countries (discussed later in this report).

Preliminary indications are that the limited enrollment of twenty participants will be met.

2. AID/USDA - Land-Grant Colleges and University Cooperative Short Courses - As a land-grant university, Kansas State University has cooperated with AID in hosting groups of individuals from developing nations during their participation in various types of touring short courses.

Although the visits are coordinated through the International Agricultural Programs office at Kansas State, much of the lecture, discussion, and laboratory instruction given the participants comes from various departments (economics, engineering, entomology, grain science) and the Food and Feed Grain Institute within the University. A great majority of the persons who provide instruction for the participants have had overseas assignments either through the USAID contract to provide technical assistance in food grain drying, storage, handling, and transportation or through other foreign assistance programs at the University.

Four such groups were hosted during the period reported here.

Participants were conducted on field trips to observe marketing, storage, drying, handling, and transportation functions of the U. S. grain industry. In addition, they visited grain farms and had classroom instruction in the various aspects of the grain industry. Project personnel participated in discussions of grain drying, storage, and pest control in stored grain. Basic biology and identification of stored product insects, microorganisms associated with stored food grains, and grain processing were also an integral part of the short course.

a. Agricultural Extension Education (PIO 608-036-1-90034 Morocco) at Kansas State University, June 23 through July 3, 1969.

This group of six Moroccan officials had as their primary objectives:

1. To discuss federal/state relationships, state/local government administration, and regional development programs.
2. To gain additional information about the organization and operation of the cooperative extension service and its programs for assisting farmers and ranchers to improve livestock, ranges, soils, and credit facilities.
3. To learn more about the place of research in agricultural development and methods of getting research results put to use by farmers.
4. To see and discuss the place of industry in agricultural development. Also to learn of different types of industry involved, such as tourism, and measures used to attract such business.
5. To become acquainted with the functions, organization, and facilities of the U. S. credit institutions providing credit to farmers and farmer cooperatives.
6. To see and learn about educational programs at secondary and college level agricultural training institutions, paying particular attention to programs which prepare students to work in agriculture and agri-business.
7. To gain an understanding of use of national forest lands for grazing livestock.

As a part of the total agri-business and extension overview of agriculture members of the grain storage and marketing team spent considerable time with the group discussing in particular objectives number 3, 4, and 5.

Members of the team were:

Mr. OUHADDOU Lhoucine
Chairman of the Chamber of
Agriculture - MEKNES

Mr. KRIBECH Jillali
Chairman of the Chamber of
Agriculture - FES

Mr. OUHENACH Brahim
 Division Chief of Chamber of
 Agriculture - Rabat
 Ministry of Agriculture - RABAT

Mr. BELHOUCINE Dris
 Administrator of the Chamber of
 Agriculture - AGADIR, Tarfaya

Mr. BOULASRI Lhaj Lhoucine
 Chairman of the Chamber of
 Agriculture - MARRAKECH

Mr. ALAOUI Medaghri
 Administrator of the Chamber of
 Agriculture - MEKNES

Mr. DOUABI Mohamed
 Member of the Chamber of
 Agriculture - FES

b. Grain Storage and Marketing, TC100-31 at Kansas State University, September 7 through October 4, 1969.

The central purpose of this group training project for fourteen Latin American and two Philippine participants was to enable these grain storage and marketing officials and technicians to study programs, agencies, facilities, and processes in the United States to increase their technical knowledge and leadership abilities in speeding developments in their home countries.

The specific objectives emphasized at Kansas State University were:

1. To introduce the group to basic economic principles and market structure of the cereal and feed grain industries.
2. To familiarize the group with different kinds of storage bins and equipment.
3. To observe on-the-farm handling and storage of several different grain crops.
4. To discuss how to control various physical problems of storage, including insects, rodents, moisture, etc.
5. To familiarize the group with programs and services that government agencies and institutions furnish the grain farmer and grain industry, including standardization, grading and inspection, price support and incentive programs, credit and finance, research, and market news and crop production information.

Participants accompanying the technical leader, Mr. Dwight Tolle, were:

PHILIPPINES

Dominador Jarabelo
 25 Walring Waling
 Roxas District
 Quezon City, Philippines

Herculano Sabas
 3567 Magistrado Aroullo
 Fatima Village
 Sta. Mesa, San Jaloc
 Manila, Philippines

NICARAGUA

Bernando Castillo
Apto. 1041
Managua, Nicaragua

Antonio Vasquez
Incei, Apto. 1041
Managua, Nicaragua C.A.

Santos Torono Bardales
Posoltega, Chinandega
Nicaragua

Felix Gonzalez
Incei Box 1041
Managua, Nicaragua

HONDURAS

Oscar Flores Chaez
Division de c.c.c.
Banco Nacional de Fomento
Comayaguela, D. C.
Honduras

Alonso Gomez Zelaya
Graneros
Banco Nacional de Fomento
San Pedro Sala, Honduras

BRITISH HONDURAS

Patrick Simmons
29 Claihoon St.
Belice City
Belice, British Honduras

DOMINICAN REPUBLIC

Juan Ordehi
Isabel Agruar #211
Herrera, D. N.
Republica Dominicana

Leopoldo Ramirez
Francisco I. Peynado # 5
Sto. Domingo

Jose Ruguel Chicon
Calle Las Cassenas # 42
Santrago, Dom. Rep.

Segundo Diaz C.
Av. Rivas 151
La Vega, Dom. Rep.

BRAZIL

Benjamin Nobrega
Rua Riachuelo 485
Villa S. Antonio, Casa XV
Recife, Pernambuco
(Sudene/DAR/AB)
Tel. 40361

Juan Borrás C.
Rua Padre Chico 314
V. Pompeia
Sao Paulo - 10 - S.P.

Marcelo Cruz
Rua Julieta, 143
Encruzilhada
Recife, Pernambuco
Tel. 24424

c. Cereal Production (PIO 277-444-1-90200-Turkey) at Kansas State University, August 18-22, 1969.

There were ten members of the Turkish Cereal Production team. The main purpose of the program was to allow the participants to obtain a more thorough knowledge of production and management techniques employed in the growing and handling of cereal feed crops in the midwest and south-west United States.

Objectives while at Kansas State University were to:

1. Observe and study livestock feeding and farming

2. Visit one or two farms to observe and study management systems of feed and forage production and feeding of cattle.
3. Observe feed crop production and utilization and the use of wheat in livestock feeding rations
4. Discuss and observe grain storage and handling facilities

The members of this team (listed below) were high-level administrative and technical personnel in the Ministry of Agriculture who are responsible for the development and implementation of an expanding program for the improvement of feed cereals and the handling and use of these feed materials.

Osman BOYACI
General Director of Agricultural Affairs
Ministry of Agriculture
Ankara

Nazim DURLA
Chief, Cereal Crops
General Directorate of Agriculture
Ankara

Ahmet ATLI
Technical Inspector
Provincial Agricultural Directorate
Adana

Mahmut SAMSAROGLU
Provincial Director of Agriculture
Tokat

Mehmet OZEREN
Provincial Director of Agriculture
Bursa

Fehim H. TEOMAN
Director of Region Plant Protection and
Quarantine
Adana

Mecmettin ULGER
Assistant Director General
State Increasing Farms

Enver OZDEMIR
Director of Dalaman State Farm

Aytekin ULGER
Ankara

Mumtaz KOCAK
Director of Gozlu State Farm

d. Colombian Grain Marketing (PIO 514-00075-Colombia) at
Kansas State University, November 2-6, 1969.

Members of the Colombian grain marketing team included nine grain storage and marketing executives from government and private organizations.

The primary objectives of the team were to:

1. Discuss and study policies and practices important to executives of grain marketing and storage facilities.
2. Meet with managers of grain elevators and discuss management policies and various problems in handling, storing, and selling grain.
3. Meet with university technicians and USDA officials to learn about buying practices, grades and standards, support programs and other related aspects of the U. S. grain marketing.

Members of the Colombian grain marketing team are listed below:

Bernardo Borrero OSORIO
Branch Manager of Bogota
Carrera 34 #102-08
Bogota

Armando Barbonell OSPINO
General Manager of INAGRARIO
Bogota

Eduardo Uribe HENAO
General Manager
"Al-Occidente"
Cali

Carlos A. HERNANDEZ B.
Director of Organization and Methods
Marketing, Land, and Cattle Institute
IDEMA

Octavio RESTREPO G.
General Manager
Almaviva
Bogota

Aparicio Hernandez ALVARO
General Manager
Popular Warehouse, LTD.
Bogota

Miss Fabiola ABADIA

Emilio Borelly VARGAS
Secretary General of INAGRARIO, S.A.

J. Gordon Shields
Technical Leader

Jaime E. Vilaveces NINO
General Manager
Almacenadora Grancolombiana, S.A.

3. Non-AID-Sponsored Visitors - Kansas State University is the only grain and feed processing instructional center in the United States, and as such, we are called upon to play host to many diverse groups and individuals from the U. S. and abroad who are interested in the grain and feed industries. Several such groups of foreign visitors are listed below:

- a. Japanese Flour Millers Team sponsored by Western Wheat Associates, Inc.; Great Plains Wheat, Inc.; and Foreign Agricultural Service, USDA, July 1969.

This five-man group consisted of milling research and technical managers from Japanese milling companies.

- b. Indian Wheat Mission sponsored by the Western Wheat Associates, Inc.; Great Plains Wheat, Inc.; and Foreign Agricultural Service, USDA, August 1969.

- c. Korea Bakery Industry Team sponsored by the Western Wheat Associates, Inc.; Great Plains Wheat, Inc.; Foreign Agricultural Service, USDA, April 1970.

Four baking executives were members of this team.

- d. German Wheat Importers Tour of the U. S. sponsored by the Great Plains Wheat, Inc., and Foreign Agricultural Services of USDA, April 1970.

This group consisted of five men actively engaged in grain import operations in West Germany.

- e. United Kingdom Trade Mission Tour of the U. S. sponsored by the Great Plains Wheat, Inc., and Foreign Agricultural Service, USDA, May 1970.

The five men in this group are actively engaged in administrative positions in grain and flour milling companies.

- f. The Netherlands Wheat Trade Mission sponsored by the Great Plains Wheat, Inc., and Foreign Agricultural Service, USDA, June 1970.

This three-man team consisted of wheat buyers.

- g. Individual visitors included:

Mr. M. Rahman, Project Director
Food Department of East Pakistan
Dacca

Mr. Rahman visited under the sponsorship of Weitz-Hettelsater, Inc., an engineering firm which conducted a storage feasibility study in East Pakistan and engineered four silos for construction there.

Dr. S. Sharifi, Head
Department of Plant Protection
College of Agriculture
Pahlava University
Shiraz, Iran

Mr. Bruce Champ
C.S.I.R.O.
Division of Entomology
Indooroopilly
Brisbane, Australia

4. Continuing Programs

a. Research - A large majority of the requests for technical assistance received by Kansas State University have centered on various aspects of marketing grains. The need for a method of analyzing a given country's marketing system rapidly and systematically is apparent from work under this contract.

Planning and preliminary work on developing a "Marketing Guidelines Checklist" was done during the period covered by this report. Some aspects of such a checklist were used in preparing the "Participant Country Information Summary" used in conjunction with the Grain Storage and Marketing Short Course scheduled for July 12-31, 1970.

The types of information requested in the "Participant Country Information Summary" included:

- I. General Information
 - A. Population data
 - B. Climate and topography
 - C. Political subdivisions and major cities
 - D. Transportation information including major roads and railroads
- II. Production Data (Cereal Grains)
 - A. Total annual production
 - B. Total supply and utilization
 - C. Maps showing land areas devoted to cereal production.
- III. Marketing Information
 - A. Laws and/or regulations
 - B. Number and capacity of grain handlers
 - C. Volume of sales by marketing channels
- IV. Storage Information
 - A. Annual amounts stored on farm, commercially, and by government
 - B. Primary types of storage and capacity
 - C. Quantities stored in marketing channels
- V. Processing Information
 - A. Number and capacity of grain processors

To assist participants in gathering the desired information, several worksheets were developed for use. The usefulness of the worksheets will be evaluated following the short course.

b. Information Retrieval System - In continuing to build on our information retrieval system, we have recently employed a research assistant to abstract and keyword 33 different journals and sources of information on grain storage, drying, handling, transportation, and marketing.

c. Slide File for Training Purposes - New slides showing grain storage, drying, handling, and marketing situations are continually being added to our file. The slides were used in the Grain Sanitation Workshop held in India, for the various tour groups visiting Kansas State University under AID sponsorship and/or other sponsorship, and will be used extensively in conduct of the Grain Storage and Marketing Short Course scheduled for July 1970.

5. Food Grain Drying, Storage, Handling, and Transportation reports issued to date are listed on the following page.

- No. 1 Rice Drying Technology and Equipment Which Might Be Applicable to Tropical Developing Countries. June 1968. Prepared by Dr. T. O. Hodges.
- No. 2 Brief Description for a Corn Handling Facility in Tropical Areas. June 1968. Prepared by Dr. T. O. Hodges and Dr. H. B. Pfost.
- No. 3 Structural Requirements of Grain Bins. July 1968. Prepared by Dr. T. O. Hodges.
- No. 4 Report on Food Grain Storage, Marketing, Handling and Transportation in Jordan. July 1968. Prepared by John R. Pedersen.
- No. 4A Photographic Supplement, Food Grain Storage, Handling and Transportation in Jordan. July 1968. Prepared by John R. Pedersen.
- No. 5 A Proposal to Equip Metal Silos in Jordan with Aeration and Temperature Monitoring Equipment. August 1968. Prepared by John R. Pedersen.
- No. 6 Review of Grain Storage, Handling, Processing and Distribution Problems and Proposals in the Republic of Korea. September 1968. Prepared by Alden A. Ackels, Dr. P. Gormely and Martin Keck.
- No. 7 Assessment of Food Grain Storage Facilities, West Pakistan - 1968. October 1968. Prepared by Dr. T. Wendling.
- No. 8 Implementation of Grain Storage Operations, Marketing Services and Price Stabilization in Honduras. October 1968. Prepared by John H. McCoy and Dwight S. Tolle.
- No. 9 Annual Report - 1967-1968 (November 1968).
- No. 10 Review of Grain Storage Handling and Distribution - Morocco 1969. April 1969. Prepared by Alden A. Ackels and John R. Pedersen.
- No. 11 Report on Grain Sanitation Workshop - July 7-12, 1969. Central Food Technological Research Institute, Mysore, India. July 1969. Prepared by John R. Pedersen.
- No. 12 Annual Report - 1968-1969.
- No. 13 Observations and Recommendations Concerning the Corn Marketing System in Guatemala. August 1969. Prepared by L. Orlo Sorenson.
- No. 14 An Analysis of Grain Storage and Price Stabilization Problems in El Salvador. September 1969. Prepared by John McCoy and Floyd Niernberger.
- No. 15 Review of Elevator Project in Honduras. October 1969. Prepared by Harry B. Pfost.
- No. 16 A Review of Rice Drying and Storage Problems in Ecuador. January 1970. Prepared by L. Orlo Sorenson.
- No. 17 Cereal and Dry Edible Bean Marketing and Warehousing in the States of Piaui and Paraiba, Brazil. February 1970. Prepared by Dwight S. Tolle.
- No. 17A Warehousing and Marketing Cereal and Beans in the State of Piaui, Brazil. February 1970. Prepared by Dwight S. Tolle.
- No. 17B Warehousing and Marketing Cereal and Beans in the State of Paraiba, Brazil. February 1970. Prepared by Dwight S. Tolle.