

# IMPROVEMENT OF POSTHARVEST GRAIN SYSTEMS

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Grain Storage, Processing and Marketing



**KANSAS  
STATE  
UNIVERSITY**

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

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ANNUAL REPORT  
Review of Activities  
FY 1983

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ANNUAL REPORT

Review of Activities  
FY 1983  
July 1, 1982 through June 30, 1983

Prepared for the  
AGENCY FOR INTERNATIONAL DEVELOPMENT  
UNITED STATES DEPARTMENT OF STATE  
AID/DSAN-CA-0256  
Improvement of Postharvest Grain Systems

at the  
FOOD AND FEED GRAIN INSTITUTE  
Kansas State University  
Manhattan, Kansas 66506

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## SCOPE OF WORK

In October 1980, the Kansas State University (KSU) Food and Feed Grain Institute (FFGI) and the United States Agency for International Development (USAID) signed Cooperative Agreement AID/DSAN-CA-0256, entitled "Improvement of Post-harvest Grain Systems." The FY 1983 activities were conducted under this agreement.

The major activity categories under this agreement include:

1. Development of increased technical capabilities for advising and implementing improved postharvest systems in developing countries
2. Information services
3. Training programs
4. In-country technical assistance
5. GASGA representation
6. Cooperation with a tropical institution (University of Costa Rica)

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

For presentation purposes, these activity categories have been realigned from the agreement document. They are: (1) in-country technical assistance, (2) in-country training programs, (3) on-campus training programs, (4) increase and maintain technical capabilities, (5) library and information services, (6) other activities (GASGA, co-op tropical institute), and (7) administrative support.

FY 1983 TIME DISTRIBUTION

(Person-Days)

Name	(1)	(2)	(3)	(4)	(5)	(6)		(7)	Total
	In-Country Technical Assistance	In-Country Training Programs	On-Campus Training Programs	Increase and Maintain Technical Capabilities	Library and Information Services	Other Activities		Adminis- trative Support	
						GASGA	Co-op Tropical Institute		
<b>1. Full-Time Unclassified</b>									
Borsdorf	177.5	-	62.5	-	-	-	-	24.5	264.5
Teter	238.0	-	-	-	-	-	-	-	238.0
Subtotal	415.5	-	62.5	-	-	-	-	24.5	502.5
<b>2. Part-Time Unclassified</b>									
Chung (0.40)	37.5	2.5	47.5	10.5	11.5	3.0	11.5	7.0	131.0
Foster (0.60)	67.0	2.5	128.5	5.0	6.0	0.5	-	8.0	217.5
Geiser (0.60) <sup>a</sup>	-	-	-	-	116.0	-	-	-	116.0
Haque (0.80)	18.0	30.0	67.0	52.5	0.5	-	-	1.0	169.0
Hugo (0.70)	47.0	-	23.0	-	1.0	-	-	117.0	188.0
Kiser (0.20)	-	-	6.0	-	-	-	-	-	6.0
Mills (0.20)	39.0	-	21.5	0.5	9.5	-	-	-	70.5
Pedersen (0.20)	27.5	-	54.5	14.5	15.5	10.5	-	6.0	128.5
Phillips (0.50)	11.5	-	59.0	66.5	2.0	-	11.5	5.5	156.0
Reed (0.90)	4.5	-	133.0	14.0	20.5	6.5	4.5	11.0	194.0
Schenck-Hamlin (0.40) <sup>a</sup>	-	-	-	-	81.0	-	-	-	81.0
Wright (0.60)	34.0	28.5	17.0	56.0	-	2.0	-	-	137.5
Subtotal	286.0	63.5	557.0	219.5	267.5	22.5	27.5	155.5	1595.0
<b>3. Full-Time Classified</b>									
Baumann	-	-	-	-	-	-	-	111.5	111.5
Peters	17.5	-	36.0	-	3.0	1.0	4.5	124.5	186.5
Subtotal	17.5	-	36.0	-	3.0	1.0	4.5	236.0	298.0
<b>4. Part-Time Classified</b>									
Rwee (0.8)	46.5	2.5	6.0	1.5	-	2.0	2.5	130.0	191.0
Subtotal	46.5	2.5	6.0	1.5	-	2.0	2.5	130.0	191.0
<b>5. Other KSU Staff<sup>b</sup></b>									
Burroughs	30.0	4.5	63.5	31.5	9.5	-	-	9.0	148.0
Deyoe	11.0	-	-	-	-	-	-	-	11.0
Stevens	47.0	-	-	-	-	-	-	-	47.0
Subtotal	88.0	4.5	63.5	31.5	9.5	-	-	9.0	206.0
<b>6. Consultants</b>									
Ackels	7.0	-	-	-	-	-	-	-	7.0
Harris	-	-	-	-	-	5.0	-	-	5.0
Huyser	22.0	-	-	-	-	-	-	-	22.0
Ives	-	16.0	-	-	-	-	-	-	16.0
Pfost	41.0	-	-	-	-	-	-	-	41.0
Stryker	34.0	-	-	-	-	-	-	-	34.0
Subtotal	104.0	16.0	-	-	-	5.0	-	-	125.0
GRAND TOTAL	957.5	86.5	725.0	252.5	276.0	30.5	34.5	555.0	2917.5

<sup>a</sup>Geiser resigned as PHDS Coordinator January 1982. Her position was filled by Schenck-Hamlin.

<sup>b</sup>Other KSU staff not funded under AID/DSAN-CA-0256.

## EXECUTIVE SUMMARY

In spite of reduced budget obligations during FY 1983, the level of activities under all categories of the Cooperative Agreement continued to be high and increased in certain areas. The Institute engaged in all activity categories and delivered services responsive to the needs and concerns of postharvest systems for cereal grains and legumes in developing countries. The level of effort and its distribution among activity categories is summarized below.

<u>Activity Category</u>	<u>Person-Days</u>	<u>Percent</u>
(1) In-Country Technical Assistance	957.5	33
(2) In-Country Training Programs	86.5	3
(3) On-Campus Training Programs	725.0	25
(4) Increase and Maintain Technical Capabilities	252.5	9
(5) Library and Information Services	276.0	9
(6) Other Activities	65.0	2
(7) Administrative Support	<u>555.0</u>	<u>19</u>
Total	2,917.5	100

Twenty-three technical assistance assignments addressing diverse technical and economic-marketing aspects of the postharvest grain and legume systems were undertaken in 17 countries in conjunction with local AID missions and public and private institutions. One-half of these technical assistance assignments were follow-up to previous work undertaken or annual recurrent activities.

Two in-country short courses were presented during FY 1983 including a follow-up in-service training of Peace Corps volunteers in Tanzania. Included under on-campus training were graduate students undergoing degree training, the annual Grain Storage and Marketing Short Course, a special short course for participants from Ecuador, and two special training programs.

To increase and maintain technical capabilities, FFGI staff members either concluded, started, or continued with 16 research projects during FY 1983. Also, four professional and technical meetings were attended dealing with aspects of food protection and energy conservation.

There was considerable increase in activity of the library and information services. The Postharvest Documentation Service (PHDS) increased the number of active clients and the acquisition rate of documents, obtained a new coordinator, and initiated a study of its hardware/software components, the results of which will be implemented during FY 1984. Eleven reports, two teaching manuals, and five journal articles were written and published. Sixty-nine requests for reports and technical information were serviced. Staff time was spent with 87 visitors from 25 different countries discussing various topics of postharvest grain and legume systems. Finally, additional material was added to the slide collection used for teaching and instruction.

Under other activities, staff members acted as USAID/Washington's representative to the Group for Assistance on Systems relating to Grain After-harvest (GASGA). The major issues addressed during the Fifteenth Annual Meeting of GASGA included the Prostephanus truncatus infestation in East Africa, the establishment of corresponding memberships in GASGA, and the review of the member project data sheets. Under the cooperative agreement with the Centro de Investigación de Granos y Semillas (CIGRAS), University of Costa Rica, headway was made toward the implementation of the CIGRAS project "An Analysis of the Postharvest Systems for Grains and Pulses in Costa Rica." This study, the first of its kind, will be implemented during FY 1985.

Finally, administrative changes were implemented to cope with a severe cut in fund obligations to the Cooperative Agreement.

## ACTIVITY CATEGORIES

### I. In-Country Technical Assistance

In-country technical assistance undertaken during FY 1983 is summarized in Table 1. A detailed description of each trip, including (1) nature of activity, (2) objective, (3) summary of activities, and (4) reporting and distribution, is given in Appendix A.

Assistance was given to a diversified group of local, public, and private institutions engaged in grain and legume postharvest systems in Africa, Asia, Central America, and South America.

#### First Quarter

##### Senegal

Roe Borsdorf and Kathy Foster conducted a study of cereal grain reserves and prepared the basic information requirements for Project Assistance Identification Paper (PAIP) related to the Cereal Price Stabilization and Food Grain Reserve Component of the USAID/Senegal ESF Project.

##### Sierra Leone

Ekramul Haque and Robert Mills worked with the University of Sierra Leone in the development of a project proposal on grain storage at the farm level.

#### Second Quarter

##### El Salvador

Cornelius Hugo participated in the First National Storage Congress related to reducing postharvest losses. He presented a paper and discussed postharvest problems and the need for technical assistance and training with officials from the Centro de Conocimientos Especializados en Granos y Semillas (CEGRAS).

##### Ecuador

Cornelius Hugo and Alden Ackels assessed the technical assistance needs of the wheat milling sector, desirability of soft and hard wheat blends in the milling process, and training needs for the Empresa Nacional de Almacenamiento y Comercialización de Productos Agropecuarios (ENAC). Long-term planning for the delivery of requested services was discussed.

##### Thailand

Rosemary Burroughs worked with the Seed and Postharvest Pathology Branch (SPHPB), Division of Plant Pathology and Microbiology, Department of Agriculture, in (1) exploring the present situation of aflatoxin contamination, (2) designing an aflatoxin monitoring system, (3) identifying human and technical resources, and (4) delivering necessary documentation on aflatoxins.

## Pakistan

Roe Borsdorf and Robert Mills assisted USAID/Islamabad in the preparation of a Preliminary Project Design Development Paper for the Postharvest Management Component of the Food Security Subproject under the Agricultural Production, Distribution, and Storage Project.

## Third Quarter

### Washington, D.C.

Richard Phillips participated in a workshop to evaluate criteria used in formulating agricultural marketing projects in LDCs.

### Burma

Roe Borsdorf assisted USAID/Rangoon in conducting a pre-feasibility study for oilseed processing and edible oil distribution in Burma for future investment potentials.

### Costa Rica

Do Sup Chung, Richard Phillips, and Carl Reed assisted the University of Costa Rica in planning the implementation of the project "An Analysis of the Postharvest Systems for Grains and Pulses in Costa Rica" undertaken by the Centro de Investigación de Granos y Semillas (CIGRAS), and reviewed plans for proposed CNP handling and storage facilities.

### Peru

Cornelius Hugo and Harold Stryker assessed training needs, developed short course outlines, and determined requirements for grain drying and storage in the Upper Huallaga Development Project Area.

### England

Valerie Wright participated in a Group for Assistance on Systems relating to Grain After-harvest (GASGA) workshop on Prostephanus truncatus and discussed with other donor representatives possible approaches to combating the P. truncatus problem in East Africa. A paper was presented on world distribution of this insect along with an annotated bibliography.

### Ecuador

Cornelius Hugo finalized plans for an upcoming short course to be held on the KSU campus.

### Italy

Carl Reed and Kenton Harris participated in the GASGA/FAO workshop on loss assessment in postharvest loss reduction programs. Reed chaired working session on pre-storage loss assessment technology.

## Fourth Quarter

### Korea

Charles Deyoe reviewed work plans in postharvest grain systems with officials from the College of Agriculture, Korea University, in Seoul, Korea.

### Philippines

Charles Deyoe reviewed and discussed the Southeast Asia Cooperative Research and Development Programme (SEARCA) with local team leader, other donor representatives, and USAID/Manila officials.

### Singapore

Charles Deyoe attended the annual SEARCA Policy Advisory Board (PAB) meeting. Among the items discussed were team progress during past year, Phase III of the program, and transfer of executing agency from International Development Research Centre (IDRC) to National Food Authority (NFA).

### Philippines

Charles Deyoe briefed local USAID officials on the outcome of the SEARCA PAB meeting.

### Pakistan

Roe Borsdorf, Kathy Foster, John Pedersen, Henry Stevens, Valerie Wright, Wipada Huyser, and Harry Pfof developed the Project Design of the Post-harvest Management Component of the Food Security Subproject of the Agricultural Production Distribution and Storage Project.

### Indonesia

Do Sup Chung discussed postharvest problems with officials of Gadjah Mada University, presented a paper at the 1983 Grain Postharvest Workshop, and evaluated rice complexes at P.T. Pertani.

### Korea

Do Sup Chung reviewed a research project at Sung Kyun Kwang University and presented a seminar at Seoul National University.

### Ecuador

Henry Stevens studied the potential for soft and hard red winter wheat mixes in the milling process, and established training guidelines for the personnel of the Quality Division, Ministry of Agriculture, in charge of flour and bread quality control.

## Egypt

John Pedersen attended the annual meeting of GASGA and discussed potential needs for technical assistance and training in the grain postharvest area with USAID/Cairo personnel.

## Philippines

Norman Teter returned to the U.S. after completing a six-year tour of duty as a SEARCA technical team member.

TABLE 1  
IN-COUNTRY TECHNICAL ASSISTANCE

Travel Dates	Country	University Staff	Consultant	Scope of Work
<u>First Quarter</u>				
Aug. 22 - Sep. 18, 1982	Senegal	Borsdorf Foster		Conduct a study on cereal grain reserves related to the Cereal Price Stabilization and Food Grain Reserve Component of the USAID Senegal ESF Project.
Sep. 24 - Oct. 7, 1982	Sierra Leone	Haque Mills		Review the managerial, technical, and scientific capabilities of the University of Sierra Leone to undertake a project proposal on grain storage at the farm level and to assist in the design of a more competitive project proposal.
<u>Second Quarter</u>				
Oct. 13 - Oct. 16, 1982	El Salvador	Hugo		Participate in the First National Storage Congress related to reduction of postharvest losses in grains. Present a paper, "Factors Affecting a Program of Grain Storage at Farm Level."
Oct. 17 - Oct. 23, 1982	Ecuador	Hugo	Ackels	Assess technical assistance needs for the wheat milling sector, especially wheat blends, training need requirements by ENAC, and long-term planning for delivery of required technical assistance and training needs.
Nov. 19 - Dec. 10, 1982	Thailand	Burroughs		Assist the SPHPB, Department of Agriculture, in exploring the present situation of aflatoxin contamination and ways to combat it.
Nov. 26 - Dec. 12, 1982	Pakistan	Borsdorf Mills		Assist USAID/Islamabad in the preparation of a Preliminary Project Design Development paper for the Postharvest Management Component of the Food Security Subproject under the Agricultural Production, Distribution, and Storage Project.
<u>Third Quarter</u>				
Jan. 5 - Jan. 7, 1983	Washington, D.C.	Phillips		Participate in workshop to evaluate criteria used in formulating agricultural marketing projects in LDCs as requested by USAID/Washington.
Jan. 14 - Feb. 28, 1983	Burma	Borsdorf		Assist USAID/Rangoon officials in conducting a pre-feasibility study for oilseed processing and edible oil distribution in Burma for future investment potentials.
Jan. 22 - Feb. 6, 1983	Costa Rica	Chung Phillips Reed		Assist in planning the implementation of the CIGRAS project "An Analysis of the Postharvest Systems for Grains and Pulses in Costa Rica," and review plans for proposed grain handling and storage facilities.
Jan. 26 - Mar 3., 1983	Peru	Hugo	Stryker	Conduct assessment of training needs, develop short course outlines, and determine grain storage capacity and grain drying equipment needs. Assess needs for additional short-term technical assistance in the Upper Huallaga Development Project Area.

TABLE 1 (continued)

Travel Dates	Country	University Staff	Consultant	Scope of Work
Feb. 18 - Feb. 28, 1983	England	Wright		Participate in GASGA workshop on the greater grain borer and present paper entitled "World Distribution of <i>Prostephanus truncatus</i> ."
Feb. 28 - Mar. 3, 1983	Ecuador	Hugo		Finalize plans for the upcoming short course to be held from March 14 through April 1, 1983, at KSU.
Mar. 19 - Mar. 24, 1983	Italy	Reed	Harris	Participate in GASGA/FAO workshop on loss assessment in postharvest loss reduction programs.
<u>Fourth Quarter</u>				
Apr. 11 - Apr. 13, 1983	Korea	Deyoe*		Review work plans in postharvest grain systems.
Apr. 14 - Apr. 16, 1983	Philippines	Deyoe*		Brief USAID/Manila on SEARCA program.
Apr. 17 - Apr. 20, 1983	Singapore	Deyoe*		Attend SEARCA Policy Advisory Board meeting.
Apr. 1 - Apr. 22, 1983	Philippines	Deyoe*		Brief USAID/Manila on the SEARCA Policy Advisory Board meeting.
Apr. 15 - June 7, 1983	Pakistan	Borsdorf Foster Pedersen Stevens* Wright	Huyser Pfost	Provide technical assistance to USDA/OICD in Pakistan in the development of the Project Design of the Postharvest Management Component of the Food Security Subproject under the Agricultural Production, Distribution, and Storage Project.
Apr. 29 - May 10, 1983	Indonesia	Chung		Assist the government agency P.T. Pertani in evaluating its rice processing facilities and identifying its training needs and attend the Grains Postharvest Workshop and present a paper "Mass Transfer Coefficients for Natural Air Drying on Rough Rice."
May 15 - May 16, 1983	Korea	Chung		Present a postharvest grain seminar and review a cooperative research project.
May 22 - June 23, 1983	Ecuador	Stevens*		Carry out an assessment of soft and hard red winter wheat mixes in the milling process and give recommendations. Establish training guidelines for Ministry of Agriculture.
June 18 - June 24, 1983	Egypt	Pedersen		Attend the annual meeting of GASGA. Meet with USAID personnel working on rice project.
June 30, 1983	Philippines	Teter		Return home after completion of tour of duty as SEARCA technical team member.

\*Other KSU staff not funded by AID/DSAN-CA-0256.

## II. In-Country Training Programs

Two in-country training programs were presented during FY 1983. They are summarized in Table 2, with details given in Appendix B.

### First Quarter

#### Kenya

Ekramul Haque and Valerie Wright stopped in Kenya to obtain information on natural insecticides from plants at International Centre for Insect Physiology and Ecology (ICIPE), Nairobi.

#### Tanzania

Ekramul Haque and Valerie Wright presented a one-week intensive short course as in-service training for 16 Peace Corps volunteers (PCVs) who had been trained at KSU the previous fiscal year. The volunteers were instructed in the use of local materials for constructing on-farm grain storage and advised on how to combat the continuing spread of Prostephanus truncatus (larger grain borer). Underground storage was demonstrated at the Mlingano Agricultural Technical Institute.

### Third Quarter

#### Costa Rica

Do Sup Chung, Richard Phillips, and Carl Reed, while in-country on technical assistance assignment, assisted in the final planning of the grain storage and management short course for the Consejo Nacional de Producción (CNP) and the private sector.

#### Paraguay

Norton Ives assisted in conducting a two-week short course in grain drying and preservation. A total of 14 participants attended from the Ministry of Agriculture, local cooperatives, technical schools, and the private sector.

TABLE 2  
IN-COUNTRY TRAINING PROGRAMS

Travel Dates	Country	Duration	Number of Participants	University Staff	Consultant	Scope of Work
<u>First Quarter</u>						
Aug. 18 - Aug. 21, 1982	Kenya			Haque Wright		Visit with staff of the ICIPE to obtain information on plant material for insect control to be used in the Tanzania short course.
Aug. 22 - Sep. 2, 1982	Tanzania	1 week	16	Haque Wright		Conduct short course as in-service training for PCVs previously trained at KSU. Training involved (1) ways of using local resources for construction of on-farm storage units including underground pit storage and (2) advice to volunteers on how to recognize and combat the greater grain borer ( <u>Prostephanus truncatus</u> ).
<u>Second Quarter</u>						
Oct. 1 - Dec. 31, 1982						
<u>Third Quarter</u>						
Jan. 22 - Feb. 6, 1983	Costa Rica			Chung Phillips Reed		Finalize the proposed in-country short course on grain storage and management.
Feb. 28 - Mar. 15, 1983	Paraguay	2 weeks	14		Ives	Assist in conducting a short course in grain drying and preservation for personnel of the Ministry of Agriculture, cooperatives, technical schools, and private sector.
<u>Fourth Quarter</u>						
Apr. 1 - June 30, 1983						

### III. On-Campus Training Programs

The on-campus training activity category under Cooperative Agreement AID/DSAN-CA-0256 contains four subsections: (a) academic training providing degree and research programs to students, (b) the annual Grain Storage and Marketing Short Course (GSMSC), (c) special short courses given upon request, and (d) special programs given upon request to individuals or institutions. The activities carried out under this category are summarized in Table 3, with details given in Appendix C.

#### A. Academic Training

FFGI sponsored academic training for four students during FY 1983. Zenaida Toquero finished Ph.D. degree work in agricultural economics and returned to the Philippines to continue work with the International Rice Research Institute (IRRI). Armando Reyes arrived from Honduras to begin Ph.D. training in agricultural economics. Manuel Zeledon, Costa Rica, finished his M.S. degree work in grain science. Maitri Naewbanij, Thailand, continued work on a Ph.D. degree in grain science.

#### B. Grain Storage and Marketing Short Course

The annual GSMSC was held June 13-July 29, 1983. A total of 24 participants from 12 different countries participated. The details on the short course, including the brochure and class schedule, are given in Appendix C.

#### C. Special Short Courses

One special three-week short course was designed for officials of ENAC based on recommendations given during previous technical assistance. Six participants received instruction on the basic aspects of grain handling, conditioning, and storage.

#### D. Special Programs

Two special programs were undertaken during FY 1983. The first was a four-day program for two Nigerians which dealt with grain production, handling, and storage. The second was FFGI's annual participation in the Mississippi State University (MSU) Seed Improvement Training Course. Valerie Wright traveled to MSU under this exchange program to present "Identification and Control of Stored-Grain Insects."

TABLE 3  
ON-CAMPUS TRAINING PROGRAMS

Dates	Participant Country	Number	Name of Participant	Duration	Type of Training	Subject Area
<u>First Quarter</u>						
July 1 - Sep. 30, 1982	Costa Rica	1	Zeledon, M.		M.S. Grain Sci.	Effectiveness of methoprene as a protectant for stored grain
	Philippines	1	Toquero, Z.		Ph.D. Agri. Econ.	Evaluation of alternative rice post-production technologies in the Philippines
	Thailand	1	Naewbanij, M.		Ph.D. Grain Sci.	Quality changes of rough rice during aerated storage
July 12 - July 15, 1982	Nigeria	2	Ogbouji, M Azih, A.	4 days	Special program	Grain production, handling, and storage
<u>Second Quarter</u>						
Oct. 1 - Dec. 31, 1982	Costa Rica	1	Zeledon, M.		M.S. Grain Sci.	Effectiveness of methoprene as a protectant for stored grain
	Honduras	1	Reyes, A.		Ph.D. Agri. Econ.	Improvement of grain marketing systems in LDCs
	Philippines	1	Toquero, Z.		Ph.D. Agri. Econ.	Evaluation of alternative rice post-production technologies in the Philippines
	Thailand	1	Naewbanij, M.		Ph.D. Grain Sci.	Quality changes of rough rice during aerated storage
<u>Third Quarter</u>						
Jan. 1 - Mar. 31, 1983	Costa Rica	1	Zeledon, M.		M.S. Grain Sci.	Effectiveness of methoprene as a protectant for stored grain
	Honduras	1	Reyes, A.		Ph.D. Agri. Econ.	Improvement of grain marketing systems in LDCs
	Thailand	1	Naewbanij, M.		Ph.D. Grain Sci.	Quality changes of rough rice during aerated storage
Mar. 14 - Apr. 1, 1983	Ecuador	6	Quevedo, W Alava, F. Fernandez, E. Narvaez, B. Baldassari, J. Aguirre, F.	3 weeks	Special short course	Grain handling, conditioning, and storage
<u>Fourth Quarter</u>						
Apr. 1 - June 30, 1983	Costa Rica	1	Zeledon, M.		M.S. Grain Sci.	Effectiveness of methoprene as a protectant for stored grain
	Honduras	1	Reyes, A.		Ph.D. Agri. Econ.	Improvement of grain marketing systems in LDCs
	Thailand	1	Naewbanij, M.		Ph.D. Grain Sci.	Quality changes of rough rice during aerated storage
June 13 - July 29, 1983	Burundi Ecuador	1 4	Havyarimana, M. Armas, C. Gallardo, R. Guevara, R. Espinoza, F.	7 weeks	Short course	Grain storage and marketing

TABLE 3 (continued)

Dates	Participant Country	Number	Name of Participant	Duration	Type of Training	Subject
	Ethiopia	1	Dagne, M.			
	Honduras	4	Rodriguez, J. Ordonez, A. Maradiaga, M. Osorto, R.			
	Kenya	1	Asress, A.			
	Peru	6	Guerra, R. Benza, C. Vela, G. Vilcapoma, E. Pinella, L. Moreales, J.			
	Saudi Arabia	1	Al-Yaeesh, F.			
	Sudan	1	Wongo, L.			
	Tanzania	1	Ngondo, A.			
	Venezuela	1	Arrevillagas, A.			
	Yemen	1	Aodu Hasher, D.			
	Zambia	2	Maliande, M. Mweemba, M.			
June 23 - June 24, 1983				2 days	Special program	Exchange program with MSU Seed Improvement Training Course, par- ticipation by V. Wright

Note: Though fiscal year ends June 30, the annual GSMSC is conducted through July 29 and is considered as part of the 1983 fiscal year.

#### IV. Increase and Maintain Technical Capabilities

##### A. Research Activities

The research activities carried out during FY 1983 are summarized in Table 4 by area and research topic. A more detailed description is contained in Appendix D.

A total of 16 different research projects closely related to grain postharvest systems were pursued during FY 1983, some of which were carried over from previous years. Six of the projects were completed in FY 1983. Some of the research projects were not funded by AID/DSAN-CA-0256, but benefitted from the input of staff members associated with the Cooperative Agreement.

##### B. Professional and Technical Meetings

A total of five meetings were attended by staff members. Three of them dealt with food protection issues including grains, one dealt with energy conservation in food processing, and one dealt with fumigation in grain storage and controlled atmosphere. These meetings are detailed in Table 5.

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TABLE 4  
RESEARCH ACTIVITIES

Area	Research Title
Agricultural economics	1. Critical Evaluation of Alternative Rice Post-Production Technologies in Central Luzon and Bicol Regions, Philippines
	2. Simulation of a Food Security System for the Countries of South Asia
	3. Simulation of a Food Security System in Northeast Asia, Southeast Asia and Oceania
	4. Computerized Systems for Feasible Agribusiness Development
	5. Analysis of Food Security Programs in LDCs
	6. Quantitative Analysis to Support LDC Grain Policies
	7. Improvement of Grain Marketing Systems in LDCs
Agricultural engineering	1. Modeling and Optimization of Feed Mill
	2. Changes in Quality of Rough Rice During Aerated Storage
	3. Underground Grain Storage Methods for Developing Countries
	4. Grain Drying by Zeolite
Biology/entomology	1. The Effects of Insect Interaction on Milled Rice and a Sample Model to Evaluate Insect Population Growth
	2. Technological Quality of Dry Beans ( <u>Phaseolus vulgaris</u> L.) Stored Under Nitrogen
	3. Estimating Stored-Grain Insect Populations: Invasion of Grain from Local Reservoirs
	4. Effectiveness of Methoprene as a Protectant for Stored Grain
	5. Biology and Behavior of <u>Corcyra cephalonica</u> , the Rice Moth: A Pest of Stored Rice in the Tropics

TABLE 5  
PROFESSIONAL AND TECHNICAL MEETINGS

Travel Dates	University Staff	Consultant	Location	Type of Meeting
<u>First Quarter</u>				
Sep. 13 - Sep. 17, 1982	Pedersen		Brainerd, Minnesota	Food Protection Committee and Safety Committee meetings, Association of Operative Millers.
<u>Second Quarter</u>				
Dec. 12 - Dec. 17, 1982	Chung		Chicago, Illinois	Short Course on Energy Conservation in Food Processing, Winter Meeting of American Society of Agricultural Engineers.
<u>Third Quarter</u>				
Jan. 25 - Jan. 29, 1983	Pedersen		Houston, Texas	Food Protection Committee meetings, Association of Operative Millers. Make field trip planning arrangements for 1983 GSMSC.
<u>Fourth Quarter</u>				
Apr. 10 - Apr. 18, 1983	Wright		Perth, Australia	International Symposium on the Practical Aspects of Controlled Atmosphere and Fumigation in Grain Storage.
May 7 - May 10, 1983	Pedersen		Kansas City, Missouri	Food Protection Committee meetings and Technical Conference, Association of Operative Millers. Present a paper at technical conference.

## V. Library and Information Services

### A. Postharvest Documentation Service

In spite of a 30 percent decrease in the Postharvest Documentation Service (PHDS) budget, acquisitions and clients increased by 10.9 and 10.2 percent, respectively. The number of requested documents declined 19 percent, possibly due to a new PHDS policy reducing from 20 to 10 document deliveries per client per month.

Most PHDS clients continue to be researchers in LDCs, government, or private institutions with librarians making up the second largest group. Regionally, clients were distributed as follows: Asia--38 percent, Africa--23 percent, Latin America--18 percent, North America--14 percent, and Europe and Middle East--7 percent.

Requests by subject area were as follows: biology--47 percent, engineering--38 percent, economics--11 percent, and general--4 percent.

PHDS initiated a study of its hardware/software components which will result in some modifications during FY 1984. These changes will allow PHDS to increase acquisitions and search rates without an increase in its budget.

A complete account of PHDS activities for FY 1983 is contained in a separate annual report.

### B. Reports, Teaching Manuals, and Journal Articles

A total of 11 technical assistance reports were published and made available to USAID/Washington and USAID missions. A teaching manual was prepared for the on-campus Ecuador short course. The GSMSC storage manual was improved and reprinted for the 1983 course. Five journal articles were published by staff members.

A more detailed description of these publications is contained in Table 6.

### C. Report and Technical Information Requests

A total of 69 requests were handled during FY 1983. FFGI responded to these requests by providing 230 technical assistance reports, 62 research reports, and 62 special reports. In addition, 26 requests for information were received from 20 different countries.

A complete listing of requests is given in Tables 7 and 8.

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TABLE 6  
 REPORTS, TEACHING MANUALS, AND JOURNAL ARTICLES

Date	Author(s)	Title
<b>A. REPORTS</b>		
Technical Assistance Reports		
<u>First Quarter</u>		
Aug. - Sep. 1982	Roe Borsdorf Kathy Foster	A Survey of Cereal Reserve Requirements in Senegal
Sep. - Oct. 1982	Ekramul Haque Robert Mills	Project Proposal--Design Construction and Field Testing of Rice Drying and Storage Facilities Appropriate for Sierra Leone Farmers
<u>Second Quarter</u>		
Oct. 1982	Cornelius Hugo Alden Ackels	Project Identification Mission: Analysis of Current and Future Needs of the Wheat Milling and Baking Industries in Ecuador (Spanish also)
Oct. 1982	Cornelius Hugo	Project Identification Mission: Assessment of Current and Future Technical Assistance and Training Needs of ENAC, Ecuador (Spanish also)
Nov. - Dec. 1982	Roe Borsdorf Robert Mills	Preliminary Project Design Development--Postharvest Management Component of Food Security Subproject Agricultural Production, Distribution, and Storage Project 391-0476--A Working Paper
Dec. 1982	Rosemary Burroughs	Recommendations and suggestions to assist with aflatoxin survey and detection
<u>Third Quarter</u>		
Jan. - Feb. 1983	Do Sup Chung Richard Phillips Carl Reed	Evaluations of Training Needs and Grain Handling Facilities of CNP, and CIGRAS Research Project in Costa Rica
Jan. - Feb. 1983	Cornelius Hugo Harold Stryker	Grain Handling, Conditioning and Storage in the Upper Huallaga Area
Jan. - Mar. 1983	Loren Schulze J. Givens Tung Aung Prue U Than Htay U Htay Aung U Mein Thein Roe Borsdorf	Oilseed Processing and Edible Oil Distribution in Burma, Recommendations for Future Investment Potentials
<u>Fourth Quarter</u>		
May 1983	Roe Borsdorf Kathy Foster Wipada Huyser John Pedersen Harry Pfost Henry Stevens Valerie Wright	Postharvest Management Project Design, Pakistan
June 1983	Henry Stevens	Analysis of the Utility of Substitution of Soft Red Winter Wheat for a Portion of the Imported Wheat Currently Being Milled in Ecuador
<b>B. TEACHING MANUALS</b>		
<u>Third Quarter</u>		
Mar. 1983	FFGI Staff	Grain Handling, Conditioning and Storage Short Course (Ecuador)
<u>Fourth Quarter</u>		
June - July 1983	FFGI Staff	Grain Storage and Marketing Short Course
<b>C. JOURNAL ARTICLES/REPORTS</b>		
<u>Second Quarter</u>		
Dec. 1982	Byung Seo Ryu Richard Phillips Paul Kelley	Feasibility of Food Security Reserves for Korea

TABLE 6 (continued)

Date	Author(s)	Title
<u>Third Quarter</u>		
Feb. 1983	Valerie Wright	World Distribution of <u>Prostephanus truncatus</u> (Horn)
Mar. - Apr. 1983	Larry Seitz Harold Mohr Rosemary Burroughs James Glueck	Preharvest Fungal Invasion of Sorghum Grain
<u>Fourth Quarter</u>		
Apr. 1983	Valerie Wright Rosemary Burroughs	Mold-Damaged Grain Sorghum as a Diet for Three Stored-Grain Beetles (Coleoptera)
May 1983	Noel White Valerie Wright Fred Watters Robert Mills	Future Directions and Current Problems for Stored-Product Entomology

TABLE 7  
REQUESTS FOR REPORTS

Location	Number of Requestors	Technical Assistance Reports	Research Reports	Special Reports
AFRICA				
Nigeria	1	0	0	1
Rwanda	1	0	1	0
Senegal	1	0	0	1
Sudan	1	0	1	0
West Indies	1	11	5	2
ASIA				
Indonesia	1	0	1	0
Korea	1	1	1	1
Pakistan	1	0	0	2
Philippines	2	7	1	3
CENTRAL AMERICA				
Costa Rica	1	1	0	0
Honduras	1	1	0	0
EUROPE				
England	1	0	0	1
Japan	1	0	2	0
Switzerland	1	2	0	0
LATIN AMERICA				
Ecuador	2	16	4	2
Peru	12	17	0	0
UNITED STATES				
Commercial	13	36	7	5
Government	7	68	23	10
KSU				
Ag. Econ. class	1	0	0	30
Faculty-Staff	12	57	15	2
Universities	<u>8</u>	<u>13</u>	<u>1</u>	<u>2</u>
TOTAL	69	230	62	62

TABLE 8  
TECHNICAL INFORMATION REQUESTS

Request Subject	Country
Simple steel bin manufacturers	USA
Silos, pneumatic transport, etc.	Argentina
U.S. manufacturers of bins/silos	India
Seed bag manufacturers	Liberia
Shrinkage due to moisture loss	Colombia
Manufacturers of rice handling/processing equipment	USA
Insect fragments	USA (2)
Rodent control	Honduras
Concrete dome structures	USA
Cereal product insects	USA
Efficacy of liquid grain fumigants	USA
Appropriate technology in developing countries	USA
Grain storage	USA (2)
Long-term training	USA
Grain storage training	Cyprus, USA
Training programs	El Salvador, Nigeria, Rwanda, Sierra Leone, USA (2)
FFGI activities	Bolivia, Haiti, Pakistan, Turkey
Technical assistance	Costa Rica
Grain storage, processing, and development	India
Information on FFGI	Panama, Zaire
Kenya small farm project	Canada

TABLE 8 (continued)

Request Subject	Country
Postharvest food losses in the Caribbean and Latin America	Switzerland
United Nations (U.N.) relief commodity storage	USA
Grain storage consultant	USA
Short-term consultant for Pakistan	USA
Slides on rodent control in grain storage structures	USA

#### D. Visitors

A total of 87 visitors from 25 different countries visited FFGI during FY 1983. FFGI staff spent time discussing a range of topics covering many aspects of grain postharvest systems.

The visitors' names, origin, and purpose of visit are summarized in Table 9.

#### E. Slide File

As each of the teams under Cooperative Agreement AID/DSAN-CA-0256 works in the field, a collection of slides showing grain storage, processing, and marketing situations is being built. The slides have been used extensively in training sessions at Kansas State University, both in the GSMSC and in grain storage and marketing discussions with visitors and students. These slides are also used in teaching off-campus training programs.

TABLE 9  
VISITORS

<u>Dates</u>	<u>Name and Country</u>	<u>Purpose of Visit</u>
<u>First Quarter</u>		
Jul. 20, 1982	Mr. Daniel Baraunpana	Discuss and obtain information regarding on-farm grain storage
Jul. 30 - Aug. 4, 1982	Mr. Phocas Kayinamura, Rwanda	Discuss bean and grain drying and storage
Aug. 1982	Dr. Azim Abdalla, Sudan, Sorghum Breeder	Brief visit
Aug. 1982	Mr. Robin Wilkin, Stored-Grain Entomologist, Slough Laboratory, Britain	Discuss stored-product pest problems
Aug. 1982	Portuguese Milling Team (24)*	Discuss grain storage, mill sanitation, insect identification
Aug. 1, 1982	Israeli Milling Team (5)	Discuss mill sanitation and grain storage
Aug. 1982	Japanese Food Agency Team (5)	Discuss grain storage, pest control, food contamination
Aug. 1982	Venezuelan Wheat Team (4)	Discuss grain storage, mill sanitation, pest control
Sep. 1982	Mr. Makoni and Dr. Dom, Zimbabwe Grain Marketing Board	Discuss grain storage problems and preservation.
Sep. 1982	Mrs. Martinez Ovozoco, Campo, Ghiretti, Guzman Colombian Wheat	Discuss grain storage and preservation
<u>Second Quarter</u>		
Oct. 1, 1982	Mr. J. O. Glatthaar, South Africa	Discuss grain storage and pest control
Oct. 6, 1982	Burmese Oilseed Team (5)	Discuss grain storage and plant sanitation
Oct. 17, 1982	Dr. H. J. Banks, Australia	Discuss FFGI activities, International Symposium on Grain Storage and Controlled Atmosphere
Nov. 3 - Nov. 4, 1982	People's Republic of China Team (6)	Review and observe educational and research programs on grain storage, handling, and processing
Nov. 19 - Nov. 20, 1982	Russian Wheat Team (5)	Discuss grain storage and preservation
<u>Third Quarter</u>		
Feb. 18, 1983	Dr. D. J. Chung, Korea	Review FFGI activities in grain storage and marketing
Feb. 22, 1983	Dr. B. H. Lee, Korea	Review FFGI activities in grain storage and marketing
Mar. 17 - Mar. 18, 1983	Ing. Jose Orellana, Ecuador, Manager of ENAC	Discuss future technical assistance and training under AID/DSAN-CA-0256
<u>Fourth Quarter</u>		
Apr. 1983	Belgium Grain Marketing Team (5)	Discuss grain storage and preservation
Apr. 1983	Representatives from BASF/Wyandotte Corp. (5)	Discuss potential for new insecticides and usage in developing countries

TABLE 9 (continued)

Dates	Visitor	Purpose of Visit
Apr. 1983	Ms. Vicki Schoen, Extension Specialist with experience in Africa	Discuss KSU and Schoen activities
June 7, 1983	Dr. Jacob Ruegg, Switzerland	Discuss problems and solutions to postharvest losses with particular reference to tropical and sub-tropical countries
June 13, 1983	Mr. H. S. Lee Mr. J. H. Chou	Review grain storage and marketing programs at KSU
June 22, 1983	Dr. D. L. Srivastava, India	Obtain information and costs of laboratory equipment, books, etc.
June 23, 1983	Mr. Adelis Arrevillagas, Venezuela	Discuss development of postharvest technology courses and curriculum
June 1983	Chilean Wheat Trade Mission (6)	Discuss grain storage and quality preservation

\*Number of persons in team.

## VI. Other Activities

### A. GASGA

The Fifteenth Annual Meeting of GASGA was held June 20-23, 1983, hosted by IDRC of Canada at their Cairo, Egypt, office. The meeting, was attended by representatives from IDRC, TDRI (Tropical Development Research Institute, England), IRAT (L'Institut de Recherches Agronomiques Tropicales et des Cultures Vivrières, France), GTZ (Gesellschaft für Technische Zusammenarbeit, West Germany), FAO (Rome), ACIAR (Australian Centre for International Agricultural Research), and KSU. No representative from KIT (Koninklijk Instituut voor de Tropen, Netherlands) attended.

Major issues addressed at this meeting included: (1) Prostephanus truncatus infestation problem in Tanzania and East Africa. A common cable drafted by the GASGA membership was sent to all donor agencies represented alerting them of the problem and strongly recommending the need for assistance; (2) corresponding membership in GASGA. A paper developed by TDRI was used as a basis for discussion. It was agreed that more linkages with the Third World are necessary and that these might be encouraged through corresponding memberships in GASGA. A draft of the objectives, a definition of corresponding members and their privileges and obligations was prepared; (3) review of member project data sheets. GTZ prepared computer printouts of summarized GASGA member projects. These were reviewed and revised. The objective of the project data sheets is to allow various GASGA members to informally share their activities, and thereby make their efforts more effective by building on each other's experiences and coordinating their efforts in the future.

The Sixteenth Annual Meeting is to be held at Montpellier, France, on June 11-15, 1984.

### B. Co-op Tropical Institute

FFGI staff members worked with CIGRAS personnel to plan the implementation of the project entitled "An Analysis of the Postharvest Systems for Grains and Pulses in Costa Rica," a cooperative effort between CIGRAS and FFGI. The project is expected to be implemented during FY 1985.

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VII. Administrative Support

FY 1983 was marked by a significant reduction in the obligation of funds to the Cooperative Agreement. A subsequent internal review brought about reduced staff levels, new management and office procedures which enabled FFGI to continue serving the Cooperative Agreement. Current staffing is considered the minimum for maintaining the quality of service at given levels of activity.

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APPENDIX A  
IN-COUNTRY TECHNICAL ASSISTANCE

First Quarter

Senegal

Nature of Activity. Upon request of USAID/Dakar, Dr. Roe Borsdorf, agricultural economist, and Ms. Kathy Foster, linguist, traveled to Dakar to develop a PAIP for USAID. The travel dates were August 22 through September 18, 1982.

Objective. Conduct a study on cereal grain reserves related to the Cereal Price Stabilization and Food Grain Reserve Component of the USAID/Senegal ESF Project.

Summary of Activities. The team undertook a two and one-half week investigation of the cereal reserve situation in Dakar, including discussion with officials of the Commissariat à l'Aide Alimentaire (CAA) and field trips to warehouse sites. Based on this investigation, the team produced a report on cereal reserve requirements in Senegal. The study team also visited the USAID training center in Dakar to observe training activities being presented by CAA agents who had attended the 1980 Training of Trainers Short Course presented by FFGI in Dakar.

Reporting and Distribution. A trip report was filed with the Project Manager, USAID/Washington. A draft copy of the team's report was left with USAID/Dakar and the report was finalized as Technical Assistance Report 85 entitled "A Survey of Cereal Research Requirements in Senegal."

Sierra Leone

Nature of Activity. Upon request of USAID/Freetown, Dr. Ekramul Haque, agricultural engineer, and Dr. Robert Mills, entomologist, traveled to Freetown to revise and strengthen grant proposal A-20. The travel dates were September 24 through October 7, 1982.

Objective. Review the managerial, technical, and scientific capabilities of the University of Sierra Leone for undertaking a project proposal on grain storage at the farm level and assist in the design of a more competitive project proposal.

Summary of Activities. The team determined that proposal revision would be extensive, and that the project would be limited primarily to rice in order to concentrate research on one crop and because rice is the most important food crop and is afflicted with serious storage problems.

The team gathered background information on the rice storage situation and on projects on grain storage in Sierra Leone. Various government and private organizations were visited to obtain additional information.

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Since interest in adaptive research at the rural level was high at Adaptive Crop Research and Extension (ACRE) and Njala University College (NUC), it was suggested that the agricultural engineering department be formally included in the proposed project.

It was learned that very little attention is being given to improving drying methods and since most of the rice is harvested with high moisture content, this is an area that should receive more attention.

Reporting and Distribution. A trip report was filed with the Project Manager, USAID/Washington, along with a draft copy of the proposal. A draft copy of the proposal was left with USAID/Freetown and forwarded to the Office of the Science Advisor, USAID/Washington.

#### Second Quarter

##### El Salvador

Nature of Activity. Upon invitation of CEGRAS, Dr. Cornelius Hugo, coordinator, traveled to San Salvador to present a paper at the First National Storage Congress. The travel dates were October 13 through October 16, 1982.

Objective. Participate in the CEGRAS First National Storage Congress related to reduction of postharvest losses in grains.

Summary of Activities. Dr. Hugo presented an abbreviated version of Dr. Richard Phillips' paper "Viable Grain Storage of Small Farmers in Developing Countries," which he retitled "Factors Affecting a Program of Grain Storage at Farm Level."

During the congress he had the opportunity to visit with CEGRAS' President Ing. Ricardo Machado de Toledo, and other officials. He explained the functions of FFGI and its cooperative agreement with USAID. Potentials for technical assistance and training were discussed, as well as the possibility of sending two participants to the 1983 GSMSC.

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

##### Ecuador

Nature of Activity. Upon request of Ecuador's Ministry of Agriculture (MOA) through USAID/Quito, Dr. Cornelius Hugo, coordinator, and Mr. Alden Ackels, consultant/milling engineer, traveled to Quito to assess wheat milling needs. The travel dates were October 17 through October 23, 1982.

Objective. Assess technical assistance needs for the wheat milling sector, especially wheat blends, training need requirements by ENAC, and long-term planning for delivery of required technical assistance and training needs.

Summary of Activities. The team met with USAID/Quito, MOA officials, and private sector representatives, and developed the scope of work, time frame, team makeup, and costs to undertake short-term technical assistance in wheat milling.

The team also held discussions with officials of ENAC in order to set up a short course at KSU during March-April 1983, identify technical assistance and training needs of ENAC's personnel, and set up a tentative long-term program to deliver required technical assistance and training.

Reporting and Distribution. A trip report was filed with the Project Manager, USAID/Washington. Technical Assistance Report 86 entitled "Project Identification Mission: Analysis of Current and Future Needs of the Wheat Milling and Baking Industries in Ecuador" was prepared in both Spanish and English, with copies being sent to USAID/Quito and USAID/Washington. In addition, Technical Assistance Report 87 entitled "Project Identification Mission: Assessment of Current and Future Technical Assistance and Training Needs of ENAC, Ecuador" was prepared by Dr. Hugo, and is available in both Spanish and English.

#### Thailand

Nature of Activity. Upon request of the SPHPB, Division of Plant Pathology and Microbiology, Department of Agriculture, Mrs. Rosemary Burroughs, mycologist, traveled to Bangkok to assist with aflatoxin problems in corn and peanuts. The travel dates were November 19 through December 14, 1982.

Objective. (1) Explore the present situation with aflatoxin contamination in the postharvest system, (2) assist in designing an aflatoxin monitoring system with suggestions for extension activities, (3) identify technical and human resources available to implement aflatoxin monitoring, control, and extension projects, and (4) deliver documentation from PHDS on decontamination of aflatoxin in corn and peanuts and on biology of aflatoxin-producing fungi and conditions for mycotoxin production.

Summary of Activities. Mrs. Burroughs attended meetings and workshops dealing with the handling, processing, and marketing of corn and peanuts. Several field trips were made to observe corn handling facilities and the seed and postharvest laboratory. Discussions were then held to determine areas of research on the aflatoxin problems in Thailand.

Mrs. Burroughs also reported to U.S. government officials on mycotoxins associated with "yellow rain" in Afghanistan and discussed possible research projects in Thailand to identify natural occurrence of trichothecenes.

The SPHPB Chief expects to conduct a 2-4 day course on aflatoxins for agricultural extension officers before the 1983 wet-season harvest. Assistance for the course may be needed. This would be an appropriate technical assistance opportunity for a mycologist/storage specialist.

Reporting and Distribution. A trip report, including recommendations, was filed with the Project Manager, USAID/Washington. A copy of the report was left with the chief of SPHPB.

## Pakistan

Nature of Activity. Upon request of USAID/Islamabad, Dr. Roe Borsdorf, agricultural economist, and Dr. Robert Mills, entomologist, traveled to Islamabad to work on the first stage in designing the postharvest management and data collection/analysis components of the Food Security Subproject. The travel dates were November 26 through December 12, 1982.

Objective. Assist USAID/Islamabad in the preparation of a Preliminary Project Design Development Paper for the Postharvest Management Component of the Food Security Subproject under the Agricultural Production, Distribution, and Storage Project.

Summary of Activities. The team met with officials of the Pakistan Agricultural Research Council (PARC) and the Ministry of Food, Agriculture and Cooperatives to obtain data. The team then traveled to various sites in Pakistan to visit laboratories, research centers, and government storage facilities. Contacts were made with officials at each of these locations. After gathering pertinent information, the team prepared a draft copy of their report detailing items to be addressed by subsequent consultant teams.

Reporting and Distribution. A trip report was filed with the Project Manager, USAID/Washington. A draft copy of the working paper was left with USAID/Islamabad. Final copies of the working paper were forwarded to ASIA/TR, Washington, and USAID/Islamabad.

## Third Quarter

Washington, D.C.

Nature of Activity. Upon invitation of USAID/Washington, Dr. Richard Phillips, agricultural economist, traveled to Washington to participate in a workshop sponsored by USAID. The travel dates were January 5 through January 7, 1983.

Objective. Participate in the Small Farmer Market Access Workshop.

Summary of Activities. Dr. Phillips participated in the workshop to evaluate criteria used by USAID missions in formulating agricultural marketing projects in LDCs.

Reporting and Distribution. No trip report was filed.

Burma

Nature of Activity. Upon request of USAID/Rangoon and USDA/OICD, Dr. Roe Borsdorf, agricultural economist, traveled to Rangoon to conduct a feasibility study on production and distribution of edible oils. The travel dates were January 14 through February 28, 1983.

Objective. Assist in conducting a study on oilseed extraction recovery rates and the effect of domestic supply for cooking oil; cooking oil market pricing mechanisms; processing, packaging, and distribution costs; effect of AID-supported project on employees and consumer beneficiaries; and expected cost-benefit ratio of proposed project.

Summary of Activities. The team analyzed data pertaining to oilseed production, cooperative sector oilseed purchasing, edible oil extraction and consumption, oilseed pricing, and future potentials for oilseed production and edible oil extraction.

Reporting and Distribution. A trip report was filed with the Project Manager, USAID/Washington. A feasibility report entitled "Oilseed Processing and Edible Oil Distribution in Burma, Recommendations for Future Investment Potentials" was prepared for the Ministry of Cooperatives in Burma.

#### Costa Rica

Nature of Activity. Upon request of USAID/San José, Dr. Do Sup Chung, agricultural engineer, Dr. Richard Phillips, agricultural economist, and Mr. Carl Reed, grain storage specialist, traveled to San José to revise a project proposal and evaluate needs for facilities. Travel dates were January 22 through February 6, 1983.

Objective. Revise the project proposal on "An Analysis of the Postharvest Systems for Grains and Pulses in Costa Rica" previously prepared by CIGRAS and FFGI. Review plans for proposed CNP handling and storage facilities.

Summary of Activities. The team visited with USAID, Ministry of Planning, and CIGRAS officials, including Dr. Miguel Mora and Mr. Ronald Jimenez who were formerly trained at KSU. The team also took field trips to various CNP handling, drying, and storage facilities. The team completed the project proposal revision which included a schedule for future training of CNP personnel. The team also reviewed plans for CNP's proposed storage facilities.

Reporting and Distribution. No trip report was filed. Technical Assistance Report 88 entitled "Evaluations of Training Needs and Grain Handling Facilities of CNP, and CIGRAS Research Project in Costa Rica" was prepared.

#### Peru

Nature of Activity. Upon request of USAID/Lima, Dr. Cornelius Hugo, coordinator, and Mr. Harold Stryker, consultant/agricultural engineer, traveled to Lima to give technical assistance in grain storage and training needs. The travel dates were January 26 through March 3, 1983.

Objective. Conduct an assessment of training needs, develop short course outlines, determine storage capacity and grain drying equipment needs, and assess needs for additional short-term technical assistance in the Upper Huallaga Area Development Project.

Summary of Activities. The team met with USAID/Lima, Empresa Nacional de Comercialización e Insumos (ENCI), and Empresa Comercialización del Arroz, S.A. (ECASA) officials. The team also visited ENCI warehouses at various locations, Upper Huallaga Project headquarters, and ECASA warehouses and facilities.

Reporting and Distribution. No trip report was filed. Technical Assistance Report 89 entitled "Grain Handling, Conditioning, and Storage in the Upper Huallaga Area" was prepared and copies were forwarded to USAID/Lima and USAID/Washington.

#### England

Nature of Activity. Upon invitation of Tropical Products Institute (TPI) in London, Dr. Valerie Wright, entomologist, traveled to Slough to participate in the GASGA workshop on Prostephanus truncatus. The travel dates were February 18 through February 28, 1983.

Objective. Attend GASGA workshop on Prostephanus truncatus and present a paper entitled "World Distribution of Prostephanus truncatus."

Summary of Activities. Dr. Wright visited with the Ministry of Agriculture, Fisheries and Food (MAFF) and TPI personnel concerning the Third International Working Conference on Stored-Product Entomology to be held at KSU, and attended GASGA workshop where she presented a paper.

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

#### Ecuador

Nature of Activity. Upon request of USAID/Quito through OICD/ITD/Washington, Dr. Cornelius Hugo, coordinator, traveled to Quito to give technical assistance on short course planning. The travel dates were February 28 through March 3, 1983.

Objective. Finalize logistics for the upcoming on-campus short course.

Summary of Activities. Dr. Hugo visited the personnel of USAID/Quito and the MOA to discuss the training proposal for the upcoming short course to be held March 14 through April 1, 1983, at KSU. Meetings were held with USAID/Quito, ENAC, and MOA on training and technical assistance needs.

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

#### Italy

Nature of Activity. Upon request of USAID/Washington, Mr. Carl Reed, grain storage specialist, and Mr. Kenton Harris, consultant/loss assessment specialist, traveled to Rome to attend the GASGA/FAO workshop on loss assessment. The travel dates were March 19 through March 24, 1983.

Objective. Attend GASGA/FAO workshop on loss assessment in postharvest loss reduction programs.

Summary of Activities. The team attended the three-day workshop and discussed current loss assessment activities and recommended preferred techniques for use in post-production operations.

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

## Fourth Quarter

### Korea

Nature of Activity. Dr. Charles Deyoe, director, traveled to Korea to review work plans in postharvest grain systems. The travel dates were April 11 through April 13, 1983.

Objective. Present lecture at Korea University and discuss progress of research in postharvest areas.

Summary of Activities. Dr. Deyoe held discussions with Korea University officials on research in postharvest areas. He also gave a lecture to Korea University graduate students and faculty of the College of Agriculture.

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

### Philippines

Nature of Activity. Upon request of USAID/Washington, Dr. Charles Deyoe, director, traveled to Manila to brief USAID personnel on the SEARCA program. The travel dates were April 14 through April 16, 1983.

Objective. Acquaint USAID/Manila personnel with the functions of the SEARCA program.

Summary of Activities. Dr. Deyoe met with SEARCA/Post-Harvest Research and Development Programme (PHRAD) officials to discuss information from USAID/Washington regarding recommendations for continued support of the PHRAD program. He also met with USAID personnel to discuss the SEARCA Phase III proposal. Dr. Deyoe traveled to Central Luzon State University (CLSU) to discuss CLSU activities.

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

### Singapore

Nature of Activity. Upon request of USAID/Washington, Dr. Charles Deyoe, director, traveled to Singapore to meet with PAB representatives. The travel dates were April 17 through April 20, 1983.

Objective. Attend SEARCA PAB meeting.

Summary of Activities. Dr. Deyoe attended the SEARCA PAB meeting on April 19-20. Among the items discussed were the Phase II review and the Phase III proposal, a change in the sponsorship of the program, and the responsibilities of the new team leader.

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

## Philippines

Nature of Activity. Upon request of USAID/Washington, Dr. Charles Deyoe, director, returned to Manila after attending the SEARCA PAB meeting in Singapore. The travel dates were April 21 through April 22, 1983.

Objective. Brief USAID/Manila personnel on the results of the PAB meeting.

Summary of Activities. Dr. Deyoe met with USAID/Manila personnel to report on the items discussed at the SEARCA PAB meeting held in Singapore.

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

## Pakistan

Nature of Activity. Upon request of USAID/Washington through USDA/OICD. Dr. Roe Borsdorf, agricultural economist, traveled to Islamabad to head a seven-person team who assisted in a project design development. Travel dates were April 15 through June 7, 1983. Dr. Harry Pfost, consultant/agricultural engineer, joined Dr. Borsdorf on April 18 and returned May 27. Dr. Valerie Wright, entomologist, joined the team on April 20 and returned May 20. Mr. Henry Stevens, milling engineer, joined the team on April 23 and returned on May 6. Dr. John Pedersen, grain storage specialist, and Dr. Wipada Huyser, consultant/agricultural economist, joined the team on May 14 with Pedersen returning on June 7 and Huyser on June 29. Ms. Kathy Foster, linguist, joined the team on May 21 and returned June 7.

Objective. Provide technical assistance to USDA/OICD in the development of the Project Design of the Postharvest Management Component of the Food Security Subproject under the Agricultural Production, Distribution and Storage Project.

Summary of Activities. The team collected and analyzed data in different areas of the postharvest grain system in order to focus on solving specific problems. A previous report by Dr. Borsdorf and Dr. Robert Mills was used as a guide. A project design was then developed and a report written.

Reporting and Distribution. A trip report was filed with the Project Manager, USAID/Washington. Technical Assistance Report 91 entitled "Postharvest Management Project Design, Pakistan" was prepared and submitted to ARD/USAID/ Islamabad.

## Indonesia

Nature of Activity. Upon request of SEARCA, Badan Urusan Logistik (BULOG) and Gadjah Mada University, Dr. Do Sup Chung, agricultural engineer, traveled to Jakarta to attend the 1983 Grains Postharvest Workshop and to provide technical assistance. Travel dates were April 29 through May 14, 1983.

Objective. (1) Attend the Grains Postharvest Workshop and present a paper, (2) assist the government agency P.T. Pertani in evaluating its rice processing facilities and in identifying its training needs, and (3) discuss postharvest problems.

Summary of Activities. Dr. Chung presented a paper entitled "Mass Transfer Coefficients for Natural Air Drying of Rough Rice" at the workshop. He also provided technical assistance to P.T. Pertani by visiting and evaluating six rice complexes and making recommendations for improvements. He also made suggestions on training requirements. Dr. Chung then visited Gadjah Mada University to discuss postharvest problems.

Reporting and Distribution. A trip report was filed with the Project Manager, USAID/Washington with copies distributed to P.T. Pertani, USAID, SEARCA, IDRC, and DGIS/DAL.

#### Korea

Nature of Activity. Upon request of USAID/Washington, Dr. Do Sup Chung, agricultural engineer, traveled to Seoul to present a grain postharvest seminar. The travel dates were May 15 through May 16, 1983.

Objective. Present a postharvest grain seminar and review a cooperative research project.

Summary of Activities. Dr. Chung reviewed a cooperative research project at Sung Kyun Kwang University. The research project was designed and conducted in Korea in cooperation with research done at KSU. Dr. Chung also presented a special seminar on grain postharvest technology at Seoul National University and Sung Kyun Kwang University.

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

#### Ecuador

Nature of Activity. Upon request of the MOA through USAID/Quito, Mr. Henry Stevens, milling engineer, traveled to Quito to give technical assistance in winter wheat mixes and establish future training guidelines. The travel dates were May 22 through June 23, 1983.

Objective. Carry out an assessment of soft and hard red winter wheat mixes in the milling process and establish training guidelines for the MOA.

Summary of Activities. Mr. Stevens visited and examined flour mills in Ecuador to determine what effect different wheat mixes would have on their operations. Bakers and noodle makers were also interviewed to see how changes in wheat mixes would affect their products. Discussions were held with the MOA.

Reporting and Distribution. A trip report was filed with the Project Manager, USAID/Washington. Technical Assistance Report 90 entitled "Analysis of the Utility of Substitution of Soft Red Winter Wheat for a Portion of the Imported Wheat Currently Being Milled in Ecuador" was prepared and forwarded to USAID/Quito and USAID/Washington.

## Egypt

Nature of Activity. Upon request of USAID/Washington, Dr. John Pedersen, grain storage specialist, traveled to Cairo to attend the GASGA Executive Meeting. The travel dates were June 18 through June 24, 1983.

Objective. Attend the GASGA Executive Meeting and discuss needs for technical assistance and training with USAID/Cairo.

Summary of Activities. Dr. Pedersen attended the GASGA meeting, and met with USAID/Cairo personnel to discuss technical assistance and training needs in the grain postharvest area.

Reporting and Distribution. No trip report was filed.

## Philippines

Nature of Activity. Mr. Norman Teter, SEARCA technical team member, returned to Lincoln, Nebraska, on June 30, 1983, after completing a six-year tour of duty in the Philippines.

Objective. Serve as agricultural engineer in postharvest sector of SEARCA.

Summary of Activities. ● National Post-Harvest Institute for Research and Extension (NAPHIRE) project review to evaluate project reports was held in Cabanatuan City.

● Assist in developing improved teaching, research, and extension services on grains afterharvest at Bicol University College of Agriculture, Guinobatan, Albay.

● Meetings on corn handling, possibilities for exchange on corn and peanut handling, research and development projects with the department of agriculture, rice aeration, and processing course content at Chulalongkorn University were held at Amphur Pak Chong, Sattahip, Bangkok, Thailand.

● Meetings were held in Kuala Lumpur, Malaysia, on the 1983 Grain Postharvest Workshop, a request of consultancy support on post-harvest losses of maize, and research project proposals on grains.

● Meetings were held in Kuala Lumpur, Malaysia, with the Lembaga Padi dan Beras Negara (LPN) on future training courses, research projects, training center development program, and on-farm drying.

● Visits were made to the Faculty Natural Resources, Prince of Songkla University, Haad Yai, Thailand, for discussion of a rice processing and conservation course, a draft research project proposal, and a planned survey of postharvest practices and related problems in southern Thailand.

● Visits were made in Bangkok, Thailand, to the Department of Agriculture, Department of Cooperative Promotion, Department of Agricultural Extension, and Marketing Organization for Farmers. Discussions centered on the course curriculum and schedule for a Grain Postharvest Training Programme to be conducted in Thailand and silo maintenance and operation problems.

- Technical assistance was given to the Interagency Study Group on Bulk Handling of Wet Paddy as organized by the LPN through its engineering division, Kuala Lumpur. An in-depth report was written and distributed.
- A guest lecture was presented on climate and storage, aeration, storage construction, and computer software for storage at the postharvest short course in Bangkok, Bangkok, Thailand.
- Lecture on climate and grain handling was presented at NAPHIRE seminar in General Santos, Philippines.
- Meeting was held in Taguig, Metro Manila, with NAPHIRE staff, Food Terminal, Inc., to review project proposals for the Australian Center for International Agricultural Research (ACIAR).
- Follow-up was done on previous work with the LPN in Kuala Lumpur, Malaysia. Items discussed were the LPN/(Malaysian Agricultural Research and Development Institute (MARDI) research project proposal on paddy and rice postharvest technology, bulk handling of paddy, implementation of training courses, and facilities development of LPN's training center.
- Technical assistance on milled rice storage was provided to the International Trading Company (INTRACO) in Singapore. The assistance included inspection of three warehouses as well as discussions on planned storage facilities.
- Participation in the "Paddy Bulk Handling Workshop" held in Alor Setar, Kedah State, Malaysia, jointly organized by LPN and SEARCA. A report was developed and the workshop proceedings.

APPENDIX B  
IN-COUNTRY TRAINING PROGRAMS

First Quarter

Kenya

Dr. Ekramul Haque, agricultural engineer, and Dr. Valerie Wright, entomologist, stopped in Nairobi to visit with staff of the International Center of Insect Physiology and Ecology (ICIPE) to obtain information on insecticidal plant materials to be used in the Tanzania short course.

Brief meetings were also held with Peace Corps, Kenya, and USAID/Nairobi to discuss future training plans.

Tanzania

Dr. Ekramul Haque, agricultural engineer, and Dr. Valerie Wright, entomologist, traveled to Dar es Salaam to present in-service training to 16 PCVs previously trained at KSU. The in-service training included (1) ways of using local resources and (2) advice to volunteers on how to combat the larger grain borer (Prostephanus truncatus).

Training activities included classroom instruction, progress reports by PCVs, travel to various sites to obtain information on grain and seed storage facilities, discussion on a research proposal concerning P. truncatus, and an extension project for the PCVs. Demonstration of underground pit storage was given at Mlingano Agricultural Technical Institute.

Third Quarter

Costa Rica

Dr. Do Sup Chung, agricultural engineer, Dr. Richard Phillips, agricultural economist, and Mr. Carl Reed, grain storage specialist, while on technical assistance assignment, assisted in the final planning of the grain storage and management short course for CNP and private handlers.

Paraguay

Dr. Norton Ives, consultant/agricultural engineer, traveled to Asunción to assist in conducting a short course in grain drying and preservation for 14 personnel of the Ministry of Agriculture, cooperatives, technical schools, and the private sector.

Training activities included classroom instruction on grain drying and preservation, with additional information being presented on the MOA's grain production and marketing program, and visits to production areas, storage facilities and a corn flour mill. At the end of the course each trainee was requested to write a report on the training.

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APPENDIX C  
ON-CAMPUS TRAINING PROGRAMS

A. Academic Training

Several students are in various stages of progress toward advanced degrees in postharvest grain technology under the support of USAID and other international organizations. Participants are listed under their respective areas of study.

1. Grain science

Mulyo Sidik - Indonesia (completed)  
Carl Reed - USA  
R.D.M. Bediako - Ghana (discontinued)  
Mboye N'dir - Senegal  
Maria Regina Sartori - Brazil (completed)  
Manuel Zeledon - Costa Rica  
M. Naewbanij - Thailand  
Lawrence Wongo - Sudan

2. Agricultural economics

Zenaida Toquero - Philippines (completed)  
Elizabeth (Sto. Domingo) Espiño - Philippines (completed)  
Esterlina Olan - Philippines (completed)  
Hahn Koo Lee - Korea  
Byung Seo Ryu - Korea (completed)  
Jorge Reyes - Honduras (completed)  
Rosseni Manalo - Philippines (completed)  
Abdel Nahsem - Egypt (completed)  
Emanuel S. Santiago - Philippines  
Armando Reyes - Honduras  
Abdel Raheem Hashem - Egypt  
Christopher Agbo - Nigeria  
Alberto Manalo - Philippines

3. Agricultural engineering

Kyung K. Park - Korea (completed)  
Yong Kook Lee - Korea  
Gabr Abdelmohsin - Sudan (completed)  
Mansoo Kim - Korea  
Boma Kanujoso - Indonesia  
S. K. Abbouda - Sudan

4. Entomology

Noorma Osman - Malaysia  
Yousif Seifelnasr - Sudan

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## B. Grain Storage and Marketing Short Course

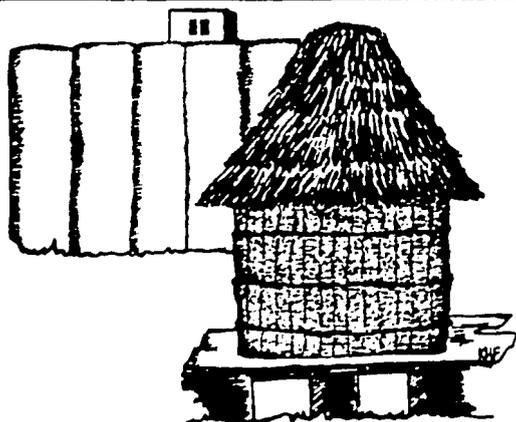
The goal of this 7-week training course is to improve the efficiency and effectiveness of developing country grain storage and marketing organizations. Participants received instruction in all basic areas of grain storage and grain marketing. In addition, each participant elected to specialize in marketing or storage. In addition to lectures, discussions, and laboratory experiences, participants learned through field trips and an eight-day study tour which included stops at port facilities, rice mills, and boards of trade.

Lectures and laboratory sessions were delivered in English with simultaneous interpretation in Spanish. Manuals and written materials were also supplied in Spanish.

A questionnaire supplied by the USDA Training Office, was completed by each participant at the end of the course.

The 1983 course was attended by 24 individuals from the following countries: Burundi, Ecuador, Ethiopia, Honduras, Kenya, Peru, Saudi Arabia, Sudan, Tanzania, Venezuela, Yemen, Zambia. Names of the participants were given in Table 3.

A brochure describing the short course was sent to USAID missions, other institutions in developing countries, and individuals requesting information on the course. The brochure was distributed in English, Spanish, and French. A sample of the brochure, the short course schedule, and a picture of the participants are on the following pages.



# Training in Grain Storage and Marketing

*June 13-July 29, 1983*

A seven-week course in grain storage and marketing will be offered again this year at Kansas State University through Cooperative Agreement AID/DSAN-CA-0256 with the U. S. Agency for International Development. The goal of the course, presented by the Food and Feed Grain Institute, is to improve the efficiency and effectiveness of developing country grain storage and marketing organizations through training.

## Objectives

The course is designed to increase participants' knowledge and skills in the following areas:

- Fundamentals involved in grain storage
- Causes and prevention of grain loss
- Grain inspection and loss assessment
- Grain movement and storage from production to consumption
- Management and operation of grain businesses
- Grain pricing and marketing cost relationships
- Marketing management
- Auxiliary market functions
- Analytical techniques related to grain marketing

## Content

Participants receive instruction in all basic areas including grain structure, grain moisture and its measurement, storage methods and procedures, principles of aeration and drying, introduction to pest control, principles of management and operations, agricultural policy, marketing environments, design of firms, warehouse management and inventory control, and grain marketing systems and their development. In addition, each participant also elects to specialize in marketing or storage.

Those specializing in marketing receive additional training in market management, market facilitating operations, transportation planning, storage costs and alternatives, price analysis, forecasting, economic analysis, financial analysis, and transportation and location analysis.

Those specializing in storage receive additional training in grain inspection, classification, and loss assessment; moisture measurement; stored-grain insects, storage molds, and vertebrate pests; grain aeration and drying; grain handling equipment and its maintenance; seed handling and storage; and integrated pest management including warehouse inspection and housekeeping, physical and mechanical methods, chemical methods, and pest control safety.

In addition to lectures, discussions, and laboratory experiences, participants learn through field trips and an eight-day study tour. These include visits, presentations, and discussions at farms, commercial grain handling facilities, grain handling equipment manufacturers, warehouses, service and regulatory agencies, research facilities, port facilities, rice mills, rice markets, boards of trade, grain merchandisers and speculators, and cooperatives.

## Language

Lectures and laboratory sessions are delivered in English with simultaneous interpretation in French and Spanish. Manuals and written materials are supplied in these three languages.

## Participants

The course is intended for persons involved in the storage and marketing of cereal grains and legumes in developing countries. Examples are quality control agents, managers of grain handling facilities, grain marketing specialists and administrators, and persons responsible for designing grain marketing systems. All

participants should have at least a secondary school diploma or equivalent. Persons currently enrolled at U.S. universities may receive up to five semester hours of credit for this course.

## Faculty

The course is taught by the staff of Kansas State University's Food and Feed Grain Institute. All instructors hold advanced degrees and have experience working in developing countries. The staff includes agricultural engineers, agricultural economists, stored-grain entomologists, mycologists, and grain storage specialists.

## Applications

AID missions wishing to send participants should consult the USDA Catalog of Courses and Research Opportunities in Agriculture 1983. Others may apply or receive additional information by contacting the Coordinator, Food and Feed Grain Institute, Shellenberger Hall, Kansas State University, Manhattan, Kansas 66506, USA (telephone 913-532-6161). Applications and reservations will be accepted until May 30, 1983.

## Scholarships

The Food and Feed Grain Institute is unable to grant scholarships for this course. USAID, World Bank, FAO, and other sponsoring agencies may be contacted directly by the participants.



Methods to obtain randomly divided samples of grain are among techniques learned by participants.

### Costs

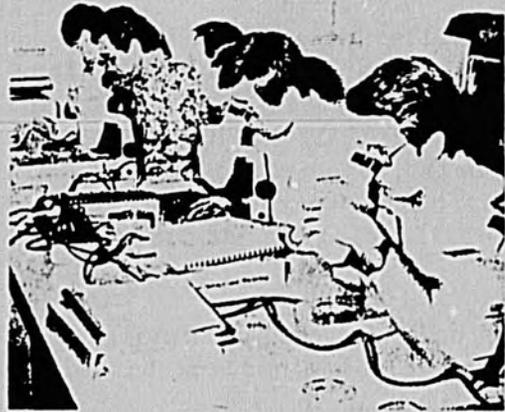
#### *AID-sponsored participants:*

Those desiring to attend this short course under AID sponsorship should consult the USDA Catalog of Courses and Research Opportunities in Agriculture 1983. The Grain Storage and Marketing Short Course is listed as TC 150-2.

#### *Others:*

The cost of the course is U.S. \$1,750. It is payable upon arrival and includes dormitory housing (double occupancy), on-campus meals (except Sunday evenings), medical insurance, and use of recreational facilities, in addition to instruction, field trip transportation, and all required manuals and training materials. Single rooms are available at a slightly higher cost.

The U.S. \$1,750 does not include lodging or meals during the eight-day study tour, lunches on two, one-day field trips, or incidental expenses. Participants must have funds to cover these expenses. An additional sum of U.S. \$1,175 is recommended (U.S. \$25 for 47 days).



Participants learn to identify molds commonly found in stored grain.



Food and Feed Grain Institute  
Shellenberger Hall  
Manhattan, Kansas 66506  
USA

#### NOTICE OF NON-DISCRIMINATION

Kansas State University is committed to a policy of non-discrimination on the basis of race, sex, national origin, handicap, or other non-merit reasons, in admissions, educational programs of all levels, and employment, all as required by applicable laws and regulations. Inquiries may be addressed to: Director, Affirmative Action Office, 214 Andevue Hall, Kansas State University, Manhattan, KS 66506, (413) 532-8220 or Regional Director, Office of Civil Rights, Department of Education, 1130 Grand Avenue, Kansas City, MO 64106 (816) 374-2356.

*Grain Storage and Marketing*  
*Short Course*

June 13 – July 29, 1983



**KANSAS  
STATE  
UNIVERSITY**

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

# WEEK I

TIME	MONDAY June 13, 1983	TUESDAY June 14, 1983	WEDNESDAY June 15, 1983	THURSDAY June 16, 1983	FRIDAY June 17, 1983
8:00 - 9:30 AM	ORIENTATION	STORAGE Post-Production Systems (Reed-Hugo) SH 301	STORAGE Structure of Cereal Grains (Burroughs) SH 301	STORAGE Types of Storage Structures (Chung) SH 301	STORAGE Physical, Functional and Biochemical Changes During Storage (Burroughs) SH 301
10:00 - 11:30 AM			MARKETING Principles of Management (Hugo) SH 301	STORAGE Microorganisms of Cereal Grains (Burroughs) SH 301	STORAGE Methods (Chung) SH 301
LUNCH 11:30 - 1:30 PM					
1:30 - 3:00 PM	ORIENTATION	MARKETING Principles of Management (Hugo) SH 301	STORAGE Moisture and Its Measure- ment (Chung) SH 301	STORAGE Methods and Procedures (Chung) SH 301	STORAGE Introduction to Storage Pests (Pedersen) SH 301
3:30 - 5:00 PM			STORAGE Microorganisms of Cereal Grains (Burroughs) SH 301	STORAGE SI Units and Calculator Operation (Haque) SH 301	STORAGE Pest Control Measures (Pedersen) SH 301

TIME	MONDAY June 20, 1983	TUESDAY June 21, 1983	WEDNESDAY June 22, 1983	THURSDAY June 23, 1983	FRIDAY June 24, 1983
8:00 - 9:30 AM	STORAGE Aeration and Drying (Chung) SH 301	MARKETING Principles of Operations (Hugo) SH 301	FIELD TRIP Clay Center, Kansas *Farm storage *Grain handling equipment manufacturer *Cooperative (Reed-Haque)	STORAGE Aeration and Drying (Chung) SH 301	STORAGE Drying Facilities and Operation (Haque) SH 301
10:00 - 11:30 AM				MARKETING Principles of Operations (Hugo) SH 301	
LUNCH 11:30 - 1:30 PM					
1:30 - 3:00 PM	STORAGE Group A Handling Equipment (Haque) SH 301	STORAGE Group A Sampling Practicum (Reed) TH 214		STORAGE Inspection Systems and Standards (Reed) SH 301	FIELD TRIP Manhattan, Kansas *Small elevator *Bagged products warehouse (Burroughs-Haque)
	STORAGE Group B Sampling Practicum (Reed) TH 214	STORAGE Group B Handling Equipment (Haque) SH 301			
3:30 - 5:00 PM				STORAGE Inspection Systems and Standards for Developing Countries (Reed) SH 301	

## WEEK III

TIME	MONDAY June 27, 1983	TUESDAY June 28, 1983	WEDNESDAY June 29, 1983	THURSDAY June 30, 1983	FRIDAY July 1, 1983
8:00 - 9:30 AM	MARKETING Principles of Operations (Hugo) SH 301	MARKETING Organization of the Grain Business (Individual Firm Design) (Borsdorf) SH 301	STORAGE Facilities Planning (Haque) SH 301	STORAGE Mycotoxins (Burroughs) SH 301	EVALUATION AND DISCUSSION (Staff) SH 301
10:00 - 11:30 AM	MARKETING Organization of the Grain Business (Agricultural Policy) (Borsdorf) SH 301	MARKETING Systems and Their Develop- ment (Hugo) SH 301		FIELD TRIP Topeka, Kansas *Large elevator *State Agricultural Laboratories (Wright-Reed)	
LUNCH 11:30 - 1:30 PM					
1:30 - 3:00 PM	MARKETING Organization of the Grain Business (Agricultural Policy) (Borsdorf) SH 301	MARKETING Systems and Their Develop- ment (Hugo) SH 301	MARKETING Organization of the Grain Business (Warehouse Man- agement and Inventory Con- trol) (Hugo) SH 301		MARKETING Organization of the Grain Business (Marketing Man- agement) (Borsdorf) SH 301 ----- STORAGE Microorganisms Laboratory (Burroughs) SH 105
3:30 - 5:00 PM	MARKETING Organization of the Grain Business (Marketing Envi- ronment) (Borsdorf) SH 301	MARKETING Organization of the Grain Business (Warehouse Man- agement and Inventory Con- trol) (Hugo) SH 301			MARKETING Principles of the Futures Market (Borsdorf) SH 301 ----- STORAGE Microorganisms Laboratory (Burroughs) SH 105

TIME	MONDAY July 4, 1983	TUESDAY July 5, 1983	WEDNESDAY July 6, 1983	THURSDAY July 7, 1983	FRIDAY July 8, 1983
8:00 - 9:30 AM	<p>EXCURSION Abilene, Kansas *Eisenhower Home *Eisenhower Museum *Eisenhower Library *Old Town</p> <p>Celebration of U.S. Independence Day--July 4, 1776</p>	<p>MARKETING Principles of the Futures Market (Borsdorf) WA 03L</p> <hr/> <p>STORAGE Aeration and Drying (Chung) SH 301</p>	<p>MARKETING Facilitating Market Operations (Borsdorf) WA 03L</p> <hr/> <p>STORAGE Microorganisms Laboratory (Burroughs) SH 105</p>	<p>MARKETING Field Trip Salina, Kansas *Grain merchandisers (Borsdorf)</p> <hr/> <p>STORAGE Stored-Grain Insect Biology and Identification (Wright) SH 105</p>	<p>MARKETING Transportation Planning (Borsdorf) WA 03L</p> <hr/> <p>STORAGE Stored-Grain Insect Biology and Identification (Wright) SH 105</p>
10:00 - 11:30 AM		<p>MARKETING Facilitating Market Operations (Borsdorf) WA 03L</p> <hr/> <p>STORAGE Aeration and Drying (Chung) SH 301</p>	<p>MARKETING Transportation Planning (Borsdorf) WA 03L</p> <hr/> <p>STORAGE Microorganisms Laboratory (Burroughs) SH 105</p>		<p>MARKETING Storage Costs and Alternatives (Borsdorf) WA 03L</p> <hr/> <p>STORAGE Stored-Grain Insect Biology and Identification (Wright) SH 105</p>
LUNCH 11:30 - 1:30 PM					
1:30 - 3:00 PM		<p>MARKETING Facilitating Market Operations (Borsdorf) WA 03L</p> <hr/> <p>STORAGE Stored-Grain Insect Biology and Identification (Wright) SH 105</p>	<p>FIELD TRIP Manhattan, Kansas *USDA Grain Marketing Research Laboratory (Burroughs)</p>	<p>MARKETING Field Trip Salina, Kansas *Grain merchandisers (Borsdorf)</p> <hr/> <p>STORAGE Moisture Measurement Laboratory (Burroughs-Wright) WA 32</p>	<p>MARKETING Storage Costs and Alternatives (Borsdorf) WA 03L</p> <hr/> <p>STORAGE Practical Examination and Discussion (Staff) SH 301</p>
3:30 - 5:00 PM					<p>FIELD TRIP ORIENTATION (Staff) SH 301</p>

# WEEK V

TIME	SUNDAY July 10, 1983	MONDAY July 11, 1983	TUESDAY July 12, 1983	WEDNESDAY July 13, 1983	THURSDAY July 14, 1983	FRIDAY July 15, 1983	SATURDAY July 16, 1983
AM		VISIT Board of Trade Kansas City, Missouri	VISIT Butler Manufactur- ing Kansas City, Missouri	VISIT Rice-Pasture Research and Ex- tension Center Beaumont, Texas	VISIT Doguet Rice Mill Beaumont, Texas	VISIT Elco Shipperside Ele- vator Houston, Texas	VISIT National Aero- nautics and Space Administration Houston, Texas
LUNCH							
PM	TRAVEL TO Kansas City, Missouri	VISIT Farmland Indus- tries, Inc. Kansas City, Missouri	TRAVEL TO Houston and Beaumont, Texas	VISIT Rice Farms Beaumont, Texas  VISIT American Rice Growers Dryer Cheek, Texas	VISIT Federal Grain Inspection Service Houston, Texas	VISIT Union Equity Export Elevator Deer Park, Texas	SUNDAY July 17, 1983  TRAVEL TO Manhattan, Kansas

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# WEEK VI

TIME	MONDAY July 18, 1983	TUESDAY July 19, 1983	WEDNESDAY July 20, 1983	THURSDAY July 21, 1983	FRIDAY July 22, 1983
8:00 - 9:30 AM	FIELD TRIP REVIEW (Staff) SH 301	MARKETING Definitive Planning--Case Study (Borsdorf) WA 03L	MARKETING Feasibility Analysis of Grain Projects (Price Analysis)--Case Study (Borsdorf) WA 03L	MARKETING Feasibility Analysis of Grain Projects (Forecasting) (Borsdorf) WA 03L	MARKETING Feasibility Analysis of Grain Projects (Economic Analysis) (Hugo) WA 03L
	MARKETING Feasibility Analysis of Grain Projects (Definitive Planning) (Borsdorf) WA 03L	STORAGE Inspection and Housekeeping (Pedersen) SH 301	STORAGE Physical and Mechanical Control (Pedersen) SH 301	STORAGE Maintenance of Grain Storage Facilities (Haque) SH 301	STORAGE Insecticides and Application Equipment (Pedersen) SH 301
10:00 - 11:30 AM	Rodent and Bird Biology (Pedersen) SH 301	MARKETING Feasibility Analysis of Grain Projects (Price Analysis) (Borsdorf) WA 03L	STORAGE Seed Handling and Storage (Mississippi State University) SH 301	MARKETING Feasibility Analysis of Grain Projects (Forecasting)--Case Study (Borsdorf) WA 03L	MARKETING .. Feasibility Analysis of Grain Projects (Economic Analysis)--Case Study (Hugo) WA 03L
		STORAGE Inspection and Housekeeping (Pedersen) SH 301		STORAGE Detection of Contaminants Laboratory (Pedersen) WA 32	STORAGE Mycotoxins Laboratory (Burroughs) SH 301
LUNCH 11:30 - 1:30 PM					
1:30 - 3:00 PM	MARKETING Feasibility Analysis of Grain Projects (Definitive Planning) (Borsdorf) WA 03L	MARKETING Feasibility Analysis of Grain Projects (Price Analysis) (Borsdorf) WA 03L	MARKETING Feasibility Analysis of Grain Projects (Forecasting) (Borsdorf) WA 03L	MARKETING Feasibility Analysis of Grain Projects (Economic Analysis) (Hugo) WA 03L	MARKETING Feasibility Analysis of Grain Projects (Economic Analysis) (Hugo) WA 03L
	STORAGE Grain Inspection Practicum (Reed-Burroughs) TH 214	STORAGE Grain Inspection Practicum (Reed-Burroughs) TH 214	STORAGE Seed Handling and Storage (Mississippi State University) SH 301	STORAGE Detection of Contaminants Laboratory (Pedersen) WA 32	STORAGE Rice Milling (Haque) SH 301
3:30 - 5:00 PM					

## WEEK VII

TIME	MONDAY July 25, 1983	TUESDAY July 26, 1983	WEDNESDAY July 27, 1983	THURSDAY July 28, 1983	FRIDAY July 29, 1983
6:00 - 9:30 AM	MARKETING Feasibility Analysis of Grain Projects (Economic Analysis) (Hugo) WA 03L	MARKETING Feasibility Analysis of Grain Projects (Financial Analysis) (Borsdorf) WA 03L	MARKETING Feasibility Analysis of Grain Projects (Financial Analysis)--Case Study (Borsdorf) WA 03L	STORAGE Fumigation Demonstration (Pedersen) SH 301	STORAGE Practical Evaluation (Staff) SH 301
	STORAGE Insecticides and Application Equipment (Pedersen) SH 301	STORAGE Fumigants and Fumigation (Pedersen) SH 301	STORAGE Fumigants and Fumigation and Fumigation Safety (Pedersen) SH 301		
10:00 - 11:30 AM	MARKETING Feasibility Analysis of Grain Projects (Economic Analysis)--Case Study (Hugo) WA 03L	MARKETING Feasibility Analysis of Grain Projects (Financial Analysis)--Case Study (Borsdorf) WA 03L			STORAGE Discussion (Staff) SH 301
	STORAGE Rodent and Bird Control (Pedersen) SH 301	STORAGE Fumigants and Fumigation (Pedersen) SH 301			
LUNCH 11:30 - 1:30 PM					
1:30 - 3:00 PM	MARKETING Feasibility Analysis of Grain Projects (Financial Analysis) (Borsdorf) WA 03L	STORAGE Loss Assessment (Reed-Hugo) SH 301	STORAGE Loss Assessment (Reed-Hugo) SH 301	MARKETING Feasibility Analysis of Grain Projects (Transportation and Location Analysis) (Borsdorf) WA 03L	QUESTIONNAIRE/CRITIQUE (Staff) SH 301
	STORAGE Erection of Facilities (Haque) SH 301			STORAGE Review of Insect and Mold Damage in Grain (Wright-Burroughs) SH 105	
3:30 - 5:00 PM			MARKETING Feasibility Analysis of Grain Projects (Transportation and Location Analysis) (Borsdorf) WA 03L		
			STORAGE Fumigation Planning (Pedersen) SH 301		6:30 PM Banquet and Presentation of Certificates



1983 GRAIN STORAGE AND MARKETING SHORT COURSE

June 13 - July 29, 1983

FIRST ROW (left to right): Luis Lossio Piñella (Peru), Rafael Urrelo Guerra (Peru), Moonga Rodgers Mweemba (Zambia), Gunther López Vela (Peru), Aberra Asress (Kenya), Makonnen Dagne (Ethiopia), Roger Armando Osorto (Honduras), Julio A. Rodriguez (Honduras).

SECOND ROW (left to right): Ekramul Haque (KSU), Havyarimana Manassé (Burundi), Cesar Castañeda Benza (Peru), Raul Baca Guevara (Ecuador), Carlos Trujillo (Ecuador), Maliande Muyunda Michale (Zambia).

THIRD ROW (left to right): Donna Schenck-Hamlin (KSU), Faisal Al-Yaeesh (Saudi Arabia), Rose Mary Reese (KSU), Derhim Ahmed Abdu Nasher (Yemen), Edgardo Sedano Vilcapoma (Peru), Raul Gutierrez Gallardo (Ecuador), Francisco Brito Espinoza (Ecuador), Lawrence Wongo (Sudan), Albert Ngondo (Tanzania), Carl Reed (KSU).

FOURTH ROW (left to right): Cornelius Hugo (KSU), Barbara Peters (KSU), Roe Borsdorf (KSU), Kathy Foster (KSU), Jeff Johnson (Group Leader), Adelis Arrevillagas (Venezuela), Manuel A. Maradiaga (Honduras), Antonio Pérez Ordóñez (Honduras), Laura Gelsi (interpreter), Rosemary Burroughs (KSU), John Pedersen (KSU).

NOT PICTURED: Do Sup Chung (KSU), Valerie Wright (KSU), Jorge Isaul Moreno Morales (Peru), Pam Cooper (KSU), Marisa Walsh (interpreter), Elena Bastida (interpreter), Ramiro Jordan (interpreter).

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C. Special Short Courses

Third Quarter

Ecuador

A 3-week short course was given March 14 through April 1, 1983, on the KSU campus for 6 participants from Ecuador. This training was requested by USAID/Quito for personnel of ENAC. The course was entitled "Grain Handling, Conditioning and Storage Management Short Course" and covered areas dealing with those subjects. Several field trips were taken to area businesses to acquaint participants with grain handling and drying equipment manufacturing, a farmers cooperative, private farm operations and a U.S. grain marketing research laboratory's functions.

D. Special Programs

First Quarter

Nigeria

Special training was supplied to Maureen Ogbuoji and Tony Azih by FFGI for 4 days. Included in the training was a visit to the Extension Farm Management Office where they discussed farm management and recordkeeping. They also visited a seed processing center and gained a better understanding of seed production. Discussions were carried out with FFGI staff on topics including microorganisms, equipment for handling and storage of grain, grain sampling, soil fertility and crop production and minimum. The training began July 12 and ended July 15, 1982.

Fourth Quarter

Mississippi State University

Dr. Valerie Wright traveled to MSU to give lectures on stored-grain insects and rodent control on a training exchange program. There were 20 participants attending the Seed Improvement Training Course from 14 countries. The course was held from June 6-August 4, 1983, with Dr. Wright's lectures given on June 23 and 24.

APPENDIX D  
INCREASE AND MAINTAIN TECHNICAL CAPABILITIES

A. Agricultural economics

1. Critical Evaluation of Alternative Rice Post-Production Technologies in Central Luzon and Bicol Regions, Philippines (formerly System for Assessment of Post-Production Losses of Rice Under Alternative Marketing Patterns)

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

The study had four objectives: (a) to review the range of alternative post-production technologies currently practiced in the area, (b) to examine the nature, patterns, magnitudes and causes of losses under various systems of post-production technology and management, (c) to determine the factors that explain the choice of technology in rice post-production, and (d) to analyze the policy implications of these considerations.

The data used in the study are based on a series of field level trials conducted by the Department of Agricultural Engineering of the International Rice Research Institute in Central Luzon in 1975-76 and in the Bicol Regions in 1976-77. These field trials were carried out to assess the performance of the IRRI-designed axial-flow thresher and twin-bed batch dryer as compared to traditional methods practiced in the area.

General Linear Model of the Statistical Analysis System was used to determine the physical and quality deterioration response functions for paddy and milled rice. Inferior quality characteristics of paddy and milled rice such as impurity, cracked, damaged, fermented, and chalky kernels were found to be associated with a reduction in the quantity, quality, and market grade of milled rice. Timeliness in the performance of subsequent post-production tasks as well as the type of machine or equipment used likewise influenced variability in rice recovery and grade.

Comparative rate of return (CRR) on added capital investment was used to measure the economic potential of alternative post-production systems over that of the traditional systems. The alternative combining the axial-flow thresher with sun drying exhibited the highest CRR in spite of the foregone quality price premiums largely because of the low capital and operating cost of traditional sun drying coupled with efficient performance of the axial-flow thresher. The second highest CRR value was obtained from systems using the axial-flow thresher and the batch dryer. Alternatives where traditional methods of threshing and cleaning

are combined with mechanical drying showed relatively low comparative rate of return even with substantial quality premiums. High capital outlay and operating expenses incurred in mechanical drying contributed to this low CRR.

Other factors not explicitly accounted for in the empirical analyses also have important influence in the choice among alternative post-production technologies.

Authors include Dr. Zenaida F. Toquero and Dr. Richard Phillips, major professor.

2. Simulation of a Food Security System for the Countries of South Asia (formerly Alternative Food Grain Stability Programs for Central Asian Countries)

The following is an abstract of the dissertation of the completed research:

The study is a quantitative estimation of the role food grain reserves would have had on stabilizing food grain supply quantities if they existed in the six (6) countries of South Asia (Afghanistan, Bangladesh, India, Nepal, Pakistan and Sri Lanka) from 1961 to 1981. Annual supply and utilization of data for each country used in the simulation are taken from the USDA Foreign Agriculture Circular. The population figures used are from the Bureau of Census of the United State Department of Commerce.

Four (4) grain reserve programs are considered, two (2) for rice and two (2) for all good grains (AFG) combined. In each category one simulation is based on reported historical net import data for each country, and the other on stabilizing trade adjustments. Each reserve system includes in-country reserves ("first line of defense") backed by regional reserves ("second line of defense"). Each of the four alternatives is capable of achieving targeted stability goals for all six (6) countries.

Using the computer program developed for the Food and Feed Grain Institute of Kansas State University by Dr. Richard Phillips, historical consumption and deviation patterns are traced, and simulations are made for reserve requirements, annual transactions, year-end inventories and storage capacities for each alternative. In addition, related costs are estimated for each component of the alternative programs.

Compared to the reserve systems with historical net import data, the reserve programs with stabilizing net imports dampen the reserve requirements and needed in-country reserve withdrawals and additions and substantially reduce the need for regional reserves.

The storage capacity utilization depends on the inventory levels and the required cumulative storage space. The earlier the maximum storage capacity is attained, the lower the capacity usage will be (assuming that the inventories do not decrease over time).

The total costs of the inventories, storage capacities and trade adjustments (for alternatives in which they are included) are generally reduced compared to the costs of reserves without trade adjustments. Bangladesh is the only country that shows greater costs for both rice and AFG programs without trade adjustments compared to the costs of the reserves with trade adjustments. The costs of the AFG reserves using historical net imports in Sri Lanka show higher costs than the AFG reserve alternative using trade adjustments.

In every area: size, population, inventory, storage and costs, India dominates. In the event that a regional reserve system (in addition to individual in-country systems) becomes effective in the area, India is the naturally logical leader.

Authors of this completed research are Dr. Elizabeth (Sto. Domingo, Espiño and Dr. Richard Phillips, major professor.

3. Simulation of a Food Security System in Northeast Asia, Southeast Asia and the Oceania (formerly Simulation of Regional Security Reserves to Serve the Republic of East Asia and the Oceania)

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

Despite a continuing trend of decline in rates of population growth, the total world population by the end of this century is estimated to be around 6.5 billion, nearly 5 billion of which will be in the developing countries. The growing population will cause increasing pressure not only on basic amenities such as living space, health and education, but also on world food supplies.

The food crisis of 1972-76 has provided opportunities for a more thorough assessment of world food prospects. At a World Food Conference in Rome in November 1974, a majority of the nations of the world accepted a resolution calling for the creation of grain stocks on a national basis as the central element in an "international undertaking on world food security." It is believed that, by approaching the security reserve program jointly, member countries can achieve targeted levels of stability in food grain supplies much more efficiently than each could do alone. This study tests how a national and regional food reserve system could have worked in Southeast Asia, Northeast Asia and the Oceania had it been in operation since 1961-1979.

The patterns of deviation in quantities of rice and other food grains available for year-to-year consumption serve as the basis for analysis of potential food security reserves. The computer Master Projection Program (MPJ) is applied to measure needs for food security reserves by country and region based on historical patterns of food grain production, international trade and utilization as they have existed during the period 1961-1979. Simulated alternative food security reserve programs are used to evaluate reserve transactions as means of offsetting excessive overruns and shortfalls. Taking into consideration the size of reserve transactions, reserve stock levels and the benefits from stability in year-to-year food supplies, targeted 3-percent maximum deviation was selected for testing.

Alternatives evaluated include:

1. Security reserves of rice only,
2. Security reserves of other food grains, and
3. Security reserves of all food grains.

All of these alternatives include a mix of in-country and regional reserves. Analyses were made using historical trade on one hand and assuming stabilizing trade adjustments on the other.

The findings indicate that for the SEANEARO countries as a group, alternatives involving stabilizing trade are more cost effective than those without stabilizing trade.

The computer Transportation Linear Program (TRLP) is applied to determine the optimum number and location of regional grain reserves in SEANEARO. Results show that a single storage location in Singapore minimizes the combination of transportation and storage costs over the 19-year historical period.

Estimation of benefits from stabilization programs to the SEANEARO countries and benefit-cost analysis are beyond the scope of this study, but the workability of a security reserve system to serve the 11 countries of East Asia and Oceania is evident from the findings.

Authors are Esterlina Olan and Dr. Richard Phillips, major professor.

4. Computerized System for Feasible Agribusiness Development

Work continues on this study. The objective is to provide a rigorous computerized system of analysis suitable for application to developing country conditions.

5. Analysis of Food Security Programs in LDCs

This is a continuing research project which is not supported by cooperative agreement funding. The objective is to determine how systems of stabilizing trade and food grain security reserves would have worked to stabilize supply quantities within targeted deviation bands from long-term trends in each of the countries over the past 20+ years.

6. Quantitative Analysis to Support LDC Grain Policies

This research continues but is not funded by AID/DSAN-CA-0256. The objective is to assist policy makers and implementing agencies in LDCs formulate and carryout public intervention programs to achieve more effective national and international systems for food grain production, distribution and utilization.

7. Improvement of Grain Marketing Systems in LDCs

Instituto Interamericano de Ciencias Agrícolas (IICA) funding has begun this research which will continue into the next fiscal year under AID/DSAN-CA-0256 funding. The objectives are (a) to identify and evaluate domestic grain marketing systems in LDCs, (b) to determine the nature, patterns, magnitudes and causes of losses and inefficiencies under various systems of post-production technology and management, (c) to isolate and measure factors that explain the choice of marketing channels and procedures in grain post-production systems, and (d) to define domestic policy implications of the findings.

B. Agricultural engineering

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

An abstract of the dissertation for this completed research is as follows:

A general model of a swine and poultry feed mill and complete pelleted dairy feed mill is formulated by analyzing a typical feed mill in U.S.A. Based on this model mill, a computer program for a swine and poultry feed mill and complete pelleted dairy feed mill design is developed for the production range from 10 ton/hr to 50 ton/hr. The computer program consists of 1 main program and 3 subprograms. The outputs of the program are the number, size, capacity, required HP, working hours and energy consumption of each individual pieces of equipment, the storage bin and working bin allocation plan and dimension of plant.

Mathematical models for energy consumption, labor requirement, capital requirement and profit of the model mill are developed. The mathematical model for energy consumption consists of the electrical energy, the boiler fuel energy and the vehicle fuel energy terms. The computer program for feed mill design developed is used for developing the electrical energy term. The boiler system and vehicle operation in the feed mill are analyzed for developing the fuel energy terms.

Labor requirement data which Vosloh (1976) estimated for his model mill are used to develop a mathematical model for labor requirements. Also, this model consists of production labor, maintenance labor and supervisory labor terms.

To develop mathematical models for capital requirement, capital requirements of 105 model mills are analyzed by dividing equipment cost, cost for installation of equipment, cost of land, building and its construction, and the cost of electrical system installation.

For developing the mathematical model of profit for the model mill, cost of feed production is analyzed as a function of the size of mill and the ratio of finished feed to total feed production.

Optimization techniques are introduced to demonstrate the application of models developed. A single objective non-linear programming problem and a multi-objective decision making method are introduced for the demonstration.

Also, sensitive analyses are performed by changing the marketing conditions and capital investments.

In conclusion, the computer program for feed mill design and the mathematical models developed for capital investment, energy uses, labor and profit are well suited for analyzing and designing the feed mill whose capacity ranges from 10 ton/hr to 50 ton/hr. Optimum feed mill design and analysis can be made by applying a single objective non-linear programming or a multi-objective decision making method (Iterative Non-linear Goal Programming), along with the mathematical models developed for capital requirement, energy uses, labor requirement and profit.

These are the first computer program and mathematical models for the feed industry in both developed and developing countries.

Dr. Kyung Kyoo Park and Dr. Do Sup Chung, major professor, are authors of this research.

2. Changes in Quality of Rough Rice During Aerated Storage (formerly Postharvest Deterioration of Rough Rice, Milled Rice and Brown Rice)

Work is nearing completion on this study. The main objectives are (a) to establish an index for deterioration of rough rice by correlating the amount of dry matter loss, ergosterol content with the grading standard of rough rice and (b) to determine the permissible holding time for rough rice at different moisture and temperature levels.

3. Underground Grain Storage Methods for Developing Countries

This project was begun this fiscal year by two FFGI staff members. The objective is to build and monitor similar underground grain storage pits under different climate conditions.

4. Grain Drying by Zeolite

A FFGI staff member began work on this research this fiscal year, with the objective as follows: to investigate the desiccating properties of Zeolite as a grain drying agent for probable application to the developing countries.

C. Biology/entomology

1. The Effects of Insect Interaction on Milled Rice and a Simple Model to Evaluate Insect Population Growth (formerly the Effect of Insects' Interaction on Stored Milled Rice and Its Basic Model of Structure)

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

The effects of interactions of lesser grain borer (LGB), Rhyzopertha dominica (F.); maize weevil (MW), Sitophilus zeamais Mots.; sawtoothed grain beetle (SGB), Oryzaephilus surinamensis (L.) and red flour beetle (RFB), Tribolium castaneum (Herbst) in various combinations on stored milled rice were determined.

Three methods of loss assessment were employed to evaluate the effect of interactions on rice weight loss. The results indicated that the observed weight loss or the flotation methods gave more reliable estimates of weight losses than the count-and-weigh method. The latter method gave relatively reliable results while the grain was not heavily damaged by insects.

The MW was the most destructive species to the rice, either alone or when in coexistence with other species. RFB appeared to reduce losses caused by either LGB or MW when they coexisted in rice. However, RFB alone did not contribute as much loss to rice as SGB. Combining LGB, MW, SGB and RFB caused the greatest weight loss, while a combination of LGB-MW-SGB ranked second.

Combinations of insects from different categories were not always beneficial to all species, but usually were to species considered secondary pests. Also, when insects with similar needs coexisted in the same medium, an adverse effect of competition for food and space was not always obvious.

The amount of dust recovered from each system gave a better indication of insect activities and the number of insects than moisture or temperature changes of the milled rice.

A simple predictive model to estimate population growth of LGB, MW, SGB and RFB, either alone or in combinations, and resultant weight loss was developed. Parameters to support weight loss was developed. Parameters to support model development, such as adult feeding rates, adult mortality rates under a no food condition and predation of adults SGB and RFB, were determined experimentally. Other necessary data for developing the model were obtained from literature. Experiments to validate the model were carried out under constant conditions.

The model predicted numbers of live adult insects and population growth quite well. Disappearance of whole grain from medium, reduction in weight of rice and amount of dust produced in each system were also predicted by the model. The results were then compared to the observed values in each system.

Dr. Mulyo Sidik and Dr. John Pedersen, major professor, authored this research.

2. Technological Quality of Dry Beans (*Phaseolus vulgaris* L.) Stored Under Nitrogen (formerly Effect of Controlled Atmosphere Storage on Preservation of Quality in Dry Beans (*Phaseolus vulgaris* L.))

An abstract of the dissertation of this completed research project follows:

Pinto beans with 14.7% initial moisture content were stored at 75°F-57% R.H. under forced air (10 cc/min), forced nitrogen (10 cc/min) and in cotton bags during 6 months. Both air and nitrogen had the R.H. adjusted to 75% before being forced through the beans. Quality changes during storage were evaluated by moisture content, cooking time, texture, fat acidity, color and flavor tests.

Within storage periods (2, 4 and 6 months) Pinto beans stored under forced nitrogen did not differ significantly from those beans stored under forced air or in cotton bags as far as cooking time, texture, fat acidity and flavor were concerned. Significant differences in relation to the initial values were registered over time in storage for cooking time (after 2 months), texture (after 4 months),

and fat acidity (after 6 months). Raw/vegetable scores tended to decrease and beany scores tended to increase over time for all treatments.

Both raw/vegetable and beany flavor scores tended to indicate a reduction in Pinto bean flavor quality over time and a slight tendency for beans stored under nitrogen to retain raw/vegetable flavor and to develop less beany flavor. Pinto beans stored in nitrogen kept the light colored seed coat, characteristic of newly harvested beans, during the entire storage period. A significant darkening was detected in beans stored in air after only 2 months.

Authors are Dr. Maria Regina Sartori and Dr. John Pedersen, major professor.

3. Estimating Stored-Grain Insect Populations: Invasion of Grain from Local Reservoirs

The objective of this research is to estimate insect population size and growth from grain probe samples and final population counts.

4. Effectiveness of Methoprene as a Protectant for Stored Grain

Work was begun on this project this fiscal year. The objectives are to determine and compare (a) the effectiveness of methoprene (an insect growth regulator) to control Rhyzopertha dominica, Tribolium castaneum, Oryzaephilus surinamensis, Cryptolestes pusillus and Plodia interpunctella in wheat and (b) the effectiveness of methoprene in relationship to malathion.

5. Biology and Behavior of Corcyra cephalonica, the Rice Moth: A Pest of Stored Rice in the Tropics

Work continues on this research not funded by AID/DSAN-CA-0256. Objectives include (a) to study aspects of biology and behavior not previously reported in the literature and (b) to estimate damage due to this insect.