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9. ABSTRACT

This Honduras Food Storage Seminar was held in January, 1976, at San Pedro Sula, Honduras. Its objectives were to 1) create an awareness of the problems associated with the handling and storage of grains and cereals, and the magnitude of such losses; 2) identify conditions that contribute to the deterioration of food by insects, rodents, and moisture; 3) present methods and tools now available for preventing or correcting the problems that produce losses of food; 4) illustrate quality control procedures available to ensure the safety and nutritional value of food; and 5) present current research findings relating to development of specialized packaging materials and handling procedures. It was noted that this seminar afforded a unique opportunity for collaboration between private industry, USDA, several offices with AID, private American voluntary agencies, the World Food Program of FAO(UN), the Industry Cooperative Program (ICP) of FAO, and government counterpart agencies from Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Panama, and Peru. Besides extended summaries of presentations made by participants from nine countries, these proceedings contain suggestions by participants for improving future seminars, comments on followup actions by individual program sponsors and/or country groups, actions which should be taken by each USAID, suggestions concerning the role of private industry in reducing commodity losses, and recommendations concerning the conduct of follow-on mini-seminars to be arranged in the various countries by participants in this seminar.

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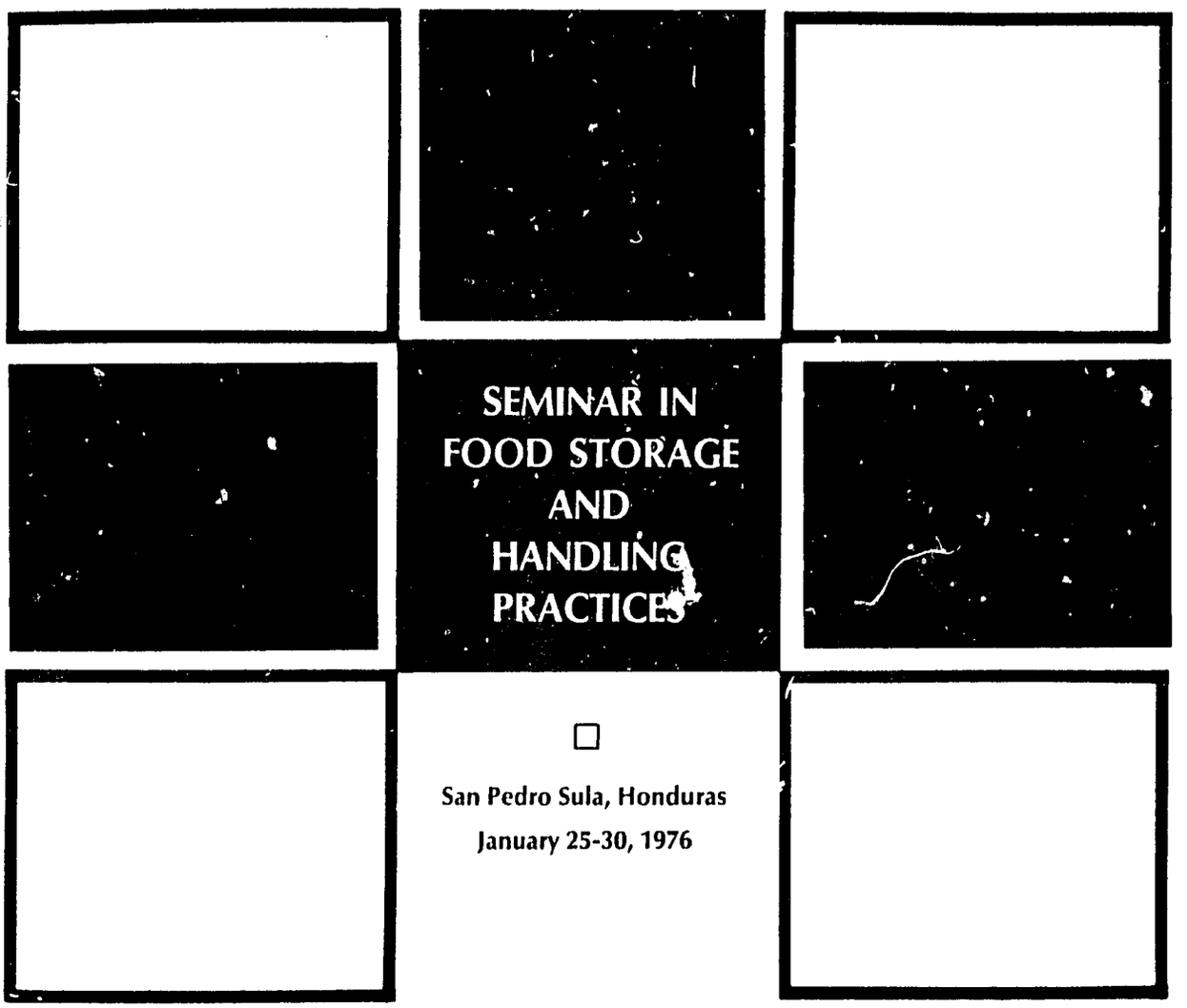

SEMINAR IN FOOD STORAGE AND HANDLING PRACTICES

San Pedro Sula, Honduras
January 25-30, 1976

Agency for International Development
Washington, D. C. 20523

REPORT
OF THE
HONDURAS
FOOD STORAGE
SEMINAR

JANUARY 26-30, 1976
GRAND SULA HOTEL
SAN PEDRO SULA, HONDURAS

Sponsored by the
Agency for International Development

Office of Food for Peace
Technical Assistance Bureau/Agriculture
Latin America Bureau

Agency for International Development
Washington, D.C. 20523

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PREFACE AND OBJECTIVES

As part of its responsibility for administering the foreign aid program, the Agency for International Development (AID) is striving to improve the status of the poor and hungry in developing countries. To achieve this goal, a prime objective of AID is to increase the wordwide availability of food. In addition to agricultural research, development of more regions capable of producing food and improving strains of food presently available, another means of contributing to this goal is the reduction of food losses. The FAO has estimated that over 200 million tons of grain is destroyed each year by insects, molds, rodents, birds and other pests. AID has recognized the severity of this problem and has designated post-harvest food losses as a "key problem area" (KPA).

The PL 480 food aid program is administered jointly by AID, the U.S. Department of Agriculture (USDA), State Department and Office of Management and Budget. Within AID the Office of Food for Peace has the major responsibility for administering the PL 480 program. The Office of Food for Peace is putting forth its maximum efforts to reduce food losses which occur during the delivery, storage and distribution of Food for Peace commodities. In order to do so, the first step is to identify the cause of the loss and then to have the knowledge of the proper steps to take to eliminate it.

To disseminate this specialized knowledge as widely as possible, Food for Peace, in collaboration with the Technical Assistance Bureau (TAB) and Regional Bureaus, has conducted a series of food storage seminars focussing on the causes of food loss and the corrective actions necessary to prevent them. It is our belief that in-country training of those individuals responsible for the handling of food is a prime means of creating an awareness of the problems and of presenting effective ways to prevent the losses.

Five objectives have been the framework for developing these seminars:

1. To create an awareness of the problems associated with the handling and storage of grains and cereals, and the magnitude of such losses.
2. To identify the conditions that contribute to the detrioration of food by insects, rodents and moisture.
3. To present methods and tools presently available to prevent or correct the problems which produce losses of food.
4. To illustrate quality control procedures that are available to ensure the safety and nutritional value of food.
5. To present current research and development of specialized packaging materials and handling procedures.

An overall view of the seminar during the opening ceremonies. The room was spacious, with ample space for course materials and translation equipment.

The first Food Storage Seminar was held in Dakar, Senegal, in November 1974 in response to the urgent need resulting from the many problems created by the Sahel emergency programs. The second took place in Manila, the Philippines, in April of 1975 for those involved in Title II projects in the East Asia region, and the most recent and the subject of this report was in San Pedro Sula, Honduras, between January 26-30, 1976.

Following the standards set in previous seminars, the Latin America seminar provided a review of the methods and procedures for reducing food losses through the protection, proper handling and preservation of stored food, including those foods produced domestically, such as corn or beans, and foods imported under PL 480 as well as through commercial channels.

One hundred and twenty-six representatives from fourteen South American, Central American and Caribbean countries (Honduras, El Salvador, Peru, Haiti, Colombia, Ecudor, Brazil, Chile, the Dominican Republic, Costa Rica, Jamaica, Guatemala, Panama and Bolivia), World Food Program/Mexico, -/Trinidad and -/Rome, and the United States attended the seminar. These participants were government officials from the Latin American countries, Food for Peace officers, field officers of American voluntary agencies such as CARE, CRS, Cáritas, CWS and SAWS, U.N. officials, AID personnel and private industry representatives. They were selected on the basis of their experience, background and present responsibilities in the area of food storage, processing, transport and distribution.

Mr. Francisco Lanza and Mr. Theodore Herrera, interpreters provided by the U.S. Department of State, who provided such excellent services during the whole seminar, not only during the lectures but also at the demonstrations.

AGENDA

MONDAY, January 26, 1976

0830-0930

Call to Order by Richard Apodaca, Food for Peace Officer, USAID, Chairman of Seminar

Opening of Seminar—Mr. Frank B. Kimball, USAID Mission Director

Welcome by Government of Honduras—LTC Efrain Gonzalez, Minister of Culture, Tourism and Information

Welcoming Address—Ambassdaor Felipe V. Sanchez

Review of Worldwide Food Shortages and Losses: Objectives of the Seminar—Ms. Peggy A. Sheehan, Chief, Program Operations Division, Office of Food for Peace

Introduction of Seminar Staff by Mr. Apodaca

0930-1230

LECTURES

(1) How to extend the World's Food Supply through Improved Packaging, Storage and Handling (8mm film)—W. Schoenherr

COFFEE BREAK

(2) Quality Assurance Programs in the United States—W. Schoenherr
(3) Fumigation Procedures—"The Enemy Within" (16mm film: Fumigation with Phostoxin)—D. Wilbur

LUNCH

1500-1700

WAREHOUSE VISIT

I. Proper Procedures Prior to Fumigation
   a. Clean
   b. Spray (with approved insecticide)
   c. Stack
   d. Cover (gas-tight tarpaulin)

II. Demonstrate Proper Fumigation
   a. Methyl Bromide Monitor (Halide Detector)
   b. Phostoxin Monitor (Auer Gas Detector)

TUESDAY, January 27, 1976

0830-1230

LECTURES

(4) Rodent Control—D. Wilbur
(5) Insect Pests of Processed Cereals and Bagged Grain—H. Highland

COFFEE BREAK

(6) Application of Insecticide Sprays and Fogs—D. Wilbur
(7) Types of Damage to Packaged Food Commodities—W. Schoenherr

LUNCH

1530-1700

WAREHOUSE VISIT

I. Cleaning Techniques

II. Application of Insecticides
   a. Sprayer
   b. Foggers
   c. Dust (Diatomaceous Earth)

III. Rodent Control
   a. Tracking Powder
   b. Other Methods

IV. Monitor Fumigation

WEDNESDAY, January 28, 1976

0830-1230

LECTURES

(8) Protection of Packaged Commodities from Insects—H. Highland

(9) Typical Movement of Commodities in Overseas Programs—W. Schoenherr

COFFEE BREAK

(10) Warehouse Construction as it Relates to Sanitation—W. Schoenherr
(11) Inspection of a Warehouse—D. Wilbur

LUNCH

1500-1700

WAREHOUSE VISIT

WEDNESDAY, January 28, 1976

1500-1700

WAREHOUSE VISIT

I. Completion of Fumigation
   a. Open Stacks
   b. Inspect for Results

Lecture by Javier Williams, Regional Director, Ministry of Natural Resources

II. Demonstration of Proper Sampling Techniques

III. Warehouse Inspection—Schoenherr, Lawson

THURSDAY, January 29, 1976

0830-1030

Presentations by Participants of Participant Country Storage Techniques
Questions and Answers

COFFEE BREAK

1045-1230

Open Forum—Questions and Answers from Floor to Panel Members
Distribution of Seminar Evaluation Forms

LUNCH

1530-1700

FIELD TRIP TO PORT

Offloading and Port Handling Operations

FRIDAY, January 30, 1976

0830-1100

Discussion of Follow-up Actions
a. Six-month In-country Evaluation
b. Commodity Loss Reporting
c. Requests for Assistance

1100-1200

Closing Ceremonies

LTC Efraín L. González, Minister of Culture, Tourism and Information, welcoming the seminar participants to Honduras during the oepning ceremonies.

OPENING CEREMONIES

The opening ceremonies of the seminar included the call to order by the Chairman of the Seminar, Richard Apodaca, Food for Peace, USAID/Honduras; the opening of the seminar by Frank B. Kimball, USAID Mission Director; a welcoming address on behalf of the Government of Honduras by LTC Efraín González, Minister of Culture, Tourism and Information; a welcoming address by U.S. Ambassador Felipe V. Sanchez; and a statement on the objectives of the seminar by Ms. Peggy A. Sheehan, Food for Peace, Washington, D.C.

Remarks Delivered by LTC González, Minister of Culture, Tourism and Information

Food storage is a more important and serious topic than most people might suppose, even to those professionally engaged in seeking immediate solutions to its problems.

It is made important and serious by the complex problem of hunger, the ability or inability to produce food, and the means of distribution and the perplexing system of structures of "free competition" which lead to imbalances and complications compounded by improvidence and short-term solutions.

Among the eminent experts here present, what we have just said is obvious or superfluous. Nonetheless, familiar as the topic may be, note should be taken of the profound concern of those presently in charge of the national economy not to regard food storage as an isolated issue but as one closely linked to the overriding need to combat the specter of hunger and to the distressing situations resulting from the absence of a master plan that would coordinate production with storage or creation of food reserves to cope with cyclical

scarcity following unusually long summers and other concurrent, regular, or possible factors.

In Honduras the experience already gained points to a pressing need for a preventive program incorporating, though not necessarily limited to, the following two aspects:

(1) Analytical evaluation of food storage practices and methods through comparative study of techniques and experiments by qualified persons over long periods at different latitudes and in different climates.

(2) Ways and means of coordination, covering everything from annual investments and rational production possibilities within a rational time frame to periods for collecting and storing food or creating food reserves.

The two points refer to the full range of production, both at the small farm and at the national macro-project level. One aspect of coordination deserves special mention: as you already know, at meetings and seminars of international development agencies, wide-ranging and specific discussions have been held on prevention of hunger in emergencies or endemic malnutrition. In that connection guidelines or pre-planning have been suggested, involving the formation of a permanent national group to serve as a clearinghouse for statistical information based on studies and reports of various kinds directed at the socio-economic, geographical, demographic and infrastructure characteristics of each vulnerable country and at food consumption, production, collection capacity and storage potential.

The latter item involves preparing people to take preventive action on emergency needs and to provide the necessary information to the population at large.

Such preparation of people and such instruction in storage and prevention techniques and processes signify large food reserves that would preclude any possibility of internal scarcity and give dynamic significance to international support in cases of acute national disaster.

The points I have raised should provide the context for this very valuable meeting. The number of conclusions reached is not important. What matters is putting the problem into clear focus as an essential need, duly substantiated by the experts who have the last word here.

Thank you.

The Honorable Felipe V. Sanchez, U.S. Ambassador to Honduras, welcoming the group on behalf of the U.S. Government.

Welcome by the Honorable Felipe V. Sanchez, U.S. Ambassador to Honduras

It is a great honor for me to welcome each one of you, on behalf of the Government of the United States of America, to this debate which has just been officially opened by my co-worker Frank Kimball.

And it is a pleasure and an honor for me to be present at this seminar, which will undoubtedly be very beneficial to all of you and the countries you represent, inasmuch as it will include discussions of very important topics in the fields of conservation, administration, distribution, storage and all related aspects of food management.

My Government is extremely interested in the development and application of new techniques and procedures designed to improve food conservation systems and methods, and thus to assist those who most need it in all parts of our planet.

I am sure you are already swamped with statistics concerning food programs, but the following is worth emphasizing: the FAO has estimated that 500 million people in the entire world suffer from some form of malnutrition. The FAO has also estimated that more than 200 million tons of grain are destroyed each year by insects, rodents, birds and other pests. Those 200 million tons of food are enough to feed 500 million people for one year, which would virtually eliminate food scarcity for those people.

You also all know that world food production in recent years has fluctuated greatly owing to natural phenomena such as prolonged droughts and heavy rains in various parts of the world, bringing about a great shortage of food for the daily diet.

For that reason we must make a great effort to develop methods and systems to help us conserve more effectively those foods that are intended to cover nutritional deficiencies in developing countries.

I am sure that upon returning to your respective countries you will be able to apply the knowledge and experience gained during this seminar—all for the benefit of mankind.

With my sincere gratitude for your attention, I wish you much success during this seminar and in your future activities.

Many thanks.

Remarks by LTC Rigoberto Regalado Lara, President of the Permanent National Emergency Committee. Seated from left to right are: U.S. Ambassador Felipe V. Sanchez; LTC Efraín González, Minister of Culture, Tourism and Information; and USAID Mission Director Frank Kimball.

Address Given by Ms. Peggy A. Sheehan, Office of Food for Peace, Washington, D.C.

On behalf of AID/Washington and Food for Peace I would like to welcome you to the Food Storage Seminar.

The purpose of the seminar is to reduce food losses and waste thereby extending the world's food supply. Each year over 200 million tons of grain is destroyed by insects, molds, rodents and other pests. This is enough to feed half a billion people a year.

These losses occur at all stages of the food delivering chain. Losses occur in the fields, during transport and in warehouses.

During this seminar, we will focus primarily on losses of stored foods.

It is estimated that over $2 billion worth of grain is lost each year in storage and in transit alone.

As your program indicates, we will be covering a variety of topics ranging from food packaging to fumigation procedures. Our program will consist of lectures, slides and warehouse demonstrations.

The seminar has five objectives:

1. To create an awareness of the problems associated with the handling and storage of grains and cereals.

2. To illustrate quality control procedures that are available to ensure the safety and nutritional value of food.

3. To review the research and development of specialized packaging materials and handling procedures.

4. To identify the conditions that contribute to the deterioration of foods by insects, rodents and moisture.

5. To present the methods and tools available to prevent or correct the problems which produce losses of food.

Hopefully, the information provided to you will lead to the extension or development of programs which will reduce losses, thereby extending our food supply.

The seminar staff during one of the question-and-answer sessions. From left to right: Dr. Henry Highland, Mr. Don Wilbur, Ms. Peggy Sheehan, Mr. Don Lawson and Mr. Bill Schoenherr.

SEMINAR STAFF

The seminar staff consisted of William H. Schoenherr, Lauhoff Grain Company; Donald A. Wilbur, Jr., the Industrial Fumigant Company; Dr. Henry A. Highland, U.S. Department of Agriculture; and Dr. Donald Lawson, Krause Milling Company. Together they represent many years of valuable experience in food production, protection and research. They form a well-balanced team, each one complementing the other in experience and field of expertise. To assist the staff whenever needed, other industry representatives were present to answer participants' questions. In addition, Javier Williams, Regional Director, Ministry of Natural Resources of the Government of Honduras, presented a lecture on grain sampling and information on local storage problems.

SEMINAR PROGRAM AND COURSE OUTLINE

The seminar activities consisted of lectures in the mornings, supplemented by slide presentations and films. The morning lectures were closely correlated with on-site demonstrations in the afternoon. Opportunities for question-and-answer sessions were offered to insure complete comprehension. In addition, an actual inspection was arranged where the participants could practice their new knowledge and skills while still under the eyes of staff members, giving them an even clearer understanding of the practical applications of the material presented in the seminar.

Major emphasis was placed on good warehouse practices. The Do's and Don't's of good warehouse management include:

1. Keep product at least 18 inches from the wall.
2. Segregate by product.
3. Segregate broken packages from good packages.
4. Segregate broken package storage area from good package area.
5. Segregate food products from non-food products.
6. Keep aisles clean and orderly.
7. Keep bags clean and sprayed with an approved insecticide prior to reusing area.
8. Keep pallets clean and treated with an approved insecticide prior to reusing.
9. Keep pallets stored in a clean area.
10. Don't use broken pallets to store foods.
11. Dispose of refuse promptly and properly.
12. Keep outside areas
    a. weeds trimmed or eliminated
    b. dispose of rubbish
    c. keep rubbish areas clean
    d. eliminate rodent, bird and insect harborage
    e. eliminate rodent, bird and insect attractants.
13. Clean empty bags carefully and fumigate before reusing.
14. Don't stack products too high.
    a. dangerous
    b. crush or damage packages
15. Handle bags carefully
    a. not by the corners
    b. place, don't throw, into place. Otherwise the life of the insect resistance could be impaired.
16. Keep broken bag area under constant surveillance.
17. Inspect warehouse on a routine basis.
18. Follow up on inspection reports on a routine and defined basis.
19. Make certain that you have a *complete* rodent control program and that it is operating as designed.
20. Make certain that you have a planned insect control program that is providing the desired results.
21. Make certain that you have a comprehensive pest build out program.
22. FIFO, or First in First out stock rotation program.

In addition to the Do's and Don't's, the following information was discussed and demonstrated.

A. Inspection
   1. Objectives
      a. to see products are contaminated
      b. to see if they *may* become contaminated.
   2. What to look for and how
      a. Tools
         (1) screwdriver or knife
         (2) flashlight
         (3) screen (optional)
         (4) black light (optional)
      b. Divide warehouse area into:
         (1) outside
         (2) structure itself
         (3) inside
            (a) storage practices
            (b) product itself
   3. Good warehousing practices.

B. Cleaning
   1. Necessity of cleaning
   2. Importance of cleaning.
   3. Storage of cleaning equipment.
   4. Storage of *Refuse*
   5. Storage of broken product containers
   6. Disposal practices of
      a. infested product
      b. out-of-date product
      c. refuse.
   7. Cleaning of storage pallets.
   8. Cleaning of area prior to storing products in that area.

C. Pest Control
   1. Insect Control
      a. Good residual program
         (1) C&C
         (2) around the refuse area
         (3) exterior—flies, etc.
      b. Routine fogging—non-residual
      c. Fumigation practices
         (1) under tarp PH_3
         (2) chamber MB—ethylene oxide
   2. Rodent Control
      a. Must be a complete program
         (1) starve them out
         (2) eliminate harborage
         (3) build them out
         (4) trap them
         (5) kill them
            (a) outside baiting
            (b) inside trapping
   3. Bird Control
      a. Why
         (1) transmit diseases

(2) pollute food—feathers, fecal matter, etc.

b. How control
   (1) eliminates attractants
   (2) scare—physical
   (3) chemical
      (a) scare—Avitrol
      (b) kill

Application of Sprays, Fogs and Dust

It was stressed throughout the seminar that pesticides should not be considered as a replacement for good housekeeping. They should only be used in support of thorough cleaning. In addition to fumigants that have already been discussed, the use of sprays and fogs should be considered.

Spraying is the application of an insecticide to surfaces. The formulation usually leaves a residue after it has dried. The residue will continue to kill insects that come in contact with it. The period of effectiveness is determined by the formulation and environmental conditions, however some will continue to kill for several weeks. Mixtures that are permitted for use around food should be safe to humans.

There are times that the application of an insecticide in the form of a fog is beneficial. The fog will drift through the air and should reach insects that are not easily reached by the spray method. Large areas such as warehouses can be fogged. Since the insecticide will move with air currents, it will not be fully effective if doors, windows and ventilators are left open during and immediately following the application.

Sprays and fogs will not penetrate, therefore they will not do the same job as a fumigant. However the proper use of sprays and fogs along with good cleaning and stock rotation may eliminate the need for a fumigation.

Rodent Control

The control of rodents requires a combination of knowledge, effort and tools. As in the case with insects the primary effort should be directed to cleanliness. Rodents require food and shelter. Therefore the removal of weeds and debris in the yards surrounding a warehouse or storage facility is important. Broken bags, poorly stacked equipment and general untidiness within a building is an invitation to rodents. Doors, windows and other openings into a building should be screened or kept closed, especially at night. Wire of 1/2 inch mesh should keep rats out, 1/4 inch is required for mice. Poison baits and tracking powders may be used both within a building and around the exterior. An anti-coagulant type of poison is relatively safe to use since it would require an extremely large quantity to injure a human. The purpose of a tracking powder is to place it in an area frequented by rodents where they get it on their feet and body, lick it off and take it into their system through the mouth. The same formulations used to fumigate grain and food would also be effective against rodents. Actually, rodents are killed with a lower concentration of a fumigant than is required for insects.

Traps may be used in a rodent control program. However because of the problem of servicing and pilferage, traps may not be practical. Cats will catch a few rodents, but like the traps they are usually not of much value.

Rodent control is a combination of five efforts:

1. Cleanliness
2. Structure design
3. Poison baits and tracking powders
4. Trapping
5. Fumigation.

Monitor for Concentration of Fumigants

The two demonstration fumigations were checked with detectors to determine the concentration of fumigant under the tarpaulines. This was 24 hours after the fumigation was started. During an actual fumigation the monitoring should be done at 2, 4 and 6 hours after introduction of the chemical. This practice will show if the gas concentration is at the proper level. After six hours then the frequency can be extended to once every 24 hours unless a problem is suspected.

Inspection

Storage facilities and their contents should be inspected. The frequency should be established by the problems that are noted. At least once each month is a good starting point. The time lapse can be adjusted to meet the needs of the season or the specific problems.

Inspection should include both the area around the exterior as well as the interior of buildings that are used for the storage of food. Artificial light, such as a flashlight, is helpful.

An inspection form was distributed at the seminar (see below). Although this may not meet the needs of all areas, it may be considered as a pattern or a guide. It does list the types of conditions that are important and that may cause spoilage to food. The information presented at this seminar by means of lectures, demonstrations and literature should have prepared each attendee to recognize problems or the conditions that could result in problems.

Inspection Form

Yard Area Surrounding the Building(s)

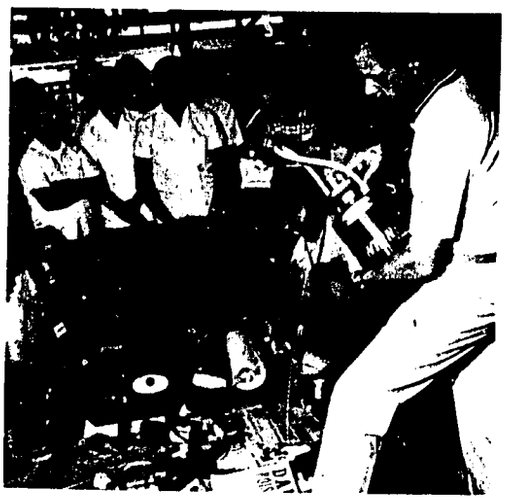
1. Are rodents present?
2. Are there refuse or other conditions serving as an attractant or breeding area for insects?

Building(s)

1. Are there openings that permit the entry of birds? Are they screened?
2. Are there openings that permit the entry of rodents? Are they screened? Are traps or rodent bait stations in use? Are the rodent control devices being used properly?
3. Does the roof leak? If so, have the products been adequately protected so they do not get wet?
4. Can rain contact the products because of open windows or doors?
5. Does surface water get into the building? If so, have the products been stored on pallets or in such a manner so as to keep them dry?

Products

1. Are the products stored in an orderly manner?
2. Is there space between piles allowing sufficient room for inspection and cleaning?
3. Is there space between piles and walls or partitions?
4. Is there refuse stored in the same building?
5. Are the floors, walls and beams free of accumulations of food that would attract insects and rodents?
6. Are the products stored off the floor, such as on pallets?
7. Is the exterior of the packages of products clean?
8. After moving a few bags, is it free of insects or products between the bags?
9. Is there evidence of activity by insects? Rodents? Birds?
10. Is there mold on the outside of any packages of food?
11. Have damaged bags been separated from undamaged bags?
12. Is there a program for rapid disposition of damaged or out-of-condition products?
13. Are insecticide sprays or fogs used? If so, are the results satisfactory?
14. Is there a program for the fumigation of insect-infested products? If so, does it appear to be successful?
15. Is there a program of stock rotation such as first-in-first-out?



Donald Wilbur explaining the proper method of handling the materials used for fumigation. The equipment was set up to encourage the participants to examine it.

Fumigation

It is difficult to store grain and dry foods in the temperate and tropical parts of the world without an insect problem developing. Long periods of storage increases the potential of spoilage caused by insects. Multiple handling of the commodities, inadequate storage facilities and the packaging materials all contribute to the problem. We should assume that the ideal conditions of handling, storage and packaging will not exist in most parts of the world where food is stored.

An insect free commodity placed in an insect proof package could be the objective, however such a package or container would cost more than the food to be placed into it. The multi-wall paper bag that is in use for some commodities will give adequate protection against moisture and invasion by insects as long as the closure remains intact and the body of the bag is not punctured. It is realized that the special paper bag is not available in all parts of the world. Therefore, jute, cotton, woven plastic and other materials are commonly used. Most of these give little protection against either moisture or insects.

Temperature during storage can prevent or at least reduce the insect problem. Above 100°F. or 38°C. most insects will not be a problem. Unfortunately it is difficult to attain this range of temperature throughout a pile of grain or a stack of bags. If extremely high temperature is reached, all insects and some micro-biological contamination would be killed, however, there would also be loss of nutritional values, especially the vitamins. Small amounts of grain or dry food can be exposed to the sun for a few hours and the temperature should correct the insect problem, however it is realized that this is not practical for a large volume of material.

Storage at low temperature can also prevent an insect problem. Insect activity is slow below 60°F. or 16°C. A temperature of 32°F. or 0°C. for a prolonged period will kill most insects. Again it is realized that refrigerated storage facilities are not readily available. As in the case with high temperature, the chill must go throughout the material being treated to receive full benefit.

During one of the on-site warehouse visits, Don Wilbur demonstrates the proper steps that should be taken prior to fumigating.

Don Wilbur and Bill Schoenherr, with help from participants showing the most effective way of sealing stacks before fumigation.

A time-tested method of killing insects in bulk grain or packaged commodities is with fumigation. Considerable emphasis was placed on this procedure during both the lecture and demonstration at the seminar.

The purpose of a fumigation is to destroy all stages of insect development that are present in the material to be treated. An atmosphere that is toxic to insects would also kill rodents or other forms of animal life. Fumigation, as described here, will not eliminate mold or bacteria. There is no residual kill, therefore insects or rodents may recontaminate the grain or commodity immediately after fumigation. This is one of the reasons for the placing of so much emphasis on cleaning and the use of sprays and insecticide fogs.

There are ten conditions to be considered in order to conduct a safe and beneficial fumigation:

1. *Temperature.* Best results should be obtained when the temperature is above 70°F. or 21°C. This is the grain or commodity temperature; however this should not be a problem in the warmer parts of the world. The label on the formulation selected should give the dosage and time exposure recommendations relative to temperature.

2. *Tarpaulin.* Bulk materials in a tight bin or bagged or bulk materials in a well constructed building may not require the use of a tarpaulin. The purpose of the tarpaulin is to form a seal around the material to be fumigated. *Plain canvas will not confine fumigants.* Plastic such as polyethylene or rubber coated canvas should serve the purpose. *Any holes in the tarpaulin must be sealed. If more than one tarpaulin is required to cover the material that is to be fumigated, the over-lap should be rolled and clipped together or the seams taped. There is no use attempting a fumigation if a gas-tight seal is not attained.*

3. *Sealing.* If tarpaulin fumigation is to be done in the open on soil or in a building over dirt floors, the tarpaulin should be placed under as well as over the grain or commodity to be fumigated. Where concrete or other hard surface is beneath the floor, then the tarpaulin should be sealed to the surface. This may be done by means of sand-snakes or other heavy objects. Tape may also do the job, but it may be difficult to get adhesion. The sealing must be complete to assure retention of the toxic gas.

4. *Formulation.* Two formulations were demonstrated. They were methyl bromide (CH_3BR) and phosphine (PH_3). Other chemicals may be available and, if so, the manufacturers' recommendations should be followed. The two materials demonstrated both have the ability of penetrating through a considerable volume of material. Methyl bromide is a quick acting fumigant but does not have the penetrating ability of phosphine, however in a vacuum vault methyl bromide will penetrate very well. Phosphine must *not* be used in vacuum fumigation. Phosphine will penetrate most commodities but acts slowly. In either case a tight seal is required. Methyl bromide will give a chemical reaction with certain commodities resulting in an objectionable odor. A permanent residue of inorganic bromide will result in certain commodities if they are fumigated several times with methyl bromide. Tolerance levels have been established for grain and food in the United States. This may not be significant in other countries but should be investigated prior to the use of this chemical. Phosphine does not leave a permanent chemical residue but solids remain after release of the gas and it may be advisable to remove these when treating certain materials.

5. *Dosage.* It is very important to use the proper amount or dosage. To use too little could mean poor results. To over-dose is costly and may cause odors or residues. When the formulation has been selected, the label on the container should list the amount to be used. If this is not on the container, the manufacturer of the fumigant should be contacted to get the necessary information.

6. *Exposure.* The length of time required to confine the fumigant will be determined by the formulation selected, the depth of material to be treated and the temperature. It is good insurance to consider the

maximum exposure time as recommended by the formulator.

7. *Monitoring* for dosage. Devices are available to give an immediate indication of the concentration of a fumigant. Two types were demonstrated: a halide detector for methyl bromide and an Auer tester for phosphine. The halide detector is a device that produces a flame in contact with a piece of copper. The color of the flame indicates the presence and concentration of organic halide (methyl bromide). The Auer tester requires the use of tubes that change color and give a reading in parts per million of phosphine. Both devices are inexpensive, accurate enough for field use and give immediate results. Air samples should be pulled from the area being treated to determine if the proper concentration of fumigant is being attained and maintained. It should be required that all fumigations be monitored.

The fumigation demonstrations involved two separate piles. One was treated with methyl bromide and one with phosphine. Here the piles have been sealed and are being tested.

8. *Monitoring* for safety. If it is necessary for workers to be present around commodities under fumigation, the same testing devices should be used. This will indicate if toxic concentrations of the fumigant are present in the working zones. A safety check is also important after the fumigation is completed and personnel re-enter the area. Fumigants are toxic to man and it is important to make the necessary precautionary checks to assure safety. Phosphine can be detected by its odor while methyl bromide is odorless.

9. *Inspection.* As soon after a fumigation as it is safe to examine the material that was treated, it should be carefully inspected to determine if the results were satisfactory. If live insects are found, then the reason for the failure should be determined. A properly conducted fumigation should give a complete kill of all stages of all insects. Anything less than that should not be acceptable.

10. *Reinfestation.* There is no lasting protection from a fumigation. Once the toxic atmosphere is gone, the material is subject to attack by insects. It is recommended that a residual insecticide be used. If the material is moved just prior to fumigation, the surface under the pile should be sprayed first. If the material to be fumigated is not to be moved, then the area around the perimeter of the pile should be sprayed. Cleanliness is always important so the cleaning of the floors and the exterior of bags is necessary to reduce the attraction to insects. Broken bags should be destroyed or moved into distribution as quickly as possible as they are also an attraction to insects and always a potential source for insect infestation. It is advisable to be cautious in leaving tarpaulins over the commodities for extended periods. Condensation may form under the tarpaulin and cause deterioration because of mold.

An excellent reference on this subject is the *Manual of Fumigation for Insect Control* prepared by the Food and Agriculture Organization of the United Nations (FAO). A copy may be available through the sources listed on the next pages.

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Hunter Publications, 23 McKillop Street, Melbourne C.1; Publications Branch, Government Printing Office, Canberra A.C.T. 2600, and outlets in each state capital city.

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CHILE
Biblioteca, FAO Oficina Regional para America Latina, Av. Providencia 871, Casilla 10095, Santiago; Librerias Renacimiento, Amunategui 458, Santiago; Editorial y Distribuidora Orbe Ltda., Galeria Imperio 256, Santiago; Sergio Feliu Cia. Ltda. "Chile Libros," Av. Santa Maria 281, Santiago.

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Paul Parey, Lindenstrasse 44-47, Berlin SW 61.

GREECE
"Eleftheroudakis," 4 Nikis Street, Athens; Institute of Scientific Publications, 9 Amerikis Street, Athens.

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Sociedad Economico Financiera, Edificio "El Cielito," Despacho 222, Zona 1, Guatemala.

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JAMAICA
Bolivar, 1 Grove Road, Kingston 10.

PARTICIPANT PRESENTATIONS

In order to present differing perspectives on the subject of the seminar, representatives from the countries participating were invited to make presentations describing their warehousing practices and local storage problems.

Offered here are abstracted versions of the speeches given by participants in the seminar, sharing with the group their particular experiences in the field of food storage and handling. All speakers were unanimously gracious in their expressions of appreciation and thanks.

Mr. Adhemar Penaya Z., Cáritas, representing Bolivia.

Bolivia—Mr. Adhemar Penaya Z., Cáritas

In my country there are three different climates resulting from the different geographic levels: the *altiplano*, or highland (3600 meters above sea level), the valley (2600 meters) and the tropics (800 meters or less above sea level). For this reason, we use different methods of preservation of food, more of prevention than of sanitation.

My country receives some 20 million pounds of food annually under PL 480 Title II. Sixty-seven percent of this food is stored in warehouses, which are very adequate, located on the *altiplano;* because of the cold climate there, food is well preserved. The major problems are caused by rodents and moths. Rodents are combated by using Bayer's "Racumin," an anti-coagulant which is effective. Mechanical spring traps are also used as well as the large metal box type, such as were shown at the Cáritas warehouse in San Pedro Sula. Shipments are made using surface transportation from these warehouses to the consumer centers of the *altiplano* region where most of the needy population is located.

The remaining 33% is stored in the valley region, in warehouses which are also very adequate. Humidity in this region is relatively high and there are problems of infestation. "Gamexane," a gas, is sometimes used and is applied in a manner similar to that used to apply "Phostoxin," which is also used. From this region 18% is sent to the tropical region where the heat is intense and humidity is high. By making periodic shipments which last from 60 to 90 days and by storing in small warehouses, food is not kept in storage for long periods of time, thus avoiding spoilage. By applying the FIFO method, we are able to effectively distribute the older food first.

Sanitation Process

Periodic disinfecting is used. Every 30 days a spray, "Black Flag," an insecticide made by Boyle Midway, is applied. Stacks are moved every 60 days. Inventory of stock is taken at the end of each month when an inspection is made of the food containers. By so doing, early signs of infestation are detected.

Other Factors Which Contribute to Losses

Since my country is landlocked, ports of neighboring countries are used. Food therefore comes to us through a Peruvian port from which it is shipped by rail to a lake port on Lake Titicaca. From there it is transported across the lake in small craft to a Bolivian port where it is again loaded on rail cars or trucks for shipment to its final

destination. These frequent handlings result in losses through disappearance or breakage of containers.

Losses from point of origin to Peruvian seaport	.70%
Losses from Peru to destination	1.50
Losses at final destination warehouse	.37
Total	2.57%

Mr. Manuel Jaime, USAID, presenting Chile's methods of food handling.

Chile—Mr. Manuel Jaime, USAID/Chile

Chile, a long and narrow country, is very familiar with the problems discussed in this seminar. Because of its geographic structure, it has had to give priority attention to these problems, especially those concerning transport, distribution and storage, in order to avoid, or at least reduce, heavy losses and damage in every stage of food handling from producer to consumer. This has required both private industry and government agencies in charge of producing, transporting, storing and distributing foodstuffs to develop an infrastructure of central and regional warehouses throughout the country to meet the ever-increasing requirements of the domestic market. Chile has also found it necessary to construct several seaports along its extensive coast and to develop a far-reaching network of highways and railways throughout its approximately 3,000-mile length.

CARE, CRS and SAWS participate in food and nutritional assistance programs in close cooperation with counterpart Chilean agencies, both governmental and nongovernmental. In their efforts to reach the strata of Chilean society that are most vulnerable from the nutritional standpoint, they have also developed a logistical and operational infrastructure to achieve their goals with maximum efficiency. Their Chilean Government counterpart agencies, also present at this seminar, are the *Junta Nacional de Auxilio Escolar y Becas* (JUNAEB) (National Scholastic Assistance and Scholarship Board) and the *Junta Nacional de Jardines Infantiles* (JNJI) (National Nursery Schools Board), responsible for school feeding programs and nursery schools, respectively; and the nongovernmental organizations Cáritas/Chile and OFASA.

These agencies together maintain at this time approximately 160 central, regional and local warehouses, with an average capacity of 3,000-4,000 cubic meters each, and approximately 8,000 small storage areas located at final distribution centers. All the above-mentioned agencies have a permanent program for warehouse construction and repair in order to meet the required levels of hygiene, safety and cleanliness and thus to achieve better conservation of the foodstuffs stored therein. Their food storage techniques and methods of chemically disinfecting the storage areas are similar to—although not so perfect as—the techniques which we have learned in this seminar and which will enable us to improve our procedures greatly in the future.

The agencies represented here have had to develop their operational capacity because they are currently reaching more than a million children of pre-school and school age who are in extreme nutritional and social need. Programs for extending the breastfeeding period and for caring for undernourished, pre-school and exceptional children and children in marginal areas are unquestionably the programs of greater priority, along with those of economic and community development carried out by volunteer workers for the improvement of their own communities.

These programs require about 40 million pounds of food annually under PL 480 Title II and, in addition, more than 60 million pounds acquired from Chilean sources to supplement in calories and protein the daily diet of the more vulnerable groups.

Mr. Umberto Alvarado, recounting the successes obtained in Colombia.

Colombia—Mr. Umberto Alvarado, WFP

In Colombia we have a program covering 1.4 million beneficiaries, carried out with foreign aid and subdivided into maternity and child care, school-age, and preschool-age programs. These programs receive assistance from different government agencies and from AID, CRS and WFP.

It is acknowledged that these programs cannot continue indefinitely with donated food and therefore the Government, through the Colombian Family Welfare Institute, has started a replacement program for which it is developing a high-protein vegetable compound containing cornmeal, soymeal, flour and powdered milk, and enriched with vitamins and minerals.

It has been kept in mind that such ingredients as the meals and flour are available in Colombia as domestic commodities. This vegetable compound is carefully controlled by laboratory analysis to meet the standards set. Fifteen thousand tons are to be produced in 1976, and production is to be raised by 20 percent annually as foreign aid is reduced. CARE, CRS and WFP are contributing raw materials for production of the vegetable compound, which will partly replace the foodstuffs being donated by them.

To process the vegetable compound, the Government has three plants run by the Colombian Family Welfare Institute.

Under guidelines for coordination between government agencies, another organization, the Agricultural Marketing Institute (IDEMA), is now transporting both the raw materials and the finished product. It has a large network of facilities with a warehouse storage capacity of 226,891 tons, not including its own silos. Private storage services are, however, used on occasion.

To assure the international agencies that the foodstuffs reach their destination and to be able to recover the value of lost shipments, they were insured during the first months of the program, but it was concluded that such insurance costs as much as the products themselves, and a system was established which we call self-insurance, or Reserve Fund for Losses, into which a percentage of the cost of the foodstuffs is paid, and when a loss occurs money is transferred from this fund to another from which replacements can be purchased. This system has saved us a great deal of money in implementing the programs.

Colombia has four seaports where foodstuffs coming into the country are received, cleared and sent inland by truck and rail.

Food storage and preservation practices are similar to those described at this seminar. Products like 57% Malathion are used in a proportion of one liter to each 30 liters of water, and one liter of methyl bromide is used for each 28 cubic meters. Products like Warfarina are used for rodent control.

Storage is effected on wooden pallets placed at least one meter from the partition or wall; the maximum dimensions of the pallets are 4.1 meter high by 7.1 meters wide by 10.5 meters long, so that they can be covered by four tarpaulins measuring 12 square meters for sanitary treatment.

Mr. Eduardo Antonio Wong Briceño, telling of the food handling situation in Costa Rica.

Mr. César H. Astudillo, describing the special conditions present in Ecuador.

Costa Rica—Mr. Eduardo Antonio Wong Briceño, National Production Council

Our country has an organization responsible for maintaining and stabilizing basic grain prices—rice, sorghum, corn and beans. The grain is not ready for storing when it is purchased and we have to make it ready.

Once the grain has been prepared for storage we take it to warehouses or metal silos.

In the warehouses we store the grain either in sacks or stacks of sacks containing grain in bulk, in which the sacks serve as walls or silos. We also have wooden platforms designed to keep the products from direct contact with the warehouse floor. Our warehouses have a capacity of up to 8,000,000 pounds.

We store all grains in silos except beans, which do not lend themselves to silo storage. The average capacity of our silos is 2,200,000 pounds.

We have preservation programs not only for sanitation experts but also for lowering grain preservation costs. We are constantly seeking adequate and optimum dosages to use according to the actual conditions we work with. We also research new products or products that act or might act as synergists. We do research on the reactions of Methyl Bromide in different oxygen levels, on different concentrations of Pyrethrum in combination with piperonyl butoxide as synergist, etc. However, we must not forget that dry, clean, cool grain is least attractive to insects, and that they prefer grain which is dirty, warm and very damp.

Ecuador—Mr. César H. Astudillo, CRS

The Office of Human Development, Cáritas, has the necessary experience to establish a system to protect and secure foodstuffs as soon as they enter the country, to ensure that they are suitable for human consumption. This report considers Ecuador's climatic conditions, available storage facilities and the methods for using them.

Climatic Conditions

Ecuador is divided in four geographic regions: the Coast, the Sierra, the East and the Galapagos Islands. All have different characteristics in altitude, temperature, humidity, etc. They are as follows:

The *Coast* is warm and humid. The normal temperature averages 25-30°C., and reaches 38°C. in winter. The worst months are March and April. Because of the constant humidity, things deteriorate quickly and insects and other harmful pests proliferate.

The Office of Human Development, Cáritas, uses 8 warehouses in this region. Although the warehouses are generally in good condition, products cannot be stored over three months. The food most apt to be damaged by fungi are bulgur, oats and ICSM. Bulgur and oats are particularly affected by weevils and therefore are stored in a special way.

Storage conditions in Port Authority warehouses are good but they are easily spoiled, especially by insects such as moths or weevils. As a result, foodstuffs can be stored there a maximum of 15-20 days.

The *Sierra*, with very high elevations, has a climate that varies from temperate to freezing. The average temperature is 15-20°C, but in winter (January-April) drops to 10°C, with high humidity. In almost all this region, commodities keep very well. The Office of Human Development uses 20 warehouses.

To the *East* is the immense Amazon forest with a hot, humid and unhealthy climate. Because of the number and variety of pests, food cannot be stored for long periods of time. Therefore, the religious missions with food programs in this region have warehouses in the Sierra where commodities are stored permanently, and only enough for one month is sent to the local warehouses. Caritas's program has six warehouses in this zone.

The *Galapagos Islands* are 600 miles off the Ecuadorian coast, with six major islands and 13 lesser ones with a varied climate. For a number of reasons, including transportation, there are no programs in this region.

Physical Conditions

All Caritas warehouses have adequate space, ventilation and are clean. The commodities are placed on platforms or planks mounted on 20cm. blocks so that they are not in direct contact with the floor, and allow good ventilation. Pesticides can be put underneath without risking contamination of the commodities. This also makes it easier to clean the warehouse.

The food is piled in stacks up to 20 sacks high and 20cm. from the walls. The warehouses are cleaned and straightened up each week. When empty they must be completely fumigated by local health services.

Distribution

The products are brought from the provincial warehouses to the distribution centers every month (except where communities are remote, where deliveries are quarterly, especially for school programs). This makes it easier to insure that products stored the longest are delivered first.

Commodities are carefully distributed in full, sealed sacks. If a sack is torn and spilled, it is refilled and sealed. Thus, contamination harmful to the consumers' health is prevented.

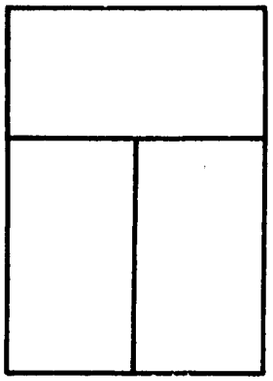
Mr. Alfonso Cañas, demonstrating the standard procedures set out by the WFP in Ecuador.

Ecuador—Mr. Alfonso Cañas, WFP

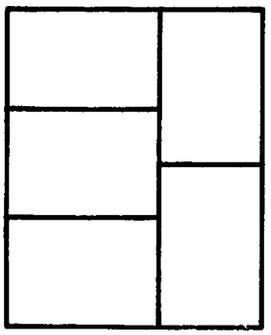
According to statistics issued by FAO, more than 500 million people in the world suffer from hunger, and yet more than 200 million tons of grain are destroyed annually by rats, insects, birds, etc. Trying to preserve the food lost, the United Nations/FAO's World Food Program in Ecuador has published a pamphlet entitled "Instructions to Warehouse Keepers for Food Storage," which covers technical aspects generally, on facilities specifically, and human and economic resources available in Ecuador. This booklet is a very specific summarization on food storage. One of the items contained in this pamphlet is related to stacking of food in storerooms, from which we quote the following:

The best method of constructing a food stack is dependent on the size, kind of package, number of stacks and space available. In any case, the stacks should be regular and follow a pattern to insure stability. This is very important if we want to use all the vertical space available in high-ceilinged warehouses. Some products like wheat and corn in resistant jute bags can be piled up to 30 or 40 high without damaging the product. Dry grain or vegetable cereals can get small tears from the grain, especially rice or vegetable seeds. These tears will always show in the lower levels of tall stacks because of the pressure from the stack. Flour and similar products cannot be piled more than 20 high to avoid compacting the lower levels.

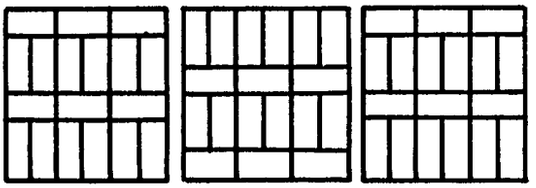
Most bags have a length-to-width ratio of 2:1.



Less frequent is the length-to-width ratio of 3:2.



In these patterns, the position of the bags can be changed easily by alternating each row. Example:



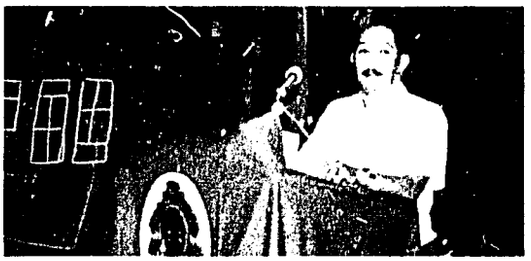
Row 1 Row 2 Row 3

These patterns can be used for any size stack and any size basic unit. Naturally, if the number of basic units in each row is reduced, the height of the pile will be reduced.

For larger stacks, the number of bags in each row of the storage units on each group should be placed in such a way as to allow accounting procedures to do inventory. It is preferable to use one unit of three or five bags, or its multiples, as the most consistent manner. However, there are several easy good ways, so long as the system is consistent. This is essential for accounting purposes as well as for stability of the stacks.

If there are no mechanical elevators to stack bags, it is easy to use stepped sides on the stacks, like pyramids. If it is planned and executed carefully, the lost space is reduced to a minimum. When high stacks are being done, it is preferable to use a bag elevator, which is cheaper and saves time and space.

Plastic or paper bags, especially the latter, are much more difficult to stack than the jute or cloth bags because of less friction. Special attention is needed to make the stack stable.



Mr. Carlos Castillo, describing procedures and climatic problems in Guatemala.

Guatemala—Mr. Carlos Castillo, CARE

I am not a Michelangelo or a Goya but I will try to show you how we stack sacks of foodstuffs in my country by forming "beds" of five sacks each, with three sacks on end and the other two horizontal in front of them. For the next "bed" this order is inverted, and so on down the line.

In Guatemala we have two well-defined climatic zones: a hot zone consisting of the southern coastal strip, the eastern departments and part of the north, and a cool zone consisting of the highlands of the west and part of the north.

The greatest problems in terms of damage to foodstuffs occur in the hot zone, where the heat results in attack by weevils, grain moths, worms, etc.

We have storage facilities in each department of the Republic and temporary facilities in several municipalities. These facilities supply the various institutions included in our programs: schools, health centers, hospitals, dispensaries, etc.

Foodstuffs are brought to the storage facilities directly from the port of entry or from the central warehouse in the capital.

To prevent damage to foodstuffs in storage we require that certain measures be taken in storing them, and these are contained in a set of instructions for storage personnel, the more interesting parts of which I will read you:

Products

A. Before foodstuffs are stored or stacked, boards or platforms must be put in place to keep the foodstuffs off the floor.
B. Store products in an orderly manner and in a way as to permit them to be counted easily and exactly at any time.
C. Stack products to leave approximately half a meter between them and the wall to avoid spoilage through contact with damp surfaces.
D. Separate all containers that are broken without the contents being damaged; repack and ship them as soon as possible.
E. Remove all products which are unfit for human consumption to prevent their contaminating the remainder.
F. CARE supervisors are responsible for insuring that when broken sacks or damaged products are found on their visits, corrective measures are carried out in their presence and adjustments entered in the control book. This requirement is so that only undamaged sacks remain in the storage facility. When goods unfit for human consumption are found, subject to the presence of an environmental health inspector, the CARE supervisor shall dispose of the foodstuffs and obtain all necessary information and documents for the claim.

We use various means of combatting pests: ordinary rodent traps, Pibutrin No. 33 (non-oily), screened windows, etc.

Mr. E. A. Kelly recounting the measures taken by the Jamaican Government to combat food losses.

Jamaica—Mr. E. A. Kelly, Ministry of Market and Commerce

A survey carried out in 1957 revealed that there were losses of approximately 12% of stored grains, cereals and other agricultural produce amounting to millions of dollars annually. As a result of the survey and requests for help and advice on storage problems, the Government set up the Storage and Infestation Division to investigate problems of storage of foods, to prevent the infestation and destruction of foods and to offer advice and assistance to all organizations, establishments and individuals concerned with the storage of perishable foods. This Division operates under the Food Storage and Prevention of Infestation Law.

Guidelines have been established on the methods of stacking and packaging of foods, on sanitation, hygiene and management in food stores, and in control of insects, rodents and fungi on premises that manufacture or store infestable foods. Inspectors visit the premises, carry out inspections, advise, serve legal notices where necessary, take samples for laboratory examinations, supervise stacking and make recommendations. Food storage assistants carry out control measures against insects and rodents on food premises owned or operated by Central Government, quasi-Government and Statutory Boards. The Division's research scientists do research on food storage and

the use of toxic chemicals on or in the presence of foods. Research finds are supplied to field staff, organizations and individuals concerned.

Foods under PL 480 are paid special attention because they are much more susceptible to infestation, especially by the red dust flour beetle *(Tribolium castaneum)* which is abundant in the country. Before each consignment is placed in the warehouse, it is required that the warehouse be thoroughly cleaned. The walls, floor and pallets are then sprayed with a residual insecticide. The commodities are then stacked to specifications to allow for fumigation under gas-proof tarpaulins if necessary, and to allow for rodent baiting and proper periodic inspections.

During storage life in the central and regional warehouses, these foods are inspected about once a month. Any treatment such as fumigation, rodent baiting or warehouse spraying found necessary is applied, and the Superintendent and warehouse managers are kept informed of the physical condition of the foods as determined by inspection and laboratory examination. Because of the prevalence of the flour beetle and the almond moth *(Ephestia cautella)*, cross infestation from other commodities usually occurs and it is necessary to fumigate the same stack about once every four months. However, the aim is not to exceed three fumigations so that after a year in storage, the particular food must be consumed. It has been found that packaging in multi-walled paper sacks offers more resistance to insects so, all other conditions being equal, foods in multi-walled paper sacks tend to have longer shelf life.

Storage losses of PL 480 foodstuffs in the main central and regional warehouses are less than 1% but increase considerably in small storehouses, especially in the rural areas where up to 20% spoilage is common. The greatest spoilage is due to damaged or broken containers.

Warehouse Construction

The central food warehouses are mainly concrete. Floor and walls are usually cement. Roofs are mainly of aluminium or corrugated metal sheets with wide openings between walls and roofs. Only in rural areas are one or two wooden buildings sometimes used. Buildings are well ventilated. Windows are made of metal or wood, placed approximately 8 to 10 feet apart and about 4 feet above ground level. Windows average 3 by 4 feet. Average size of warehouses is 100 by 50 feet with 10 feet high walls.

Stacking

In most warehouses, bags are stacked on wooden pallets, 18 inches from all walls, columns and crossbeams. Piles are sometimes as high as 20 feet but recommended height is 10-12 feet. The average warehouse can satisfactorily accommodate around 500 tons of food. Foods are not stored outdoors.

Infestation

Grains, cereals and various agricultural produce have infestation problems. Those under PL 480 programs most susceptible to insect infestation are rolled wheat, cornmeal, CSB and WSB. Rodents are also a major storage problem.

Chemicals Used

Regulations stipulate the pesticides that may be used on foods. Jamaica is guided by the legal tolerances for pesticide residues set by USDA.

Malathion and Lindane are used to spray the floor, walls and pallets of the warehouses and sometimes for surface spraying of bagged grains. Pyrethrins are used for fogging and misting. Methyl bromide and phostoxin are used under gas-proof tarpaulins or in sealed warehouses. Only the anti-coagulant type rodenticides are recommended for use in food stores, in which case cyanogas is used.

Dr. Alberto Tocunaga Ortiz enumerated the steps taken in Peru in their food storage system.

Peru—Dr. Alberto Tocunaga Ortiz, Food Supply & Distribution Manager

Our storage system is outlined in the following steps:

1. To keep the warehouses clean, a first step in the preservation of foodstuffs.
2. For fumigation we use Methyl Bromide and Phostoxin, and then spray the stacks with Malathion.
3. For rodent control we use a delayed action rodenticide called Racumin. Following ingestion, the rodents do not die until the third or fourth day, thereby preventing their rejection of this product. Racumin is a powder dusted into places frequented by rats, forming a layer 2-3mm. thick which must be renewed continuously for one week. The powder adheres to their skin or paws and is ingested when they groom themselves. It can also be used in the preparation of bait, at 1 part Racumin to 19 parts bait. All substances craved by rats can be used as bait, pulverized grains of rice, corn, wheat or potato puree. Fish and meat scraps can be used in areas where dogs and cats can be kept out. Since bait in chunk form can easily be dragged away, bait in pulverized form is recommended. Following the ingestion of Racumin, rats die without spasm or pain as though of old age or weakness. No strange symptoms appear which might attract the attention of other rats. Besides, by the time death occurs, the majority of the rats have already ingested a fatal amount. Racumin is also very effective and fast-acting with mice. Below are some of the special advantages of Racumin:
   a. Such rapid and complete extermination of the rat population that reinfestation only occurs with later migration.
   b. Kills rats painlessly and with dissimulation. Other rats have no warning and consume it without alarm.
   c. Being moisture proof, it remains effective in cellars, drainpipes, sewers and other damp areas.
   d. It is persistently effective against house mice as well.
4. We use movable platforms for food storage in order to facilitate inspection and fumigation, leaving aisles 75 cms. wide in order to be able to inspect and fumigate. In fact, we have had no infestations which have not been exterminated immediately, resulting in minimal food losses.

Due to the erroneous unloading of foodstuffs by shipping companies, spoilage and losses of food for human consumption have occurred, as the food was in effect abandoned. But this is not a problem which can be controlled by pesticides; rather, it is a matter of administration at the port level and fortunately is being resolved to avoid any new problems.

SEMINAR EVALUATION AND RECOMMENDATIONS

At the end of the program the participants were asked to evaluate the seminar. The vast majority indicated that the facilities, conference participations, lectures and demonstrations were excellent. The following suggestions were made by the participants for improving the seminar.

1. Provide more information on rural warehousing with a section on construction of small, inexpensive warehouses.
2. Add lectures on climatic conditions,

temperature and humidity, as related to insect and mold development.
3. Visit an on-going program in the host country.
4. Improving viewing arrangements at warehouse demonstrations. Due to the size of the crowd, on some occasions it was difficult for everyone to see the demonstrations. One suggestion was to set up pallets as a "staircase" where participants could either sit or stand.
5. Discussions and demonstrations at port should be more specific and include problems related to off-loading and handling of food commodities, both bagged and bulk.

Participants were asked to comment on potential follow-up actions by individual program sponsors and/or country groups; USAID's; and private industry.

Follow-up actions which they thought should be taken by program sponsors were as follows:

1. Provide in-service training for local personnel;
2. Improve warehousing in rural areas;
3. Organize a short course on food handling and food conservation for those involved in the feeding programs;
4. Assume more responsibility in implementing procedures taught in the course.
5. Study the food storage practices within their country, identify the problems and establish the necessary program of action. In conjunction with their own evaluation of planned follow-up actions, the participants were asked to transmit a short report on follow-up activities to the Food for Peace Office in their country in approximately six months. The report should specify both the direct and indirect actions which have been implemented as the result of the seminar.

The participants also commented on the actions which should be taken by each USAID:

1. More extensive monitoring and surveillance;
2. Support requests for training of personnel;
3. Establish standards for warehousing techniques. Evaluate results of improved techniques by recording food losses.
4. Work more closely with the voluntary agencies in the country, again emphasizing training.

Concerning the role of private industry in reducing commodity losses, the participants suggest that industry:

1. Continue research on improved packaging;
2. Continue to provide quality control on their products;
3. Keep participants informed on current developments so that they can continue to learn better methods of grain storage.

The Food for Peace staff recommended the following changes in planning future seminars:

1. More attention to the details of length of travel time needed for participants from different areas, so that more accurate estimates of per diem can be made.
2. The addition of a shipping expert to the staff, primarily to cover ocean shipping and off-loading.
3. The inclusion of lectures, slides and instructional materials on warehouse construction.

Overall, initial reaction from participants indicates the seminar was a success and met its objectives.

In addition to the participant and staff evaluations, the seminar was officially evaluated by Dr. Malcolm Bourne, Technical Assistance Bureau/Agriculture (TAB/AG) Food Processing Consultant; and Ms. Helen Vaitaitis, TAB/PPU Program Analyst. This evaluation team has prepared a separate report on the seminar. In summary, the TAB evaluation team made recommendations related to the mechanics of the seminar, recommendations for future seminars as well as reaching a general conclusion on the seminar. The major recommendations were to:

1. Prepare and hand out lecture outlines which refer to the specific place/page of the reading material provided;
2. Encourage participants to handle demonstration equipment and possibly purchase basic equipment for such use by partici-

pants in future;
3. Improve technical aspects of slide presentations;
4. Make the critique simpler to fill out;
5. Hold regional seminars regularly to keep up with the turnover in personnel.

Regarding the seminar objectives, the conclusion was that the seminar was a success, and had great potential for further dissemination through mini-seminars held on a national basis by participants of this course. It was noted that this seminar afforded a unique opportunity for collaboration between private industry, USDA, several offices within AID, private American voluntary agencies, the World Food Program of FAO (UN), the Industry Cooperative Program (ICP) of FAO, and government counterpart agencies from fourteen countries.

ANNEX A

LIST OF ATTENDANTS

BOLIVIA
Ricardo Gueva Rap, WFP
Robert F. Parker, CRS
Arnulfo Pañaloza, USAID
Adhemar Pinaya Z. Caritas
Hugo Vacaflor, Food Program Manager
Hernán Vera Jemio, Food Development Office

BRAZIL
Leo Jose Castro, National Supply Agency (SUNAB)
Francisco Chagas Cavalcante, SUNAB
Francisco Frota Neves Filho, SUNAB
Vital Maria Tine, SUNAB

CHILE
Ramón Daques D., CRS
Robinson Gómez M., SAWS
Ed Greaves, CARE
Manuel Jaime, USAID
Fernando Lyon, Junta Nacional de Jardines Infantiles (JNJI)
R. W. O'Pfill, SAWS
Gerardo Valenzuela, CRS
Jorge Vega, Junta Nacional de Auxilio Escolar y Becas (JUNAEB)
Eric Woolvet, CARE

COLOMBIA
Humberto Alvarado, WFP
Douglas Atwood, CARE
David Denman, FFPO
Gabriel Lagos, Bienestarina Program
Guillermo Torres, CRS

COSTA RICA
Maria Helena Denegra, WFP
Eugenio Morales Matamoros, Department of Planning
Carlos González Rojas, Department of Planning
Eduardo Antonio Wong Briceño, National Production Council

DOMINICAN REPUBLIC
José Antonio Alba Martínez, Cáritas
Enrique Bonatti, CARE
Walter Cox, CARE
Julián Reynoso, Caritas
Juan Francisco Samboy, CWS

ECUADOR
César H. Astudillo, CRS
Raúl Cadena, CARE
Robert C. Flick, CARE
Mark E. Reilly, CRS

EL SALVADOR
Daniel Barrera, CRS
Roberto Chávez, AID
Alberto Antonio Reyes Rubio, CRS
José Arnulfo Sandoval, Fomento y Cooperación Comunal con Esfuerzo Propio y Ayuda Mútua
Guillermina Segura, WFP

GUATEMALA
Carlos Castillo, CARE
Miguel Angel Grajeda, WFP
Norberto Rosales, CARE
Fernando Sotomayor Schaart, Cáritas

HAITI
Constant Auguste, CRS
Susan Bailey, CARE
John R. Bullard
Willy Fremont, CARE
Samuel Michel, CWS
Louis Omero
Duane M. Roberts, CWS

HONDURAS
Juan Antonio Arredardo P.
Edgardo Banítez
Arnold A. Bueso
Lawrence Carbajal, CARE
Arnold Castellanos Riera, Consejo Permanente de Energía Nacional (COPEN)
Jorge A. Castillo, Banco Nacional de Fomenco (BANAFOM)
José Antonio Coello, BANAFOM
Rodolfo Cojulan, BANAFOM
Jonathan Coulter, Federation of Consumer Cooperatives
Jose Enrique Espinoza, Centro de Emergencia Nacional (CEDEN)
Ricardo S. García, CARE
José Antonio González, Municipality of San Pedro Sula
Miguel A. Mattis, CRS
Irma Mejía, National University of Honduras
Amilcar Mejia López, CEDEN
Julio C. Montoya
José Fernando Ochoa B., Municipality of S.P.S.
Aristides Padilla, CRS
Marco A. Ramírez, BANAFOM
Enoc Rodriguez M., BANAFOM
Ricardo Rodriguez Ramos, WFP
Luis Eduardo Rosales, BANAFOM
Rubén E. Santiago
Angel Octavio Santos, Municipality of S.P.S.
Julio Sosa, BANAFOM
Roberto Tinoco, CRS
Francis Valva, CRS
René Velázquez
Louis Ziskind, CARE

JAMAICA
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Herman B. Earle, Ministry of Market and Commerce
Eliphalet Albert Kelly, Ministry of Market and Commerce
Charles A. Panton, Jamaica Nutrition Holdings

PANAMA
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PERU
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Alberto Tocunaga O., Food Supply and Distribution Manager

WFP
Kent Blum, Trinidad
Luís Joe Chang, WFP/Central Regional Director
Jorge Folton, Mexico
Raúl Gonzalez Vigil, Mexico
Pascual Montanara, WFP/Rome

WASHINGTON
Guinella Jonson, Michigan State University
Paul H. Russell, AID/FFP
Malcolm Bourne, AID/TAB
Herbert J. Waters, American Freedom from Hunger Foundation
Francisco L. Lanza, Translator, State Department
Theodore Herrera, Translator, State Department
Joan C. Johnson, AID/FFP
Helen Vaitaitis, AID/TAB
Ray Treichler, ICP/FAO
Keister Adams, USDA ASCS
Gerald Johnston, AID FFP
Peggy A. Sheehan, AID FFP
Jeanne Markunas, AID FFP

PRIVATE INDUSTRY
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John H. Dively, St. Regis Paper Company
Gordon Stoa, ADM Milling
Donald J. Walker, Textile Bag
Douglas Barnes, ICP/FAO
Betsy Faga, Protein Grain Products

STAFF
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Henry Highland, U.S. Department of Agriculture
Donald Wilbur, Industrial Fumigant Company
Donald Lawson, Krause Milling

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Dr. Donald Lawson
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AID FOOD FOR PEACE
Miss Peggy A. Sheehan
Food for Peace AID
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Department of State
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ANNEX B. 1

WAREHOUSE INSPECTION

YARD AREA SURROUNDING THE WAREHOUSE

1. Are Rodents present? (Look for pellets, tracks, burrows, holes, signs of feeding)
2. Are there refuse or other conditions serving as an attractant or breeding area for insects? (Spilled cereals or grains, birds nests, weeds, trash, piled pallets or damage)

WAREHOUSES

1. Are there openings (windows, ventilators, open eaves, etc.) that permit the entry of birds? Are they screened?
2. Are there openings that permit the entry of rodents? Are they screened?
3. Are traps or rodent bait stations in use? Are the rodent control devices being used properly? (Cleaned and Serviced regularly; properly located; correct bait?)
4. Does the roof leak? If so, have the products been adequately protected so they do not get wet?
5. Can rain contact the products because of open windows or doors?
6. Does surface water get into the building? If so, have the products been stored on pallets or in such a manner so as to keep them dry?

PRODUCTS

1. Are the products stored in an orderly manner?
2. Is there space adequate between stacks for inspection and cleaning?
3. Is there adequate space between stacks and walls or partitions?
4. Is there refuse or other infested materials stored in the same building?
5. Are the floors, walls and beams free of accumulations of food that would attract insects, rodents, or birds?
6. Are the products stored off the floor, such as on pallets, racks or bamboo mats?
7. Is the exterior of the packages or products clean?
8. Are there insects or spilled products between the stacked bags?
9. Is there evidence of activity by insects rodents birds ?
10. Is there mold on the outside of any packages of food?
11. Have damaged bags been separated from undamaged bags?
12. Is there a program for removal and rapid disposition of damaged or out-of-condition products?
13. Are insecticide sprays or fogs used? Is someone responsible for checking for effectiveness? If so, are the results satisfactory?
14. Is there a program for the fumigation of insect-infested products? If so, does it appear to be successful?
15. Are adequate records kept for a program of stock rotation such as first in—first out?

ANNEX B. 2

CRITIQUE

FOOD STORAGE PRACTICES SEMINAR

San Pedro Sula, Honduras

January 25-30, 1976

Name:

Country:

Affiliation (Agency):

Title (Job Function):

The Seminar Staff and USAID wish to determine the effectiveness of this Seminar. Please help us by answering the following questions. It will be a great help if you will include comments to the questions.

1. Were the training aids (slides, film, notebook, etc.) clear and adequate?
2. Were the physical facilities (meeting room, lighting, seating, hotel, etc.) adequate?
3. Were administrative arrangements (hotel reservations, funding, etc.) adequate?
4. Was the subject matter of the seminar adequate to meet your needs? If not what subject matter should be included?
5. Were the lectures and demonstration presented in a clear, understandable manner?
6. Please give your suggestions for improving the seminar.
7. Have you received adequate information for you to implement recommendations that have been presented?
8. Have the information and recommendations been practical?
9. What follow-up activities *should be* implemented by—
   a. You and your organization
   b. USAID
   c. Private industry
10. What follow-up activities will you *actually* implement?

Summary of Critiques Prepared by Participants at the Latin America Food Storage Seminar. Total number of Critiques Submitted 65.

I. SUMMARY OF QUESTIONS:

1. Were the training aids (slides, film notebook, etc.) clear and adequate?
   Yes: 63 No: 2

2. Were the physical facilities (meeting room, lighting, seating, hotel, etc.) adequate?
   Yes: 62 No: 3

3. Were administrative arrangements (hotel reservations, funding, etc.) adequate?

Yes: 57	No: 1	No Response: 7

4. Was the subject matter of the seminar adequate to meet your needs?
   Yes: 59 No: 6

5. Were the lectures and demonstrations presented in a clear, understandable manner?
   Yes: 60 No: 5

7. Have you received adequate information for you to implement recommendations that have been presented?
   Yes: 60 No: 5

8. Have the information and recommendations been practical?
   Yes: 65 No: 0

ANNEX B. 3

Circle the correct answer.

1. *Most insects have:*
   A. Three body divisions, 2 pairs of wings, 6 legs
   B. An inne · skeleton
   C. Two body divisions, 2 pairs of wings, 8 legs

2. *Most insects that attack stored-products are:*
   A. Larvae
   B. Moths or beetles
   C. Cockroaches

3. *Beetles are distinguished by:*
   A. Small rear wings
   B. Abdomen with 3 pairs of legs
   C. Hard front wings and membranous rear wings

4. *Adult moths have:*
   A. Scales on the wings
   B. Very small rear wings
   C. Feeding mouth parts

5. *Flour beetles (Tribolium species) are:*
   A. The largest stored-product beetle
   B. Red brown in color
   C. Very rare

6. *Lesser grain borers (Rhyzopertha dominica):*
   A. Are common in candy
   B. Always live outside of the individual grain
   C. Are excellent penetrators

7. *Cigarette beetles (Lasioderma serricorne):*
   A. Cannot penetrate any package
   B. Are only found on stored tobacco
   C. Feed on many stored products

8. *Sawtoothed grain beetles (Oryzaephilus surinamensis):*
   A. Are "invading" insects
   B. Feed only on sawn teeth
   C. Are found only in Surinam

9. *Fumigants are applied:*
   A. To walls and floors
   B. As a surface treatment
   C. As a space treatment

10. *Fumigants, at room temperature, are:*
    A. Solids
    B. Gases
    C. Liquids

11. *Fogging is a form of:*
    A. Fumigation
    B. Space treatment
    C. Package treatment

12. *Methyl bromide is a:*
    A. Fumigant
    B. Surface treatment
    C. Fogging treatment

13. *Methyl bromide is:*
    A. Heavier than air
    B. Odorless
    C. Both A and B

14. *Phosphine:*
    A. Weighs about the same as air
    B. Has a distinctive odor
    C. Both A and B

15. *Phosphine is detected with a:*
    A. Halide detector
    B. Auer tube
    C. Flame detector

16. *When working with methyl bromide you must always wear:*
    A. Gloves
    B. Face mask
    C. A smile

17. *When using phosphine you should:*
    A. *Never* stack a large quantity of pellets or tablets together
    B. Always wet the pellets or tablets with water
    C. Work alone, for safety

18. *Methyl bromide is poisonous to:*
    A. Insects only
    B. Rodents only
    C. Most living things

19. *Warehouse pallets should:*
    A. Not be used, to avoid insect and rodent harborage
    B. Be stacked against walls
    C. Always be used to get stored items off the floor

20. *Insect contamination can be minimized by:*
    A. Use of insect-resistant packages
    B. Avoiding movement of oldest stock, to prevent damage to packages
    C. Storing leaking bags in the warehouse, as attractive baits

21. *Insects can enter:*
    A. Tightly sewn cotton bags
    B. Woven polypropylene bags
    C. Both A and B

22. *Insecticides can be classified as:*
    A. Fumigants, residuals, contact
    B. Fogs, space treatments
    C. Solids

23. *Insecticides can be applied as:*
    A. Fogs, sprays, dusts
    B. Liquids, dusts, fumigants
    C. Both A and B

24. *Application by fogging is principally to kill:*
    A. Hidden larvae
    B. Flying and exposed insects
    C. Insects hidden behind walls

25. *Fogging may be considered a:*
    A. Fumigation
    B. Surface treatment
    C. Space treatment

26. *Spraying is principally to apply a:*
    A. Fumigant treatment
    B. Residual treatment
    C. Fogging treatment

27. *Rodent harborage can often be found:*
    A. Inside the warehouse
    B. Outside the warehouse
    C. Both A and B

28. *Anti-coagulant rodenticides:*
    A. Kill immediately
    B. Take several days to kill
    C. Are the most dangerous rodenticides that are used

29. *Rodents can enter an opening that is:*
    A. 1/2 inch (1.25 cm.)
    B. 1 inch (2.5 cm.)
    C. 3 inches (7.5 cm.)

30. *Insect-resistant packages must have:*
    A. Insect-tight construction
    B. Insect-resistant treatment
    C. Both A and B

31. *Penetrating insects can easily bore through:*
    A. Paper, polyethylene, foil
    B. Tin cans, glass
    C. Insect-resistant-treated paper

32. *Residual treatments kill insects that:*
    A. Crawl on surfaces
    B. Move around inside bags
    C. Fly in the air

33. *Dispose of phosphine residual ash by:*
    A. Pouring ash and detergent in water
    B. Pouring on the ground
    C. Either A or B

34. *Proper warehousing procedures include:*
    A. Storing product away from walls
    B. Keeping the warehouse filled at all times
    C. Minimal use of insect control and sanitation procedures

35. *Insect-resistant-treated bags are treated with:*
    A. Nothing, but are insect tight
    B. Pyrethrins plus piperonyl butoxide
    C. Pyrethrins plus piperonyl butoxide; therefore they do not have to be insect tight

36. *The following is shipped in insect-resistant bags:*
    A. CSB and cornmeal
    B. Wheat flour
    C. Bulgur and rice

37. *Heavy infestations require the following, as compared to light infestations:*
    A. More fumigant
    B. Less fumigant
    C. The same quantity of fumigant

38. *Fabric bags:*
    A. Are easily infested
    B. Are difficult to infest
    C. Are never infested

39. *One of the principal sources of reinfestation after fumigation is:*
    A. Damaged bags or neglected, exposed stocks
    B. Insects brought in from the ships
    C. Insects escaping from other bags

40. *Inspections are required:*
A. Only after treatment with an insecticide
B. At regular, frequent intervals
C. Only when insects or rodents are seen

ANSWER SHEET

1. A
2. B
3. C
4. A
5. B
6. C
7. C
8. A
9. C
10. B
11. B
12. A
13. C
14. C
15. B
16. B
17. A
18. C
19. C
20. A
21. C
22. A
23. C
24. B
25. C
26. B
27. C
28. B
29. A
30. C
31. A
32. A
33. A
34. A
35. B
36. A
37. C
38. A
39. A
40. B

ANNEX C

SEMINAR ORGANIZATION/PRE-PLANNING

Administrative Checklist

For those who are thinking of preparing a mini-seminar on food storage and handling, the checklist we used for our preparations might be of use.

1. Questionnaires mailed 60 days in advance.
2. Funding secured to cover costs of seminar
3. *Facilities*
   a. Hotel Accommodations for all attending seminar
   b. Meeting Room
      (1) Adequate size
      (2) Location
      (3) Availability on required dates
   c. On-Site Facilities
      (Request only routine sanitation practices be employed prior to seminar.)
      (1) Adequate size to accommodate attendees
      (2) Location (name and address)
      (3) Availability on required dates
      (4) Commodities on hand—Grain and cereal products
         (a) in multi-wall paper bags
         (b) in cotton or jute bags
         (c) in woven polypropylene bags
4. *Services*
   a. Transportation for Staff, Attendees and Guides, from Quarters to sessions and return
   b. Refreshments
      (1) Coffee breaks
      (2) Lunches
      (3) Hospitality and/or dinner
5. *Personnel* (Other than staff and Guests)
   a. Translators
   b. Local pest control operator (if desired)
   c. Secretarial services with duplication equipment
6. *Equipment*
   a. Mailing of equipment and supplies from U.S.
   b. Meeting room
      Public address system
      Translation equipment to be used by interpreters
      Audio-visual equipment
      —16mm movie projector—sound
      —Super-8mm movie projector—sound preferred
      —35mm slide projector with remote control
      —Screen—6 foot preferred
      Blackboard
      Easel with paper—black felt-tipped pens
   c. *Warehouse*
      Portable public address system
      2 tarpaulins for fumigation, 40 feet by 80
      2 tarpaulins for fumigation, 40 feet by 80, preferred 5 mil polyethylene minimum or gas-tight vinyl-covered canvas
      Phosphine—pellets or tablets
      Methyl bromide—cans
      Jiffy applicator with 10-foot plastic tube for methyl bromide cans
      Sand snakes (4 or 6 inch canvas tubing) to hold down edges of tarpaulin
      Hand sprayer, 2 or 3 gallon capacity
      Fog device, any model that is available, ultra-low-volume (ULV) preferred
      Insecticide (spray), residual or contact, formulation permissible for use in Honduras
      2 full face gas masks with 2 canisters for methyl bromide and 2 for phosphine
      Halide detector for detection of methyl bromide—with 20-foot plastic tubing
      Auer (or similar) detector with tubes for phosphine—with 20-foot plastic tubing
      10 fumigation warning signs as may be required in Honduras.

ANNEX D

ACKNOWLEDGEMENTS

Department of State

The United States Department of State furnished two translators, Messrs. Francisco Lanza and Theodore Herrera. They were excellent and, with most of the attendees speaking Spanish, their instantaneous translation was an important and necessary part of the seminar.

Private Industry

The following companies furnished literature for distribution at the seminar. The literature represented some of the chemicals and equipment that is available to aid in the control of insects, rodents and birds in warehouses and grain storage facilities. The presentation of this material is not an endorsement of the chemicals or equipment. It was the intent to indicate the type of materials available.

Auergesellschaft GMBH
1000 Berlin 65 (West)
Friedrich-Krause-Ufer 24
Germany

Avitrol Corporation
7644 E. 46th Street
P.O. Box 45145
Tulsa, Oklahoma 74145

Bower Industries, Inc.
1601 W. Orange Wood Ave.
P.O. Box 1631
Orange, California 92668

Chemagro Chemical Corp.
P.O. Box 4913 Hawthorne Road
Kansas City, Missouri 64120

Chempar Chemical Company, Inc.
260 Madison Avenue
New York, New York 10016

CIBA-GEIGY Corporation
P.O. Box 11422
Greensboro, North Carolina 27409

Conwed Corporation Plastics Div.
7700 29th Avenue Street
Minneapolis, Minnesota 55414

Degesch
Postfach 2644
Frankiurt (Main) 1
Western Germany

Dow Chemical Company
Midland, Michigan 48640

J. T. Eaton & Company, Inc.
10311 Meech Avenue
Cleveland, Ohio 44105

ANNEX D1 ANNEX D2

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Great Lakes Chemical Corporation
P.O. Box 2200
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500 N. Michigan Avenue
Chicago, Illinois 60611

The Industrial Fumigant Company
923 State Line
Kansas City, Missouri 64101

Kness Manufacturing Company
Albia, Iowa 52531

McLaughlin-Gormley-King Company
8810 Tenth Avenue North
Minneapolis, Minnesota 55427

Micro-Gen Corporation
8127 Vidor Drive
San Antonio, Texas 78216

Mine Safety Appliances Company
201 Penn Center Blvd.
Pittsburgh, Pennsylvania 15235

Phostoxin Sales
2221 Poplar Blvd.
Alhambra, California 91801

Prentiss Drug & Chemical Co., Inc.
363 Seventh Avenue
New York, New York 10001

Rid-A-Bird
Box 22
Muscatine, Iowa 52761

Root-Lowell Corporation
Lowell, Michigan 49331

Solvit Chemical Company
7001 Raymond Road
Madison, Wisconsin 53713

Spraying Systems
North Avenue at Schmale Road
Wheaton, Illinois 60187

Velsicol Chemical Company
341 E. Ohio Street
Chicago, Illinois 60611

Virginia Chemical Company
3340 W. Norfold Road
Portsmouth, Virginia 23703

SEMINAR IN
FOOD STORAGE AND HANDLING PRACTICES
SAN PEDRO SULA, HONDURAS
JANUARY 26-30, 1976
Request for follow-up assistance

Please fill in the following:

Name: _____

Mailing Address: _____

_____

Please place an X in the left column where follow-up material *is* requested. Also list language or languages of preference.

Request	Lecture Number	Title	Language
	(1)	How to Extend the World's Food Supply Through Improved Packaging, Storage and Handling (8mm film)	Not available at this time
	(2)	Quality Assurance Programs in the United States	
	(3)	Fumigation Procedures: Slides and Lecture Outline 16mm Movie on Phostoxin (may be available on a loan basis)	
	(4)	Rodent Control	
	(5)	Insect Pests of Processed Cereals and Bagged Grain	
	(6)	Application of Insecticide Sprays and Fogs	
	(7)	Types of Damage to Packaged Food Commodities	
	(8)	Protection of Packaged Commodities from Insects	
	(9)	Typical Movement of Commodities in Overseas Programs	
	(10)	Warehouse Construction as it Relates to Sanitation	
	(11)	Inspection of a Warehouse	

Mail this form to. Ms. Peggy A. Sheehan
Chief, Program Operations Division
Office of Food for Peace
Room 301 R.P.E.
Agency for International Development
Washington, D.C. 20523