

Food Security Management Project (391-0491)
Storage Technology Development and Transfer
Contract No. 391-0491-C-00-6080-00

Planning Phase Report

by

John R. Pedersen
Grain Storage Specialist

Food and Feed Grain Institute
Kansas State University
Manhattan, Kansas 66506
USA

2-13 August 1986

I. INTRODUCTION

This TDY was undertaken as part of the Planning Phase of the STDT sub-component of the Food Security Management Project.

The specific objectives of this assignment was to:

- 1) establish contacts with potential counterpart agencies and individuals.
- 2) identify and review proposed activities with potential counterpart agencies and individuals.
- 3) identify constraints to the accomplishment of STDT sub-component objectives.

Prior to start of this TDY, discussions regarding the Planning Phase of the STDT sub-component were held with Mr. Inamul Haq, Joint Secretary of Agriculture (Food) and Dr. Zakir Hussain, USAID/Islamabad at the Food and Feed Grain Institute, Kansas State University.

The content of this report is organized according to the following task groupings of the STDT sub-component.

- o Bulk storage technology development.
- o Research activities and extension of research results.
- o Training activities.
- o Special activities:
 - Literature file and computerized bibliography.
 - Data collection on current conditions and practices associated with losses.
 - Distribution of weather information related to grain storage.

II. BULK STORAGE TECHNOLOGY DEVELOPMENT

A team from FFGI/KSU is scheduled to arrive in Pakistan on or about September 4 with the specific objectives of:

- 1) finalizing detailed work plans for year 1 activities.
- 2) determining an organizational structure.
- 3) compiling equipment lists so that purchase can be initiated.
- 4) conducting a bulk storage review.

The bulk storage review team is to be made up of a FFGI/KSU team and counterparts designated by agencies of the Government of Pakistan (GOP). The Post-harvest Management Specialist (PMS) has prepared a list of potential Pakistani counterparts to work with the FFGI/KSU review team (Annex 1). This joint team is to review the several current studies on the feasibility of public sector bulk storage.

This consultant's activity centered on assisting in the identification of a suitable grain storage specialist to serve on the FFGI/KSU part of the team, and in reviewing correspondence pertinent to the arrangements for the bulk storage review.

III. Research Activities and Extension of Research Results

The STDT sub-component includes three main research efforts: a survey to determine the levels of insect resistance to pesticides currently used in Pakistan; a study to determine whether the use of grain protectants (in admixture with wheat) would result in undesirable residue levels in foods; and the comparison of integrated pest management (IPM) protocols for use in godowns to determine the most effective and economical.

On the basis of visits by the PMS prior to this consultant's arrival, joint visits during this TDY and other information it was judged that the best qualified institutions to be involved in the resistance and residue studies respectively, were the Grain Storage Research Laboratory (PARC) and Federal Pesticide Research Laboratory (PARC), both located in Karachi. Staff lists from the most recent annual reports of these laboratories are attached as Annex 2 and Annex 3.

On a visit to these laboratories on August 5-7, 1986 discussions were held with the directors, Dr. Hafiz Ahmed (GSRL) and Mr. M.M.H. Baig (FPRL), and their staff members to tentatively outline work plans, manpower requirements and equipment needs for the three main research efforts. Written proposals were requested from the GSRL and FPRL for the three main research projects that were discussed, i.e. insect resistance, pesticide residues and integrated pest management research projects. At the request of Dr. Barry Primm, estimated costs to cover subcontracting for the research projects were prepared and are included in Annex 6.

Insect Resistance

Discussions were held with Mr. Mohammad Sardar Alam and Mr. Mohammad Qasim Chaudhry, GSRL, regarding the development of a research effort to conduct a survey of insect resistance to pesticides used in public sector grain storage facilities. A plan was outlined to collect insect populations twice each year from six primary areas located throughout Pakistan (Annex 4). Secondary godown locations in each of the primary areas were also suggested. Approximately 20-25 sampling sites would be included. A first sampling would be made early in the storage season; the second, late in the storage period, each year.

A questionnaire would be developed to identify specific information regarding the insect population collected for testing, e.g. location, quantity of grain involved, history of pesticide application, etc.

Insect population collections would be made by GSRL personnel, for the most part, to provide consistency in the sampling. However, where other qualified field stations may be established by PARC with competent personnel, their assistance should be solicited.

The insect resistance survey is scheduled for a three year period. The first year the insect species to be surveyed include the three most common pests in public sector godowns: Rhyzopertha dominica, Trogoderma granarium and Tribolium castaneum. Other species that may be surveyed include Sitophilus oryzae, Oryzaephilus surinamensis and Sitotroga cerealella.

The pesticides to be included are malathion, pirimiphos methyl (Actellic) and phosphine (a fumigant). Other pesticides which may be included are fenitrothion, permethrin (Coopex), chlorpyrifos-methyl (RELDAN) and dichloros (NOGOS).

FAO standardized methods are to be used for evaluating the insecticides and fumigant.

It is anticipated that manpower requirements will include the following:

- 1 Scientific Officer
- 1 Assistant Scientific Officer
- 2 Laboratory/Field Assistants

Travel support for insect population collections will also be required.

Equipment needs were tentatively outlined and are included in Annex 4. The most critical need appears to be for environmental chambers to maintain constant temperature and humidity conditions for the resistance testing and insect culture maintenance. Some funds for equipment are included in the FFGI/KSU contract.

Pesticide Residues

Grain protectants are currently not used extensively in Pakistan. Mr. Baig (FPRL) indicated that the only material currently "registered" for use in direct admixture with wheat is pirimiphos-methyl (Actellic). There are also some indications that malathion has been admixed with wheat. In view of the decision to establish a grain storage reserve, the difficulties in conducting whole godown phosphine fumigations and the apparent move toward increased bulk storage of wheat, admixture of certain insecticides with wheat to prevent it from becoming infested may prove to be an economically viable alternative. This could help maintain the quality of stored wheat and reduce the necessity for phosphine fumigation. There are also concerns on the part of some individuals that direct admixture of insecticides with wheat for human consumption is not an acceptable practice. However, this type of treatment is used quite extensively in many countries and the FAO/WHO Codex Alimentarius has established acceptable tolerance levels for those insecticides proposed for testing.

To document the fate of insecticides directly admixed with wheat under the conditions of storage and end-product use in Pakistan, a pesticide residue research project was proposed for USAID support under the Storage Technology Development and Transfer (STDT) sub-component.

Discussions were held with Dr. S.Z. Masud, Mrs. Shamim Farhat and Miss Zahida Parveen of the Federal Pesticide Research Laboratory regarding the development of a research project to determine the residues of protectants in cereal food products. A tentative plan for a three year, three phase study was outlined (Annex 5).

The first year of the study would involve a laboratory evaluation to determine the residues of three grain protectants admixed with wheat and stored at two (2) temperatures and three (3) moisture contents for 1 year. The second phase of the study would evaluate the residues of the three grain protectants when admixed with wheat and stored at six (6) storage sites at various locations in Pakistan. The third phase of the residue study would determine the fate of residues in processed products and consumer foods made from protectant treated wheat.

The Federal Pesticide Research Laboratory, PARC located in Karachi is considered the most logical site for the conduct and coordination of this research effort.

Dr. Masud has had previous experience working with persistence of fenitrothion and malathion in stored wheat (Masud and Zaki, 1976) and the laboratory is generally equipped for pesticide analysis. There is a need, however, to upgrade the gas-liquid chromatographic (GLC) equipment, thin layer chromatographic (TLC) equipment and extraction/clean-up equipment. Certain chemicals are also required which are not locally available.

In addition, the pesticide research laboratory is located on the same site as the Grain Storage Research Laboratory. This should facilitate the treatment and storage of grain samples used in the research project.

Integrated Pest Management

A general discussion was held with personnel of the Grain Storage Research Laboratory and the concept of comparing different integrated pest management (IPM) protocols in public sector godowns was presented.

Dr. Harlan Shuyler, Postharvest Management Specialist (PMS), held discussions on the implementation of the IPM research project under the STDT sub-component with selected GSRL staff members. The substance of these discussions should be included in the PMS report.

The IPM research effort will require coordination by persons who understand the IPM concept and are familiar with the application of the various types of pest control to be used in the research effort.

Personnel of the GSRL are familiar with the handling of insecticides and fumigants and some have been involved in godown fumigations and the public sector loss assessment study.

In my opinion, the staff of the GSRL should be involved in coordination of the research but is not large enough to provide the total manpower that will be needed to accomplish the IPM research component. It will be necessary to enlist the support of personnel at the godown sites selected for implementing the IPM research. Much of the effort at godown sites will involve preparation of facilities for receiving wheat into storage, sampling/weighing of wheat into storage and preparation for accomplishing the aspects of each protocol.

The involvement of local godown personnel would necessitate supervision of their usual activities to conform to the protocols.

IV. TRAINING ACTIVITIES

A. Short-Term Study Tours

In the contract "Food Security Management (PHM-STDT) page C-13, in In-Country Training reference is made to "Specialized Training for Insecticide Resistance and Residues". The two persons selected to be responsible for conducting the insecticide resistance and residue research should receive a minimum of 2 person-months each of overseas training in the most recent technology related to insect resistance and insecticide residue analysis. The overseas rather than in-country training is considered mandatory in order to provide these investigators with a greater opportunity to gain experience and observe ongoing work in established laboratories conducting research in this field. A broader

spectrum of training and information can be obtained at less cost by sending the two investigators overseas than by attempting to bring this expertise and equipment to Pakistan through short-term consultancies.

The two persons who would most likely derive the greatest benefit from the proposed short-term study tours are Dr. S.Z. Masud (FPRL) or one of his assistants and Mr. Mohammad Sardar Alam (GSRL). Dr. Masud is Senior Scientific Officer of the Residue Research Section, FPRL. Either one of his two scientific staff would also be potential candidates for the training.

Mr. Mohammad Sardar Alam is the Entomologist assigned duties in the area of insecticide resistance. A Tropical Development and Research Institute (U.K.) bilateral project will provide an in-country training effort in measuring phosphine resistance later this year. However, this project calls for measurement of resistance to insecticides in addition to phosphine (a fumigant).

Laboratories considered for inclusion in the study tours encompass universities, USDA, FDA, EPA and those of pesticide manufacturers.

B. Long-Term Training - Degree Programs

Degree program training opportunities were outlined during discussions with Mr. U.K. Baloch, National Coordinator (Post Harvest Management), PARC and with personnel at the Grain Storage Research Laboratory and Federal Pesticide Research Laboratory. Dr. Shuyler has indicated the opportunities for degree program training in contacts with university personnel at Peshawar and Faisalabad and in the Ministry of Food, Agriculture and Cooperatives (MINFA).

Although the Food Security Management (PHM-STDT) Contract specifies that three entomologists and three storage engineers will be trained at the M.S. level, this should not preclude the possibility training chemists or persons of other disciplines that are engaged in post-harvest grain storage activities.

Some of the more promising candidates for degree program training are located within the Grain Storage Research Laboratory. Several of the GSRL personnel have M.Sc. degrees and could be candidates for Ph. D. programs (See Annex 2). There are two B.Sc. level personnel who may be candidates for M.Sc. training.

Nominations from the various sources contacted have been requested. To date no formal nominations have been received through PARC. The PMS should be supplied with application blanks and other pertinent forms so that when candidates are identified a simultaneous screening can be undertaken at KSU.

C. Training of Trainers

This subject has been discussed with various entities within Pakistan. There seems to be many views on who should be the trainers and who should train who.

The contract calls for the establishment of a special training section within PARC to organize and conduct intensive short courses for the extension of PHM technologies to those operationally concerned with public sector grain storage and to develop and implement an intensive training program for establishing a cadre of indigenous trainers to staff the special training section. Candidates for the training cadre were to be recruited from a variety of organizations.

It has been suggested that training of PASSCO and Provincial Food Department personnel at the procurement center and godown level may be accomplished by their own personnel (i.e. PASSCO and PFD

personnel) and that training of these trainers could be provided under this contract. The assumption is that persons familiar with godown operations would be better able to provide relevant training.

It was originally proposed by the FFGI/KSU that persons selected for the training cadre be sent to the AID/KSU Grain Storage and Marketing Short Course with an additional 2-week specialized training in the preparation and use of audio-visual materials. During this short course and two weeks specialized training the trainers will be provided guidance and materials required for developing the training courses in Pakistan. This recommendation is still valid. Five participants per year over the four years of the project are to be sent for this training.

For the first years group of trainers it is suggested that two individuals be selected from the Grain Storage Research Laboratory, two from PASSCO and one from the Agricultural University, Faisalabad or from the NWFP Agricultural University, Peshawar. This selection should provide a top level core of trainers.

V. SPECIAL ACTIVITIES

1. Literature File and Computer Bibliography

1. Grain Storage Research Laboratory - Although I haven't had the advantage of reviewing situations at the agricultural university facilities at Faisalabad, Peshawar or Hyderabad (Tandojam) it appears that the strongest concentration of literature related to post-harvest storage management is located in the library of the Grain Storage Research Laboratory (GSRL). The library though small, is neatly organized and maintained. A micro computer (Multitech 64K) located in the library is used for data storage, statistical analysis and bibliographic purposes.

Staffing at the GSRL does not presently include a librarian. Obviously some one has been taking responsibility for the library as shown by its current condition. The laboratory is a "subscriber" to the FFGI/KSU Post-Harvest Documentation Service and regularly receives the acquisitions lists, makes use of computer subject searches and has received reprints.

Unless there are other reasons, this seems to be the logical location for the postharvest literature file and computer bibliography.

The FFGI/KSU Post-Harvest Documentation Service is in the process of planning a 3-day seminar on the development of a post-harvest documentation network. This seminar, tentatively planned for April 1987, will be held at the National Agricultural Library (NAL), U.S. Department of Agriculture, Beltsville, Maryland (near Washington, D.C.).

The seminar will explore the development of compatible computerized bibliographic literature files which would allow the exchange of information between postharvest documentation centers.

It is recommended that someone from the GSRL who has worked with the library and the micro computer be funded to attend the proposed seminar. An initial notice of the seminar will be sent to Mr. U.K. Baloch, National Coordinator (Post Harvest Management), Pakistan Agricultural Research Council, Islamabad with copies to Dr. Hafiz Ahmed, Director, Grain Storage Research Laboratory, Karachi and Dr. Harlan Shuyler, Post-Harvest Management Specialist, Storage Technology Development and Transfer (STDT), Food Security Management Project, USAID/Islamabad.

2. Other locations in Pakistan - As indicated, there may be other potential sites for the location of a centralized literature file and computerized bibliography on post harvest management. Dr. Shuyler(PMS) has indicated that the national Agricultural Research Center (NARC), located in Islamabad, has been suggested as a site for such a literature file and computerized bibliography. This possibility should be explored, however, in the interest of getting the file initiated and in use, the GSRL still appears to be the most logical site for the present.

B. Data Collection on Current Conditions and Practices Associated with Losses

1. Published Reports and Other Documents - The collection of data on current conditions and practices associated with losses, at least initially, is best accomplished by collecting published reports and other documents related to postharvest practices and losses. To this end a series of references are presented in Annex 7. Copies of these reports and/or documents have been obtained and should be made a part of the STDT project file in Pakistan as well as at the FFGI/KSU. As new reports and/or documents are identified they should be included in these files.

2. Factors that affect the accurate assessment of losses - In discussions and in published reports, there are reference to various ways in which actual losses may be masked or inaccurately determined or interpreted. A special effort should be made under this aspect of the project to document the most reliable loss assesment method for use with the grains stored in Pakistan and its use under conditions in Pakistan. The World Bank study on losses (Baloch et al, 1986) and associated loss studies being evaluated at the GSRL compare loss assessment methodologies.

Another aspect which must be considered in evaluating the various IPM protocols is the change in moisture content of grains as well as the by-products of insect infestation, i.e. dust, extent of damage, etc.

There are also suggestions of deliberate contamination of grains with sand or other debris to alter weights. Any loss assesment as a means of comparing IPM protocols should bear this factor in mind.

C. Distribution of weather data (information) related to storage

No specific efforts were undertaken with respect to this "special activity" by this consultant.

Food and Feed Grain Institute
Kansas State University

Storage Technology Development & Transfer/
Food Security Management Project

Islamabad, July 24, 1986

Mr. Sirajuddin Ahmed
Deputy Secretary(Storage Cell)
Ministry of Food, Agriculture
and Cooperatives
29-Blue Area, FSM Building
Islamabad

Dr. Umar Khan Baloch
Director, Research (Crop Protection)
PARC, L-13, Al-Markaz F-7
Islamabad

Dear Messrs Ahmed and Baloch:

During this planning phase of the STDT project, a review is to be made by the Food and Feed Grain Institute (FFGI) of the results of studies to date on the feasibility of public sector bulk grain storage facilities, in collaboration with PARC and MINFA personnel. If a bulk storage/handling system is feasible and desired by the Government of Pakistan, an implementation plan is to be developed by FFGI, in collaboration with PARC and MINFA personnel, for conducting a study to identify the most efficient bulk storage facility design(s) for Pakistan conditions.

It is requested that personnel be nominated with whom FFGI specialists will work in collaboration on this task. Each person involved must have knowledge of the grain storage/handling system. It is anticipated that the study will begin 6 or 7 September 1986 and will be completed in about a five-week period. An initial briefing/task assignment meeting is intended to be held in Islamabad. Similarly there will be a meeting at the conclusion of the study. There might be a need for other meetings. An average of about 2 work days per work week will be required of each person.

Suggested experience of the personnel for this review and suggested names, where known, follow:

1. Storage engineer with extensive knowledge and experience of the bag and bulk storage/handling systems. Mr. Muhammad Amin, Senior General Manager (Works), PASSCO, Lahore, is suggested.

2. A person with economics/finance experience and knowledge of these kinds of information regarding bag and bulk storage/handling systems. Mr. S.M. Chaudhry, General Manager (Finance & Accounts), PASSCO, Lahore, is suggested.
3. An official of a food department of a province producing a surplus of wheat, having extensive knowledge and experience of the bag storage/handling system and some knowledge of the bulk storage/handling system, and, preferably, having an acquaintance of grain quality preservation problems due to insects, etc. Mr. A. Rashid Khan, Director, Food, Punjab Food Department, is suggested.
4. A person with extensive knowledge and experience in the logistics of grain handling and storage and, preferably, with knowledge of economic/financial matters related to these logistics. Mr. Abdul Majeed, National Transport Research Center, Planning and Development Division, is suggested.

The FFGI team will consist of a storage engineer, a grain marketing economist, a grain quality preservation specialist and the postharvest management specialist. The total team must not be so large as to be unwieldy, but one or two additional participants may be desired by the Government of Pakistan. Suggestions follow:

- a. An official of a food department of a province with a wheat deficit having extensive knowledge and experience of the bag storage/handling system and, preferably, some knowledge of the bulk storage/handling system. Mr. Aman Ullah Khan, Director, Food, N.W.F.P., is suggested.
- b. PARC may wish to nominate some fully qualified person from outside the Council's staff. In this connection, it is noted that Mr. Noor Muhammad Shah, Director General, Food, Karachi, has experience in handling wheat in bulk at ports and in handling/storing wheat in bags in the Sind.

Thank you for your kind assistance in this matter.

Sincerely,

Harlan R. Shuyler
→ Harlan R. Shuyler
PHM Specialist
STDT Component, FSM Project
Office of ARD, USAID/Islamabad

cc: ARD, USAID/Islamabad - Barry Primm
FSM Proj Coordinator - Gulzar Qazi
KSII - Roe Borsdorf

GRAIN STORAGE RESEARCH LABORATORY
PEST MANAGEMENT RESEARCH INSTITUTE
PAKISTAN AGRICULTURAL RESEARCH COUNCIL,
MALIR HALL, KARACHI-27

LIST OF SCIENTIFIC STAFF

1. Dr. Hafiz Ahmed, Chief Scientific Officer/Director
B.Sc. (Agric.); Ph. D. (Entomology).
2. Dr. Ghulam Jilani, Senior Scientific Officer
M.Sc. (Agric.); Ph. D. (Entomology).
3. Mr. Mohammad Nayeemullah, Senior Scientific Officer
M.Sc. (Microbiology).
4. Mr. Mubarik Ahmed, Scientific Officer
M.Sc. (Entomology).
5. Mr. Mohammad Sardar Alam, Scientific Officer
M.Sc. (Entomology).
6. Mr. Noorullah, Scientific Officer
M.Sc. (Biology).
7. Mr. Muhammad Anwar, Scientific Officer
M.Sc. (Ento. Agric.).
8. Mr. Muhammad Qasim Chaudhry, Scientific Officer
M.Sc. (Chemistry).
9. Miss Husna Salleha Haque, Scientific Officer
M.Sc. (Botany).
10. Mr. Shamim Iqbal, Assistant Scientific Officer
M.Sc. (Entomology).
11. Mr. Safdar Ali, Assistant Scientific Officer
M.Sc. (Zoology).
12. Mr. Mohammad Iqbal Khan, Assistant Scientific Officer
B.Sc. (Zool./Botany).
13. Mr. Ghiasuddin, Assistant Scientific Officer
B.Sc. (Zool./Botany).
14. Miss Ishrat Niaz, Assistant Scientific Officer
M.Sc. (Plant Pathology).
15. Mr. Akhlaq Ahmed, Assistant Scientific Officer
M.Sc. (Zoology).
16. Mr. Mohammad Ahter Rafi, Assistant Scientific Officer
M.Sc. (Zool./Ento.).
w.e.f. 02.12.84 to 27.05.85

SOURCE: Annual Project 1984-85. GSRL, PMRI, PARC. June 1986

ORGANIZATIONAL SET UP

Principal Scientific Officer
(HEAD)

MR. H. M. H. BAIG

INVESTIGATION ON STORAGE STABILITY & RESIDUES OF PESTICIDES(PL-480 PROJECT)	QUALITY ASSURANCE SECTION	RESIDUE RESEARCH SECTION	INSECT RESISTANCE RESEARCH SECTION	GENOTOXICITY RESEARCH SECTION	MICRO- BIOLOGICAL RESEARCH SECTION	OFFICE
1. <u>Sr. Sct. Officer</u> V A C A N T	1. <u>Sr. Sct. Off.</u> Mr. M. J. A. Osmani	1. <u>Sr. Sct. Off.</u> Dr. S. Z. Masud	1. <u>Sct. Off.</u> Mr. M. F. Khan	1. <u>Sct. Officer</u> Mrs. Rehana Ahmed.	1. <u>Sct. Off.</u> Mrs. Shahida Aikhtar	1. <u>Steno.</u> Mr. Atta K. Malik
2. <u>Sct. Officer</u> Mr. M. Sharif Khan	2. <u>Asstt. Sct. Officer.</u> Mrs. N. Nasir	2. <u>Sct. Off.</u> Mrs. Shamim Farhat	2. <u>Sct. Asstt.</u> Mr. Shahab- uddin	2. <u>Sct. Officer</u> Miss Khurshid Samad	2. <u>Asstt. Sct. Off.</u> Mr. A. Haneed Solangi	2. <u>Asstt. Acctt.</u> Mr. Saleem Pervaiz
3. <u>Sct. Officer</u> V A C A N T	5. <u>Asstt. Sct. Officer</u> Mr. Ahmed Khan	3. <u>Asstt. Sct. Officer</u> Miss Zahida Parveen	3. <u>iall</u> Mr. M. Afzal	3. <u>Lab. Att-II</u> Mr. Arif Nehmood	3. <u>Lab. Attd-II</u> Mr. Shamin Ahmed.	3. <u>Store- Keeper</u> K. Manif Khan
4. <u>Asstt. Sct. Off.</u> Miss Rubina Sadia Adnami (Resigned w.e.f. 1.6.35)	4. <u>Asstt. Sct. Officer</u> Mr. Farooq Jan (Resigned w.e.f. 31.3.34 - vacant post surrendered)	4. <u>Lab. Attd-I</u> Mr. M. Sami		4. <u>Lab. Attd-II</u> Mr. Zakiuddin		4. <u>Gen. Attd-II</u> Mr. Masoomullah
5. <u>Stenographer</u> V A C A N T	5. <u>S. Typist</u> Mr. Zahid Eussain					5. <u>Driver</u> Mr. H. Amir (Since resigned)
6. <u>Lab. Attd-I</u> Mr. Mubor Nooruddin	5. <u>Lab. Attd-II</u> Mr. Shahzad Ahmed.					
7. <u>Driver/Fitter</u> V A C A N T	7. <u>Go. Attd. II</u> Mr. Mashood					

Federal Pesticide Research Laboratory
Pakistan Agricultural Research Council
Malir Halt, Karachi-27

Source: Annual Report 1984-85. Federal Pesticide Research Laboratory,
PARC, Malir Halt, Karachi - 27

MONITORING PROGRAM FOR INSECT RESISTANCE TO PESTICIDES

Suggested Cooperating Organisation(s):

Grain Storage Research Laboratory (GSRL)
Pakistan Agriculture Research Council
Marin Halt, Karachi-27

Objective: To determine the level of insect resistance in Pakistan to chemicals used in residual spraying, protectants applied directly to grain and fumigants.

Survey to determine insect resistance to pesticides:

Year 1

Sampling Locations:

Primary Areas

Karachi

Sukkur

Faisalabad

Islamabad

Peshawar

Quetta

Secondary Locations

Pasui, RECP, Port Area (TPX)
Hyderabad

Jacobabad, Khairpur, Nawabshah

Multan, Sahiwal, Lahore

Sialkot, Jhelum

Other locations

Other locations

Sampling Frequency: Twice yearly

1. Initiation of Storage
2. Late in Storage period

Methods of Analysis:

1. Background information questionnaire - Developed at GSRL.
2. FAO standardized methods -
 - a. For insecticides
 - b. For fumigants (Phosphine)

Test for Resistance to:

1. Malathion - used as surface treatment
2. Pirimiphos - methyl (Actellic) - registered for direct admixture to grain

3. Phosphine - fumigant

Alternative Pesticides for Testing:

1. Fenitrothion - surface treatment
2. Permethrin (coopex) - Surface treatment/direct admixture to grain
3. Chlorpyrifos-methyl (Reldan) - admixture with grain
4. Dichlorvos (Nogos)

Insect Species for Resistance Testing:

1. Rhyzopertha dominica (adults)
2. Trogoderma granarium (Larvae)
3. Tribolium castaneum (Adults)
4. Sitophilus oryzae (Adults)

Alternatives:

- Oryzaephilus surinamensis (Adults)
Sitotroga cerealella (Adults)

Total number of tests for resistance and time required:

- 1) 25 sites x 3 species/site = 75 populations; with 2 sampling per year = 150 populations to be tested.
- 2) Where resistance for 3 pesticides evaluated there will be a total of 450 tests for resistance.
- 3) It was projected that an evaluation of 16 tests (4 doses x 4 species x 1 pesticide) could be conducted in a 48 hour period.
- 4) Actual conduct of the 450 tests would require approximately 56.57 days. Note: This does not include collection of populations, laboratory culturing, etc.

Year 2, Year 3 Survey Schemes

The survey schemes for year-2 and year-3 would be essentially the same as that for year-1 with adjustments based on year-1 results.

Equipment and Materials

Equipment Requested:

1. Lab-line environmental chambers (220V; 50 Hz)
 - a. Model 704A-1 Walk-in "Environette" 2 units
Dimensions:
Interior - 1.2x1.2x2.2 meters
Exterior - 1.4x1.4x2.7 meters
Temperature range: 0°C to 60°C.

- b. Model 703A-1 Reach-in "Environette" (2 doors) 3 Units
Dimensions:

Interior - 1.9x0.6x1.8 meters
Exterior - 2.0x0.8x2.3 meters
Temperature range: 0°C to 60°C

- c. Model 700A-1 Reach-in "Environette" 1 Unit
Dimensions:

Interior - 0.6x0.6x1.8 meters
Exterior - 0.8x0.8x2.3 meters
Temperature range: 0°C to 60°C

2. Gas-tight Syringes (Varying capacity as indicated below):

a.	50 microliter (fixed needle)	6 Each
	100 " " "	6 Each
	250 " " "	6 Each
	1 milliliter (with luer tip)	6 Each
	2.5 " " "	6 Each
	5.0 " " "	6 Each
	10.0 " " "	6 Each

- b. Needles for luer tip syringes (PKG 0+6) 6 Each

3. Syringe, for ISCO Power Driven Micro-Applicator,
Model M, Series 14242 (0131-001-02) 6 Each

Note: Supplier is, ISCO Instrumentation Specialties Co.,
4700 Superior, Lincoln, NE. 68504

4. SEPTA, Pure Gum Rubber for Phosphine Resistance Testing
(Fold over Cap-Type)

a.	For Phosphine Gas Collector, 25 mm I.D.	12 Each
b.	For Dessicator Exposure Chambers, 40 mm I.D. & 60 mm O.D.	12 Each

Materials:

1. Fluon GPI (An aqueous dispersion of
polytetrafluoroethylene.
Supplier is ICI) 8 liters
2. Risella 17 Oil (Primary Solvent
Carrier for Insecticide) 8 liters

Personnel

- 1 Scientific Officer
1 Assistant Scientific Officer
2 Laboratory/Field Assistants

Travel Support

1. Karachi & secondary locations:
 - a. Ground transportation - local (no per diem)
 - b. Two (2) persons
2. Sukkur & secondary locations:
 - a. Ground Transportation
 - b. Two (2) persons
 - c. Five (5) days, each of two (2) sampling
3. Faisalabad & secondary locations:
 - a. Air/Ground transportation
 - b. Two (2) persons
 - c. Five (5) days, each of two (2) samplings
4. Islamabad/Peshawar & secondary locations:
 - a. Air/Ground transportation
 - b. Two (2) persons
 - c. Five (5) days each of two (2) samplings
5. Quetta & other locations:
 - a. Air/Ground transportation
 - b. Two (2) persons
 - c. Three (3) days each of two (2) samplings

PESTICIDE RESIDUE RESEARCH

Suggested Cooperating Organizations:

Pesticide Research Laboratory
Pakistan Agricultural Research Council
Marin Halt, karachi-27

Objective: To determine whether the use of insecticides as grain protectants (in admixture with grain) will result in undesirable residues in Pakistani cereal based foods.

Laboratory Evaluation - Year 1

Protectants to be evaluated:

Chlorpyrifos - methyl (Reldan)
Pirimiphos - methyl (Actellic)
Alternative protectant materials:

Malathion
Permethrin

Variable Factors of Evaluation

Dosage - recommended for application
Temperatures - High (35°C); Low (25°C)

Moisture content - low (10%); High (13%).
Replications - 3; Rep size 3000 g.

Sampling Scheme:

Week 0, 1, 2, 3, 4
Month 2, 3, 4, 5, 6, 9, 12

Sample Total - Year 1:

3 Protectants x 3 reps x 2 mc x 3 temps x 1 dosage x
12 samplings = 648

Field Evaluation - Year 2

Variable Factors:

Protectants - 3
Chlorpyrifos - methyl
Pirimiphos - methyl
Alternative (malathion or Permethrin)

Replicates - 3

Locations - 6

Karachi, Hyderabad, Faisalabad, Islamabad, Peshawar,
Quetta

Samplings - 12 (monthly)

Sample Total - Year 2:

3 Protectants x 3 reps x 6 locations x 12
samplings = 648

Product Residue Study - Year 3:

Variable Factors

Protectants - 3

Chlorpyrifos - methyl
Pirimiphos - methyl
Alternate (malathion or Permethrin)

Replicates - 3

Moisture Content - 1 (as determined)

Temperature - 1 (As determined)

Factions - 6:

Wheat
Atta
Chipati
Maida
Nan
Bread

Sampling Scheme:

Time - 0
Months 3, 6, 9, 12

Sample Total - Year 3:

3 Protectants x 3 reps x 1 M.C. x 1 temp. x
6 fractions x 5 samplings = 270

Equipment and Materials

Equipment Requests

Gas liquid chromatograph (GLC) with flame ionization detector,
Nitrogen - phosphorous detector with replacements

23

Thin layer Chromatographic (TLC) equipment with scanner

Extraction & Cleanup

Redistillation equipment (fractional)

Rotary vacuum dessicator

Muffle furnace (small)

Materials:

Solvents 0.5 liters/sample (local)

Florocil PR Grade (import)

Silica/alumina (local)

Personnel:

Principal Investigator -

Scientific Officer - 1

Assistant Scientific Officers - 2

Laboratory Technicians - 2

ESTIMATED COST OF SUBCONTRACTING FOR INSECT RESISTANCE,
PESTICIDE RESIDUE AND INTEGRATED PEST MANAGEMENT
RESEARCH PROJECT

Line Item	Pesticide Residue Research	Insecticide Resistance Research	IPM Research	Total
	-----Rs-----			
Salaries & Wages	646,560	347,940	1,468,440	2,462,940
Travel, Transportation and Per Diem	101,890	984,432	1,448,748	2,535,070
Expendable Supplies	67,200	50,400	504,000	621,600
Non-Expendable Equip.	N/A	N/A	N/A	N/A
Other Direct Costs	50,400	42,000	151,200	243,600
Sub-Total	866,050	1,424,772	3,572,388	5,863,210
Fixed Fee(@ 25%)	216,510	356,193	1,786,194	2,358,897
Total	1,082,560	1,780,965	5,358,582	8,222,107*

* At Rs. 16.8 = \$1, Total is \$489,410.

LIST OF PUBLICATIONS AND DOCUMENTS

- AGROPROGRESS KIENBAUM INTERNATIONAL GmbH. (1986) - Grain quality, grain testing and quality control study (Draft Final Report for the Government of Pakistan, Ministry of Food, Agriculture and Cooperatives) R.W.D. Taylor, R. Friendship and Dr. M. Nasir, Consultants. agroprogress Kienbaum International, GmbH. Bonn, Federal Republic of Germany, 69 p plus appendices.
- AHMAD, EJAZ AND J.E. BROOKS (1986) - Vertebrate pest infestations in Sind provincial food storage facilities. Technical Report No. 4. Vertebrate Pest Control Project, Post-Harvest Management Component, Food Security Management. GOP MINFA, PARC, NARC/USAID, DWRC, 11p plus appendix. (July 1986).
- AHMAD, EJAZ AND J.E. BROOKS (1986) - A survey of vertebrate pest infestations in provincial grain storage facilities in North-West Frontier Province and Baluchistan. Technical Report No. 5. Vertebrate Pest Control Project, Post-Harvest Management Component, Food Security Management, GOP MINFA, PARC, NARC/USAID, DWRC. 13p plus appendix (August 1986).
- AHMED, HAFIZ (1984) - Losses incurred in stored food grains by insect pests. Pakistan Agricultural Research Council, P.O. Box 1031, Islamabad 14p.
- AHMED, HAFIZ (1985) - Management of storage pests at the Sind Seed Corporation's processing plant at Sakrand, District Nawabshah. Grain Storage Research Laboratory, Pest Management Research Institute Special Report - 2. Pakistan Agricultural Research Council Malir Halt, Karachi - 27, 29p.
- BALUCH, U.K. et al (1986) - Losses in public sector storage in Pakistan. Results of a loss assessment survey 1984-85. Pakistan Agricultural Research Council, Islamabad. 129p
- BROOKS, J.E. AND EJAZ AHMAD (1986) - Vertebrate pest infestations in Punjab provincial food storage facilities. Technical Report - 2. Vertebrate Pest Control Project, Post Harvest Management Component, Food Security Management. GOP MINFA, PARC, NARC/USAID, DWRC. 19p plus Appendix (April 1986).
- FEDERAL PESTICIDE RESEARCH LABORATORY (1985) ANNUAL REPORT 1984-85. PARC, MALIR HALT, KARACHI - 27, 54p.
- GOVERNMENT OF PAKISTAN (1986) LIST OF REGISTERED PESTICIDES IN PURSUANCE OF SECTION 29, AGRICULTURAL PESTICIDES ORDINANCE II OF 1971. CIRCULAR NO. PP- IMP-1/83 - REG 1st JAN 1986. Department of Plant Protection, Ministry of Food, Agriculture and Cooperatives. 8p.

GRAIN STORAGE RESEARCH LABORATORY (1984) ANNUAL REPORT 1984-85. PMRI,
PARC. MALIR HALT, KARACHI - 27. 25P.

GRAIN STORAGE RESEARCH LABORATORY (1986) ANNUAL REPORT 1984-85. PMRI,
PARC. MALIR HALT, KARACHI - 27. 44P.

Halliday, D. (1985) Report on a visit to Pakistan to develop
proposals for a collaborative programme of research on fumigation
with the Pakistan Agricultural Research Council (R 1316 (R)).
Tropical Development and Research Institute, ODA, London, 23p.

PASSCO (1985) PASSCO FIELD ANNUAL - ORGANIZATION & FUNCTIONS;
INVENTORY CONTROL; PEST CONTROL, PAKISTAN AGRICULTURAL STORAGE AND
SERVICES CORPORATION LIMITED. 29-McLEOD ROAD, LAHORE, PAKISTAN. 143p.

LIST OF CONTACTS

MINISTRY OF FOOD, AGRICULTURE AND COOPERATIVES

- Mr. Inam Ul Haq, Joint Secretary Agriculture (Food)
Mr. Sirajuddin Ahmed, Deputy Secretary (Storage)
Mr. Khan Naseem Iqbal, Technical Officer (Grain Quality)
Storage Cell

PAKISTAN AGRICULTURAL RESEARCH COUNCIL (PARC)

Islamabad

- Dr. Umar Khan Baloch
Director of Research (Crop Protection) and
National Coordinator (Post Harvest Management)

GRAIN STORAGE RESEARCH LABORATORY (GSRL), KARACHI

- Dr. Hafiz Ahmed, Chief Scientific Officer/Director
Mr. Mubarak ahmed, Scientific Officer (Entomology)
Mr. Mohammad Sardar Alam, Scientific Officer (Entomology)
Mr. Muhammad Anwar, Scientific Officer (Agri. Entomology)
Mr. Muhammad Qasim Chaudhry, Scientific Officer (Chemistry)
Mr. Syed Asim Rehan Kazmi, Scientific Officer

FEDERAL PESTICIDE RESEARCH LABORATORY (PRL), KARACHI

- Mr. M.M.H. Baig, Principal Scientific Officer/Head

Quality Assurance Section

- Mr. M.J.A. Osmani, Senior Scientific Officer

Residue Research Section

- Dr. S.Z. Masud, Senior Scientific Officer
Mrs. Shamim Farhat, Scientific Officer
Miss Zahida Parveen, Assistant Scientific Officer

Genotoxicity Research Section

Mrs. Rehana Ahmed, Scientific Officer

Miss Khurshid Samad, Scientific Officer

Microbiological Research Section

Mrs. Shahida Akhtar, Scientific Officer

USAID/ISLAMABAD

Mr. Alan C. Hankins, Chief/ARD

Dr. Barry K. Primm, Deputy Chief(A)/ARD

Mr. M. Gulzar A. Qazi, FSM Project Coordinator

Dr. Zakir Hussain, Program Specialist, ARD