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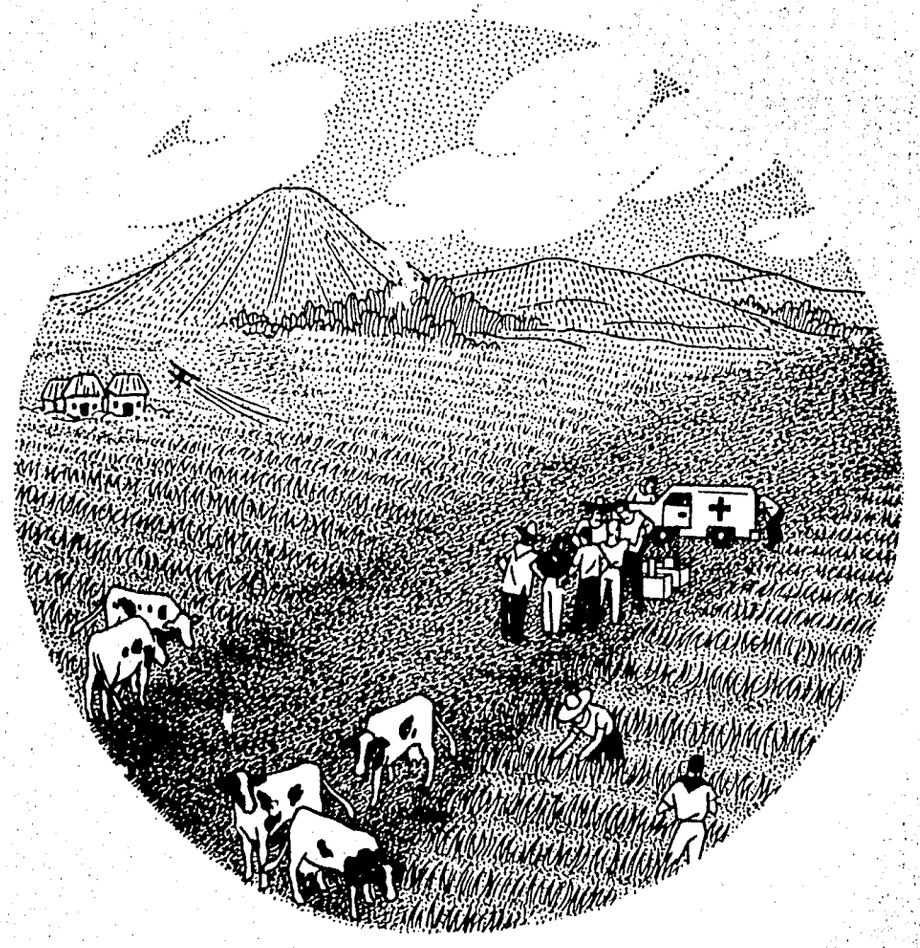

# Annual Report
# 1976

# UNIVERSITY OF CALIFORNIA/AGENCY FOR INTERNATIONAL DEVELOPMENT

# PEST MANAGEMENT & RELATED ENVIRONMENTAL PROTECTION PROJECT*

# 1975-76 ANNUAL PROGRESS REPORT


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Oregon State University
University of Florida
Agency for International Development


* Contract No. AID/ta-C-1195

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# ANNUAL REPORT

The period covered by the present annual report extends from July 1, 1975 to June 30, 1976 and provides a summarized review of the project's accomplishments during this period. Certain liaison activity that was conducted during May and June 1975 is also discussed.

## Introduction

The principal objectives of this project and its general procedures were presented at some length in the 1974-75 Annual Report. The present contract between the University of California and the United States Agency for International Development was renewed in March 1975 and will terminate on December 31, 1977.

The evaluation and appraisal of pest management capabilities of developing countries was part of a major effort of the project in its initial phase. Thus, seven multidisciplinary study teams were organized and sent to over 30 countries to obtain up-to-date information on the pest problems, pest control policies, organizations and programs, and current pesticide use practices in these countries for the purpose of identifying priority problems and assisting in the further development of local country capability in the area of pest management. These studies were nearly all conducted simultaneously in the latter part of 1972. The latest multidisciplinary study team was organized at the request of the Government of Bangladesh and USAID/Washington and sent to Bangladesh for an eight-week period from October 12 to December 4, 1975 to assess the total crop protection situation in that country. A summary of this team's report appears on the following pages.

The UC/AID Project has presented various seminar/workshops on the subject of pesticide management in order to improve the capability of developing countries with respect to the distribution, handling and use of pesticides. The seminar/workshop scheduled for presentation in Guatemala in November, 1975 was the first of these to be offered on a regional basis. It was later postponed and finally presented in February, 1976. In the midst of the workshop, a major earthquake struck and forced its cancellation. Other seminar/workshops are being planned for 1977 and the Guatemalan seminar may be repeated also.

Other major activities of the project which received emphasis this past year include a quality control program for pesticide analytical laboratories in developing countries. This program is directed by project staff at the University of Miami in Florida through means of a sub-contract arrangement with the UC/AID/PM Project. It attempts to standardize and upgrade the performance of each laboratory participating in the program as well as to facilitate exchange of technical information between the laboratories.

Upon renewal of the UC/AID contract for an additional three years, the project entered into its second phase which involves the development of ecologically sound pest management systems to handle the high priority crop protection problems identified in the first phase. These management systems will be especially concerned with the pest problems occurring on basic food crops in the developing countries.

## A. MULTIDISCIPLINARY STUDY TEAM REPORTS

Bangladesh: Team members were Roy D. Wilcoxson, plant pathologist, University of Minnesota; M. T. Ali Niazee, entomologist, Oregon State University; Edgar Dresner, entomologist, Vernon, Connecticut; Glenn W. Hedlund, agricultural economist, Cornell University, and Richard C. Maxwell, pesticide specialist, Washington State University.

In the period October-December, 1975, a UC/AID Multidisciplinary Study Team spent nearly two months in Bangladesh, at the specific request of the Government of Bangladesh, for the purpose of making a comprehensive evaluation of the plant protection program in that country.

The objectives of the study were to assess the capabilities of the Plant Protection Directorate and evaluate the capacity of the Government of Bangladesh to undertake plant protection training, conduct research, plan and implement crop protection projects as well as to determine the details of distribution, transportation, storage and handling of pesticides at all levels.

The study team found that plant protection in Bangladesh was a concern of many different individuals and organizations both within and outside the government, but that the most important was the Plant Protection Directorate. This institution was organized in its present form in early 1975 to bring many of the plant protection activities of various governmental bodies into a single administrative unit. Some of its primary functions are to coordinate all plant protection research, advise on crop protection matters, enforce pesticide regulations, organize control measures to combat epidemics, etc. However, the study team noted that, in practice, the Directorate was almost wholly occupied with the registration, acquisition, storage, distribution and sale of pesticides and sprayers and with the aerial application of pesticides. They stated that the other programs in which the Directorate was involved were poorly conceived, loosely organized and only partially executed because of the Directorate's inadequate budget, lack of well-trained employees and the problem brought about by a new organizational structure.

The UC/AID team stated that the time devoted to handling pesticides made it difficult for the Plant Protection Directorate to concentrate on other important functions such as training in pest management methods, regulatory activities and applied research, including pest population surveys. The study team found that little applied research was being done by the Directorate and that which was undertaken was mostly in the evaluation of pesticides as part of the registration process. They found that most district officers were poorly equipped and trained for conducting sound applied research.

The study team also noted an urgent need for training in all aspects of plant protection, including administration, leadership, warehousing, storekeeping, quarantine, pest identification, etc. The training programs that were available did not adequately teach individuals how to identify crop pests nor was there much information provided on the life histories of the pests or on alternative systems of pest control in these programs.

There is little done in the way of pest surveillance in Bangladesh, although the major insect pests, diseases, rodents and weeds that affect crop production are well known. The data that are gathered consist almost entirely of unverified accounts of pest infestations given to the union or thana officers by the farmers. Since funds for travel are limited, very few of the district or thana personnel are able to verify these reports.

The aerial spraying program is currently under the supervision of a Deputy Director of the Directorate of Plant Protection. The seven planes available in the program for spraying are supplied with chemicals either at Dacca or at secondary plant protection aerial bases distributed throughout the country. The chemical and rate of application is recommended by the Directorate. Rice is the major crop treated by air mainly for the control of the ear cutting caterpillar and the swarming caterpillar. In recent years, large acreages of sugarcane have also been sprayed by air to control pyrilla and the top-shoot borer. The study team pointed out, however, that the aerial spraying service is seldom used. In 1974, for example, only 378,000 acres were sprayed from the air.

The process of distribution of the pesticides within the country was found by the team to often require several years to be completed. This occurs because of lack of transport facilities and absence of financial incentive to move the chemicals. The conditions of storage of the pesticides ranged from good to very poor. A few of the warehouses had concrete floors, some had dirt floors and at least one had a bamboo floor. These latter two situations are particularly hazardous because of the difficulties they present in decontamination. Most of the warehouses were ventilated very poorly, if at all. Many of them were rented from private individuals or firms and, thus, were not constructed specifically for pesticide storage.

The system of inventory in use does not provide an accurate account of the quantity of pesticides actually in storage or the length of time a particular pesticide has been in storage. As pesticides are received,

they are stacked on top of one another without the benefit of shelves or pallets. As a result, the UC/AID team saw many drums of pesticide which had rusted so badly they were leaking. This deterioration of pesticides in storage was a severe health hazard and presented a major problem in disposal. Visual observations made by the Directorate revealed that nearly 600 tons of formulated pesticides were unusable due to deterioration. Their data indicated that most pesticides were unsuitable for use after three years of storage under their conditions of high temperature and humidity.

The UC/AID study team was informed that samples of water, soils and crops had been collected from 1969-1971 to analyze for residues of malathion, diazinon, dimecron, fenitrothion and DDVP. However, they stated that there was no work being done on this problem at the present time. The Plant Protection Directorate operates a pesticide analytical laboratory, but its primary function is the analysis of locally produced and imported pesticides in a program of quality control.

The team reported that only a few types of manufactured equipment are available for application of pesticides in Bangladesh. Some of this equipment is too expensive for the small farmer to purchase and some of them were applying pesticides by dipping a brush, a palm frond or a broom into a pail of pesticide solution and flicking the chemical over the crop. A small bellows duster that can be produced inexpensively in local villages was introduced by one UC/AID study team member. Only a few copies of this duster were made while the team was in Bangladesh, but in brief tests it performed more efficiently than two other common methods practiced by the farmers.

Research in plant protection is also carried out by the Bangladesh Agricultural Research Institute (BARI) and other research institutes which have been established for individual crops such as rice, jute, tea, sugarcane, etc. These institutes carry out research in plant pathology and entomology, but not in nematology, weed science, bird or rat control. The work in plant pathology at the research institutes has resulted in a rather complete inventory of plant diseases and nematodes that occur in the country. Most of the present work is on biology of pathogens, on testing chemicals for disease control and on the development of resistant varieties of crops. The study team reported that no work was being done on the use of cultural practices to control disease.

The team found that the laboratories at most institutes were generally small and meagerly equipped, though the facilities seemed adequate for many applied studies. Their field facilities also seemed adequate.

The entomology work at BARI is carried out by several qualified individuals concerned with pests of cotton, pulses and vegetables. Most of the work is oriented toward the identification and cataloging of insects with little effort devoted to develop pest control and management schemes. Entomological research at the commodity-oriented institutes is

directed toward developing fundamental information on pest biology, crop loss assessment, varietal resistance and chemical control.

The teaching of plant protection is largely the responsibility of the Agricultural Institute at Dacca and the Agricultural University at Mymemsingh. In general, the universities have well trained and talented staffs; however, the teaching and research facilities are generally poor. There are no agricultural high schools though attempts are being made to initiate an agricultural curriculum at selected high schools. The study team concluded that the educational system probably was adequate to prepare plant protection people for lower level positions, but it was inadequate for positions demanding a high degree of professional skill.

Interviews with many officials indicated that the Agricultural Extension Service is severely limited in its contacts with farmers because lower echelon personnel lack transportation to visit the areas under their supervision. However, a more important obstacle to their work is their frequent temporary assignment to non-extension tasks. These tasks may vary from relief administration, assistance to local officials and crop reporting to the distribution of seeds and new varieties, distribution of fertilizer, etc. The Agricultural University has an agricultural extension faculty engaged in the education and training of extension workers, but do little, if any, extension work with the farmers.

The study team found that damage to grain in farm storage and in government storage warehouses is a serious problem in Bangladesh. The losses are estimated at between 7-10%. The team observed wheat in bulk in one warehouse as much as 25% infested by grain moths. No attempt was being made to control this severe infestation, even though an ample supply of an effective fumigant was available. The lack of capable technicians to detect and control pest infestations in stored grain was cited as the probable major cause for the apathy observed by the team in the personnel of the facility in this particular instance.

Prior to April, 1974, pesticides were provided at no cost to farmers by the government. They are now sold by thana (county) officers to selected dealers at approximately one-half the cost price. The dealers are then permitted to add 15% in establishing prices to farmers. The selling of spraying equipment did not begin until August, 1975. Sales are made directly by thana offices to farmers at prices approximately one-half the cost of new equipment and one-half the depreciated value of used equipment. These offices also loaned equipment to farmers for short-term use.

The study team felt that the Plant Protection Directorate has made a good beginning in pricing and marketing pesticides and equipment and that they should go further as rapidly as possible until all pesticides and equipment are sold with little or no subsidy.

Using the evidence available to them, the study team conducted a cost-benefit analysis for the rice crop for the purpose of estimating the value of protecting it from pest attack. Utilizing some basic assumptions,

such as that the average cost of protection is 150 taka per acre, that yields are increased by 10% as a result of protection, and that the price of rice is 120 taka per maund, the team concluded that it would not pay to protect rice crops of average yields or less. However, they stated that it would pay to protect most rice crops in years of high infestations. In addition to this cost-benefit analysis, the team also provided a discussion on the economics of plant protection in general.

The report concludes with nearly thirteen pages of recommendations, only some of which will be presented here. The study team recommended that the public and private agencies and organizations concerned with plant protection in Bangladesh should:

1) begin to develop effective surveillance programs on all types of plant pests, including insects, diseases, weeds and nematodes,

2) work to determine the relative merits of different kinds of pesticide application equipment,

3) write manuals and other training aids for use in training programs in administration, plant quarantine, methods of handling pesticides, etc.

4) register enough different pesticides to insure an adequate supply of pesticides,

5) remove pesticide storage areas from highly populated areas,

6) initiate goal-oriented field research on plant protection in the various research institutes,

7) begin studies to evaluate losses in crop production due to pests,

8) study alternative methods of pest control on each of the major crops under a variety of conditions,

9) place more emphasis on applied research in plant protection,

10) organize a Plant Protection Society to serve as a forum for all aspects of plant protection,

11) greatly increase extension work with the farmers, and

12) limit importation of pesticides and application equipment to realistic estimates of needs.

## B. PESTICIDE MANAGEMENT

The subject of pesticide management is one of primary concern to the UC/AID Pest Management Project and accounts for much of the energy and activity expended by the project over the last 3 years. During this period, the project has demonstrated in a number of countries that pesticide management is achieved more effectively through a multidisciplinary

attack (known as the agromedical team approach) that involves a concerted and coordinated effort on the part of a number of disciplines concerned with the safe use and handling of pesticides. This approach utilizes the combined expertise of the medical and agricultural sciences in such a way that new and improved methods of attacking the pesticide management problems, which confront all segments of society, are found.

Seminar/workshops which promote this philosophy of pesticide management have been previously presented in El Salvador, Indonesia and the Philippines. This series of seminar/workshops is expected to continue and plans were made to present one for the Central American region in Guatemala.

Guatemala: The first regional seminar/workshop on the subject of pesticide management was planned to be held in Guatemala from November 10-15, 1975. Its preliminary organization was the purpose of a three-day visit by the project director and 2 members of the UC/AID advisory group. The seminar/workshop, however, was later postponed and set for presentation from February 2-7, 1976.

First trip (July 6-9, 1975) - The project director, Ray F. Smith, along with John E. Davies and Virgil H. Freed visited Guatemala City the second week in July for the purpose of meeting with personnel from the Instituto Centroamericano de Investigación y Tecnología Industrial (ICAITI) and ROCAP and with various national and regional agencies located in that capital city to discuss various aspects of the proposed seminar/workshop. During the meeting with ICAITI personnel, it was agreed that the UC/AID/PM project and ICAITI would be the sponsors of this event and that the Pan American Health Organization (PAHO) would be asked to become a co-sponsor. A tentative agenda and list of speakers was developed in these discussions. The topics to be presented in the seminar included integrated pest control and the relationship between crop protection and regional nutrition. During this meeting, it was agreed that participants would be invited from Central America and Panama and would include people from both health and agriculture related fields as well as representatives of government, administration and from the chemical pesticide industry. Five U.S. speakers were to participate in the program with simultaneous translation facilities to be made available.

ICAITI was to prepare a brochure announcing the seminar/workshop and the UC/AID/PM Project would pay for the cost of its printing and mailing. A statement involving the definition of "pesticide management" and the agromedical team approach to pesticide management was developed for the brochure by the UC/AID team.

The team also met with personnel of the Instituto de Ciencias y Tecnología Agrícola (ICTA), the Dirección General de Servicios Agrícolas (DGSA), the Servicio Nacional de Eradicación de Malaria (SNEM), the Instituto Interamericano de Ciencias Agrícolas (IICA) and PAHO to inform them of the proposed seminar/workshop, solicit their support and opinions and to learn more about the programs which these agencies are conducting in the area of pesticide management.

Second trip (January 7-10, 1976) - Project Director, Ray F. Smith, and Donald J. Calvert visited Guatemala to participate in a meeting of the Organizing Committee which was to finalize plans for the seminar/workshop. This meeting was held on January 9 at ICAITI and was attended by representatives from the following organizations, PAHO, IICA, INCAP, OIRSA, CABEI, ICAITI and UC/AID/PM. During the meeting, the agenda was reviewed and only slightly modified. Speakers had not yet been chosen for some of the proposed talks and possible candidates were discussed. A number of other matters were discussed at this meeting, including topics for the workshop, publication of the proceedings, fellowships to participants, hotel accommodations, etc. It was decided that weekly contact would be made up till the time of the seminar/workshop to resolve any problems that might arise during this period.

Pesticide Management Seminar/Workshop (February 2-4, 1976) - The seminar was convened in the Auditorium of the Bank of Guatemala on February 2nd with nearly 200 people in attendance, representing the five Central American republics of Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua and the Republic of Panama. Opening statements were made by representatives of ICAITI, PAHO and the Ministry of Agriculture. Their talks were followed by several technical presentations on the chemistry and chemodynamics of pesticides, analysis of pesticides and their formulation.

After the speakers had ended their presentations, the participants at the meeting were organized into five working groups which were to study broad problem areas and develop reports and recommendations for possible approval by the entire seminar/workshop. Participants were asked to consider the following five areas of pesticide management in their deliberations:

1) formation, training and potential for service of agromedical teams,

2) pesticide analyses and monitoring of pesticides in food, humans and the environment,

3) laws and regulations relating to management of pesticides and other chemicals and their enforcement,

4) education and training in relation to pesticide management,

5) relationships of pest management, pesticide management and community health and nutrition.

These working groups held discussion meetings on both Monday and Tuesday after the end of the days' session. At times their discussions were animated and thoughtful, showing a clear awareness of the problems they faced in correcting some of the abuses of pesticide use. Their willingness to attend these informal meetings and the concerned interest they displayed during these first two days of the seminar/workshop presaged a successful conclusion to this meeting. However, a major earthquake struck the city at approximately 3:00 a.m. on February 4 and suspended

all normal activities in the ensuing days and weeks that followed while the country and people attempted to recover from this natural catastrophe and national tragedy. The toll of dead exceeded 20,000 persons and the number of people left homeless was estimated at over one million individuals, one-sixth of the entire population.

Despite the cancellation of this event, widespread concern about the safe management of pesticides in this region is still prevalent. Several letters have been received since the earthquake expressing interest in having the pesticide management seminar/workshop presented once again. In addition, several of the workshop groups have sent some of the preliminary conclusions which were arrived at during their discussions.

## C. SEMINAR/WORKSHOP FOLLOW-UP REPORTS

Follow-up in El Salvador: The agromedical team of John E. Davies, Virgil H. Freed and Ray F. Smith visited El Salvador from July 9-12 for the purpose of informing interested parties there of the forthcoming Pesticide Management Seminar/Workshop to be held in Guatemala City and to determine on a collaborative basis the areas of future assistance and program needs. This was the fifth visit of project members to El Salvador and was undertaken to attempt to evaluate the beneficial impact of the previous seminar/workshop presented in San Salvador in December, 1973, as well as to assess the benefits derived from the later activities of the project, such as the continued follow-up training and technical assistance provided by the project.

The team met with the Minister of Health, Dr. Julio Astacio. The problem of pesticide poisoning was a subject of considerable discussion at this meeting and the need to obtain better information and develop confirmatory tests to determine whether or not illness in an agricultural worker was due to actual poisoning by pesticides or to some other cause, such as dehydration and/or an infection, was stressed. Dr. Astacio was very interested in developing a program whereby the physicians in a hospital would conduct qualitative tests for pesticide poisoning and, if positive, would then obtain samples of blood and urine from the affected individual and submit them to the Santa Tecla laboratory for a quantitative evaluation.

Dr. Astacio described plans for the establishment of a system of community health workers in a pilot program which will involve 21 cantons in northeast El Salvador. This innovative plan calls for a resident of the community to be given short-term training for 2-4 weeks in maternity and child care, nutrition and general hygiene. After this training, these workers will be associated with "a post" which will be staffed by a nurse. These posts will, in turn, be linked to a clinic having a physician and supporting personnel and these, into a regional hospital.

In discussing the community health worker's program, Dr. Astacio expressed the desire to utilize the UC/AID project to introduce the agromedical approach, not only for the management of pesticides, but also for

matters of nutrition at the garden and farm level. He also expressed the desire to receive a periodic report of project activity, believing that this information would better enable him to utilize the resources of the project and integrate it with other activities conducted by the Ministry of Health.

The UC/AID team also visited with Dr. Ronald Lowe of the USDA who proceeded to relate the activities of this agency in the area of malaria control. A program for the release of sterile male mosquitos was initiated in January, 1975, to cope with the serious malaria problems in El Salvador. This program works in close collaboration with the Central American Research Station (CARS) and the Ministry of Health. The project also intends to utilize other biological techniques for larval control of mosquitos. This includes plans to use a nematode, Reesemermis nielsini.

The delegation reviewed with Minister of Agriculture, Lt. Colonel Roberto Escobar Garcia the organization and operation of the UC/AID/PM Project and gave a brief history of its activities in El Salvador. Col. Escobar then described to the team the new laws and regulations on pesticide management that are under consideration and probably will be implemented in the near future. The team discussed with Col. Escobar the possibility of the Santa Tecla laboratory providing chemical and analytical back-up on cholinesterase testing for the hospital program and reported that he approved of this idea.

The progress of construction of the new laboratories at San Andres was reviewed with Octavio Duarte, Director of the laboratory at Santa Tecla. These facilities are scheduled to be completed by the beginning of 1977. The Santa Tecla laboratory has four operative gas chromatographs, a liquid chromatograph, an atomic absorption unit, and an infra-red spectrophotometer as well as an ultraviolet/visible spectrophotometer, but has major problems of overcrowding and lack of sufficient training of bench level chemists. There is also a need for improved management to organize flow of work in the laboratory.

## D. PROJECT REPRESENTATION AT INTERNATIONAL MEETINGS AND CONFERENCES

The UC/AID Pest Management Project has continued to send representatives to attend various important international meetings and conferences related to plant protection because of the overall benefits

that derive from this practice. A list of the meetings and conferences attended by project representatives in the last fiscal year is appended as Appendix 3. A review of these meetings now follows.

VIII International Plant Protection Congress, Moscow USSR (August 21-27, 1975) - The UC/AID/PM Project sponsored the attendance at this very important conference of Ray F. Smith, Project Director, and Stephen Wilhelm, plant pathologist, University of California, Berkeley. The Congress was attended by over 1,600 foreign scientists representing 41 countries, in addition to the 700 delegates from Russia. This gathering together of so many leading plant protectionists afforded an exceptional opportunity for the discussion of critical matters of interest and the coordination and planning of mutually beneficial activities in the area of crop protection.

The Congress was held at the October Cinema where the opening ceremonies were witnessed by a capacity crowd of approximately 2,500 people in the main auditorium. There were 380 scientific papers and communications presented during the Congress, quite a number of which discussed the concept of integrated pest control. The head of the plant protection department in the USSR Ministry of Agriculture discussed the crop protection situation in Russia at the present time and referred to early development of integrated pest control in that country. A speaker from the European and Mediterranean Plant Protection Organization (EPPO) discussed the concept of integrated control at some length while other talks were given on biological control, economics of plant protection, etc. Project Director, Ray F. Smith, also gave a short talk on the subject of integrated control at this meeting.

During the course of the Congress, Dr. Smith had the opportunity to meet with many leading scientists from various international organizations and institutes. Among project activities that were considered, an important discussion was held with William R. Furtick, FAO, about the organization, composition and objectives of the Bangladesh study team. Other project activities discussed included the UC/Cairo Colloquium, Training Courses in Integrated Control and a study on information systems for developing countries.

Horticultural Education Association Conference on Crop Protection in Horticulture, University of Reading, England (September 8-12, 1975) - This meeting was attended by Allyn A. Cook, plant pathologist, University of Florida, who is a member of the project's Ad hoc Advisory Group. The subject matter of the formal lectures presented at the conference was directed toward pest management through biological and other control means that serve to reduce the inherent danger of pesticides to grower, consumer and the environment. The keynote speaker discussed the international implications of the inadvertent distribution of virus-infected, vegetatively propagated plant materials and emphasized the need for more strict international regulations concerning dissemination of propagating stocks.

While attending the conference, Dr. Cook also found time to visit the agricultural chemicals research division of ICI and the weed research facilities of the European Weed Research Organization. Among the subjects discussed with officials of these two organizations were international aspects of pesticide development and methods for assessment of these chemicals.

Second International Conference on Progress and Problems in Vegetable Virus Research, Avignon - Montfavet, France (September 15-18, 1975) - Following the conference just described, Dr. Cook traveled to France to attend this meeting of the EUCARPIA Working Group on Vegetable Viruses. It was organized to provide a forum to relate progress in breeding for resistance and formal presentations of research accomplishments filled two days of the meeting. Dr. Cook presented two talks - one on virus disease resistance in peppers and the second on international cooperation in vegetable crop improvement. According to Dr. Cook, this meeting substantiated the assumption that virus diseases, especially those of herbaceous crops grown under environmental conditions conducive to quick increase in insect populations, continue to be one of the most difficult international problems for satisfactory solution, with only plant breeding for resistance being an effective control measure at this time.

FAO/UNEP Consultation on Impact Monitoring of Residues from the Use of Agricultural Pesticides in Developing Countries, Rome, Italy (September 29-October 3, 1975) - The UC/AID/PM Project was represented at this meeting by John E. Davies, medical toxicologist, University of Miami, Florida. This conference was convened as a result of recommendations of the 1974 World Food Conference and the Ad hoc Government Consultation on Pesticides held in Rome, April, 1975. The meeting was opened by William R. Furtick, Director of the Plant Protection Service, FAO, who welcomed the consultants and stated FAO's position with regard to the effects of pesticides in the human environment.

The first two days of the Consultation were taken up with the presentation by all the delegates of five minute position papers. Dr. Davies took this opportunity to describe the UC/AID/PM Project and its activities in the area of pesticide management. During the following three days, the residue problem was discussed and data collected on current amounts and types of pesticides being used. Emphasis was placed upon the necessity of obtaining accurate descriptions of the amount and type of pesticides being used in all countries where impact monitoring programs were planned. Special environmental problems, such as the probability of secondary development of new and unwanted pests and the problem of resistance, were also discussed.

Following the discussions, the most relevant projects were selected and areas identified where improvements could be encouraged to support earlier impact monitoring programs. The areas involved were Brazil, Egypt, Iran, Morocco, Indonesia, the Philippines, Poland, South Korea, Sri Lanka, San Salvador and the Sudan. The special control programs selected were related to the rise of pesticide use in cotton areas, rice, tsetse fly and locust control.

The delegates expressed considerable interest in the quality control program for pesticide analytical laboratories which the UC/AID/PM Project is implementing. Several of them requested more information about the program. A statement concerning the need and desirability of a quality control program was added to a recommendation passed by the delegates, based on their awareness of the UC/AID program.

FAO/UNEP Consultation on Pest Management Systems for the Control of Pests of Cotton, Karachi, Pakistan (October 13-16, 1975) - This meeting was attended by Louis A. Falcon, insect pathologist, University of California, and H. David Thurston, plant pathologist, Cornell University, as representatives of the UC/AID/PM Project. Project Director, Ray F. Smith, and Harold T. Reynolds, Project Ad hoc Advisory Group member, were also in attendance. The Consultation was opened by a special assistant to the Prime Minister for Agriculture of Pakistan who stressed the need for the application of integrated pest control principles to help reduce losses in cotton in that country. Representatives from the Food and Agriculture Organization (FAO) and the United Nations Environment Programme (UNEP) then gave brief histories of the involvement and interest of the two organizations in the global program for the development and application of integrated pest control in agriculture.

This Consultation was convened as an outgrowth of an earlier ad hoc session of the FAO Panel of Experts on Integrated Pest Control held in Rome, October 15-25, 1974 which had met for the purpose of formulating the global program mentioned above. After consideration of various criteria, the Panel recommended that regional programs for integrated pest control on cotton and rice should receive the highest priority for funding and implementation. The present Consultation met to review aspects of the global program and to discuss details of a regional program on cotton and its implementation within this larger framework.

As a result of the four days of discussion, the Consultation recommended the establishment at the earliest possible date of three Regional Programmes on the Development and Application of Integrated Pest Control in Cotton Growing with emphasis on demonstration, training and research in these programs. These programs would be located in (1) North East Africa with links to African countries, (2) Near East with links to Middle and Far East countries, and (3) Latin America. The Consultation also recommended that a Regional Programme Coordinator, a Liaison/Training Officer and sufficient experts on specific elements of integrated pest control be provided each Regional Programme. In addition, they urged the establishment of a Regional Steering Committee comprised of delegates from the participating countries who will be directly responsible for the program planning. In order to ensure the global character of the activities undertaken, and to avoid duplication of effort, the Consultation also recommended that these Regional Programmes seek the continuous guidance of the FAO Panel of Experts on Integrated Pest Control.

In summary, Drs. Falcon and Thurston felt that a serious attempt had been made at the Consultation to come to grips with what a global program in pest management could realistically accomplish in a developing

country. They believe that this meeting resulted in sound, realistic proposals and that the guidelines developed should enable the FAO/UNEP Global Programme Coordinator to structure a realistic program.

Sixth Session of the FAO Panel of Experts on Integrated Pest Control, Karachi, Pakistan (October 20-23, 1975) - Several UC/AID/PM Project members who participated in the FAO/UNEP Consultation just described are also members of the FAO Panel of Experts on Integrated Pest control and therefore remained in Karachi after the conclusion of the Consultation to attend the Panel meeting. Membership in this Panel affords these Project personnel an exceptional opportunity to develop liaison and contacts at these meetings with officials of several international organizations that are also represented on the Panel and who are responsible for planning and implementing programs in the pest management area in various parts of the world.

This Sixth Session of the FAO Panel directed its attention primarily to the activities to be conducted by the FAO/UNEP Global Programme for the Development and Application of Integrated Pest Control in Agriculture and to establishing priorities and information essential to undertaking programs on crops critical to food production in developing countries. The Panel unanimously agreed to maintain the Global Programme as its highest priority of future activities. The Panel is the main advisory body to the Programme, and as the latter develops, Panel members will participate, either singly or collectively, for short periods and in various ways in planning, reviewing, training, etc.

The FAO Panel carefully reviewed the recommendations and program proposals of the recently concluded Consultation and developed modifications and alterations to conform more satisfactorily to the overall objectives of the Global Programme. These modified proposals were published in the Report of the Consultation and were fully endorsed by the Panel. The Panel recommended early consultation with the proposed participating countries in the Regional Programme and also recommended that the latter be implemented at the earliest possible date.

Among some of the many other topics discussed by the Panel at its Sixth Session was the presentation of a symposium in 1978 to review the worldwide developments of integrated pest control emphasizing non-pesticidal tactics; the need for the description and establishment of screening procedures for assessing host plant resistance; the publication of a brochure on use of pesticides in integrated pest control programs and a catalogue on stocks of beneficial arthropods and entomopathogens; and education and training courses in integrated pest control programs, especially in relation to regional activities within the Global Programme.

IV Reunión Nacional de Técnicos en Control Biológico y Organismos Auxiliares de Sanidad Vegetal, Tapachula, Mexico (April 21-23, 1976) - The UC/AID/PM Project was represented at this meeting by Donald J. Calvert, crop protection specialist for the project. This conference brought together nearly 300 Mexican entomologists and agronomists most of whom were employed at any one of the 14 Beneficial Insect Reproduction Centers (C.R.I.B.) that are distributed throughout the country. These centers were built for the mass rearing of beneficial insects and represent a considerable commitment on the part of the Ministry of Agriculture to biological and integrated control. They are presently devoted primarily to the rearing of various species of Trichogramma. These tiny wasps are released

in great numbers for the control of lepidopterous pests in cotton, maize, beans, sugar cane, tomato, sorghum and other crops. Quite a number of these centers have not yet attained the full rearing capacity that is expected of them. Thus, a discussion of mutual problems, on-going research and preliminary results of field tests made up the greatest part of the meeting.

The reports themselves were usually limited to fifteen minute presentations. Many of the speakers were heads of a C.R.I.B. laboratory, and their talks dealt primarily with preliminary results of a biological or integrated control program on a crop important in their region.

At an impromptu night session held at the Southeast Ecological Research Center (CIES), the possibilities of developing a cooperative program for the biological control of the boll weevil between U.S. and Latin American entomologist were explored. Those in attendance from the U.S. were Dale Bottrell, CIES; Donald Calvert, UC/AID/PM Project; James Cate, Texas A & M University; Douglas Bryan, USDA National Program Staff; and Willard Whitcomb, University of Florida.

These men discussed the possibilities of developing some kind of a cooperative program with the Latin American entomologists at some length. The latter expressed considerable interest in cooperating, but a good deal of uncertainty existed about the manner in which the program would be carried out. At the conclusion of the meeting, Dr. Cate was given the responsibility of drawing up a written proposal which then could be examined and discussed further with the intention of locating sources of financial support for the program.

When the meeting in Tapachula terminated, Dr. Calvert traveled to Guatemala to confer with ICAITI officials as a follow-up to the UC/AID Regional Pesticide Management Seminar/Workshop presented February 2-4 in that Central American republic. Plans to publish a proceedings of the seminar in Spanish were discussed, and it was agreed that only abstracts of the talks would be printed. Other matters related to the Seminar/Workshop were also discussed, including the possibility of presenting it once again. The ICAITI representatives indicated that they approved of this idea.

## E. PROJECT LIAISON ACTIVITIES

As a member of the Governing Board of the International Center for Insect Physiology and Ecology (ICIPE), Dr. Ray F. Smith, Project Director, attended a meeting of this group at ICIPE headquarters in Nairobi, Kenya from June 1-14, 1975. Although this trip was not project related, it afforded Dr. Smith the opportunity to visit in London with members of the Centre for Overseas Pest Research (COPR), with personnel in the Plant Protection Service of FAO in Rome, and with officials of the United Nations Environment Programme (UNEP) in Nairobi to discuss project matters.

Centre for Overseas Pest Research (COPR), London, England (May 28, 1975) - Dr. Smith met with Peter Haskell, COPR Director, on May 28th to discuss their participation in the FAO/UNEP Consultation on Integrated Pest Control scheduled for Pakistan in October. In other discussions, Dr. Smith was informed that COPR had been asked to send a plant protection team to Bangladesh. Since the UC/AID/PM Project was planning to send a similar team to that country, Drs. Smith and Haskell agreed to coordinate their efforts, at least on an informal basis. Accordingly, plans were made for the UC/AID Bangladesh plant protection team to stop in London en route to Dacca and pick up two COPR staff members, who will then accompany the team to Bangladesh.

Plant Protection Service, FAO, Rome, Italy (May 29-31 and June 15-18, 1975) - Dr. Smith stopped in Rome en route to Nairobi and again on his return from the ICIPE meeting. While in Rome, he met with many of the FAO personnel in the Plant Protection Service. Considerable discussion was held with them concerning the FAO/UNEP Consultation on Integrated Pest Control with regard to its role in the implementation of the new Global Cooperative Programme in Integrated Control. Dates for this meeting were fixed and a provisional agenda developed.

Arrangements were made for the Bangladesh plant protection team to stop in Rome en route to Bangladesh. Dr. Smith obtained an agreement from FAO officials to utilize a plant pathologist from the FAO/UNDP project in Korea to serve as a member of the UC/AID study team for Bangladesh.

Dr. Smith also discussed the FAO/UNDP program for integrated pest control training courses in Latin America and agreed to have the UC/AID/PM Project collaborate in presenting these courses.

Discussions were also held on the involvement of the FAO/UNEP project on Impact Monitoring of Pesticides with the Man and the Biosphere (MAB) Project #9. A FAO official indicated that they would use the UC/AID Pesticide Management Seminar/Workshop presented in Manila as a model in developing their impact program. This program will probably emphasize monitoring of cotton and rice.

Another topic discussed was the publication of parts of the UC/AID International Plant Protection Meeting List in the FAO Plant Protection Bulletin. Agreement was reached on its publication and Dr. Smith agreed to provide the FAO Bulletin with the copy for its meeting list.

United Nations Environment Programme (UNEP), Nairobi, Kenya (May 31-June 14, 1975) - While Dr. Smith was in Nairobi attending the ICIPE meetings, he also at various times met with UNEP officials to discuss pest management and pesticide related problems connected with the UNEP program. In these discussions, the FAO/UNEP Integrated Pest Control meeting in Pakistan was reviewed, and the arrangements that had been developed in Rome were confirmed. Other discussions centered on the global review of pest management which UNEP would perform in 1976.

## F. SPECIAL PROJECT REPORTS

Pest Management and Pesticide Management in the Arab Republic of Egypt: During a seven day stay in the Arab Republic of Egypt, six U.S. entomologists participated in a Pest Management Colloquium and conducted careful analysis of the current cotton pest and pesticide management situation in that country. The U.S. participants were Perry L. Adkisson, Texas A & M University; Andrew P. Gutierrez, University of California, Davis; F. Aubrey Harris, Mississippi State University; Harold T. Reynolds, University of California, Riverside; Ray F. Smith, University of California, Berkeley; and Theo F. Watson, USDA, Washington, D.C.

These men reported there was considerable need for the development of pest management systems as a rational guide for pest control activities in Egypt. They stated that a radically modified or fresh approach to the pest control problems of cotton must be developed if Egypt's cotton production is to be maintained in the most efficient and economical manner. The report emphasized that a clarification of the real economic importance of the several important pests of cotton should receive the highest priority. Using the information provided them on the two most important pests of cotton in Egypt - the cotton leafworm and the pink bollworm - the UC/AID team analyzed their status as pests and gave suggestions and recommendations on procedures for improving the control of these two species.

In the case of the cotton leafworm, the team recommended the development of a carefully designed research program in order to obtain data for the establishment of an economic threshold which would be acceptable to entomologists throughout Egypt. They added that this research should be done with the aid of a plant growth analysis study. The team indicated also that if a selective insecticide or selective dosage is discovered which is effective on the leafworm, then recommendations for its use should have priority over broad spectrum insecticides.

With regard to the pink bollworm, team members expressed their belief that its seriousness as a pest in Egypt is somewhat overrated, based on knowledge of its population dynamics elsewhere. They stated in their report that serious consideration should be given to determining the actual need for control of this pest, especially in the early season. This determination could be made by: (1) a re-examination of the economic threshold, (2) new investigations on the possibility of better treatments during the first boll generation precluding the need for later treatments to the entire acreage, and (3) research on hand removal of unopened bolls at time of stalk harvest for storage separate from the stalks themselves.

The report cited the rise to major pest status in Egypt of several insect species that previously were considered only incidental pests. These include the cotton bollworm, a whitefly, stink bugs and jassids. These new pests are species that are known to be controlled effectively by natural enemies in undisturbed areas. The report stated that extensive insecticide use led to a depletion of the beneficial insect populations which was probably the reason why new pests were now appearing.

The U.S. entomologists considered that the most pressing problem in this changed pest situation was the reestablishment of long-term control of these "new" pests by their biological control agents. They believe that the key to such control is interwoven with the control practices used against the key pests, the cotton leafworm and the pink bollworm. If the insecticidal control practices directed against these two pests could be refined through reduced dosages, different insecticides, better timing or other methods, then this could be the real solution to the problem. However, they expressed their belief that it was more likely that improvements in control will only be made after realistic economic injury levels are established. With respect to the available information on the status of biological control organisms in Egypt, the team reported that the broad spectrum chemicals in use suppress these populations drastically, and there was strong evidence supporting the conclusion that their suppression resulted in a resurgence of target pests and increases in secondary pest species. They viewed the general decline in predator populations to about one-fourth of the levels existing 20 years ago as very disturbing as was the reduction in parasitism of important pests by a number of parasites. For example, the tachinid parasites of the cotton leafworm are almost non-existent at present, whereas previously they parasitized as much as 75% of the population.

In view of the importance of beneficial insects to suppressing populations of pest species, the U.S. team recommended that the following areas of research should be undertaken:

(1) Investigation of the causes why some formerly abundant beneficial species are no longer effective. This would involve several avenues of inquiry, especially a study of the impact of broad spectrum insecticides.

(2) Attempts to import exotic beneficial species of parasites and predators should be made.

(3) Eventually, mass production and release of beneficial species should be made.

The U.S. delegation inquired into the amount of scientific effort for cotton insect control that was expended in the testing of insecticides and learned that it was in the range of 60-80%. They stated that this amount of effort was far too great and that the same results could be obtained by a smaller but more tightly organized and administered effort. The team suggested that the total number of chemical compounds brought to Egypt each year for testing could be reduced if the Egyptians would require the chemical companies to furnish more data on pesticidal efficacy and toxicology of coded compounds. They also recommended that there should only be one central laboaratory involved in preliminary laboratory screening.

In addition, they urged that all the field evaluations of these chemicals should be performed by only 2 or 3 of the field stations, instead of having all 11 stations involved in this testing as at present.

If the pesticidal screening could be consolidated into fewer locations as recommended, the U.S. entomologists felt that more intensive research and better data might be collected because industry grant funds then might be spent to employ the technicians, students and field workers required to collect the necessary data on all aspects of the chemicals being tested. This consolidation would also free the time of a great many other scientists who then could place more effort on studies of economic thresholds, biological control, population dynamics, environmental manipulation and host plant resistance.

In summary, the need for redirecting the cotton insect pest research efforts in Egypt from a predominantly pesticide orientation toward an adoption of new approaches was repeatedly pointed out in the report. Considering the problem of limited resources for cotton pest management research, the report stated that the first priority for redirection should be determination of realistic economic injury levels for cotton pests. This would provide a sound basis for pesticide application decisions and consequently would allow for minimum insecticide usage for adequate pest control. It was emphasized that careful consideration must be given to the assignment of remaining resources to research on new insect control techniques. Among the several new approaches discussed during their visit were host plant resistance, cultural control, biological control, microbial control, pheromones and hormones and the sterile insect release method.

Pesticide Management Seminar/Workshop, Alexandria, Egypt: While in Egypt, Dr. Smith discussed plans for a Pesticide Management Seminar/Workshop with the Minister of Agriculture, the Supervisor General of the Agricultural Research Center, representatives in the Institute of Plant Protection, the Rector of the University of Alexandria, members of the faculty of Agricultural Sciences in the University of Alexandria and also members of the faculty of Agricultural Sciences in Ain Shams University. Personnel in all discussions agreed that it would be most desirable to involve those concerned with pesticides in North Africa in the Seminar/Workshop. To handle the logistical problems in Egypt associated with this event, it was agreed that an Egyptian steering committee would be formed which would communicate directly with the UC/AID Pest Management Project. It was agreed that the Project would provide five or six experts to participate in the Seminar/Workshop which would be held at the University of Alexandria in February 1977.

Information Systems for Alternative Methods of Pest Control: This document was prepared by Dale G. Bottrell, entomological consultant; Carl B. Huffaker, entomologist, University of California, Berkeley; and Ray F. Smith, Project Director, in order to discuss problems and needs in information handling which confront pest management specialists of agricultural crops, especially those working in developing countries on alternative methods of pest control. A summary of their findings and conclusions was presented by H. David Thurston, Ad Hoc Advisory Group member at the FAO/UNEP Consultation on Pest Management Systems for the Control of Pests of Cotton held in Karachi, Pakistan, October 13-16 1975.

The goals of this special report were to identify the major problems commonly encountered by pest management specialists involved in literature searches; review the application potential and limitations of major literature search systems and services by comparing their accuracy of retrieval, geographic application, data bases, availability, etc.; discuss current progress to improve the systems; and develop recommendations relevant to needed changes.

The report placed special emphasis on the problems and needs of crop protection specialists in developing countries in obtaining access to information sources, particularly those relating mainly to non-chemical methods of pest control. A list of especially crucial problems that face these specialists was given and included the following:

(1) Inaccessibility to institutional library facilities and other information documentaries

(2) Budgetary constraints which prevent the creation of specialty libraries

(3) Inaccessibility to directories, indices and other guides to the primary and secondary sources of information

(4) Inadequate modes of communication with crop protection specialists in charge of pest control programs in developed countries

(5) Lack of time to travel to remote library facilities and budgetary constraints on travel to do so, and

(6) Unawareness of the services which provide translation of written information from one language to another.

The authors stated in their report that computer-based data bases and their services offer tremendous potential in the coordination and consolidation of a whole spectrum of activities related to information gathering and dissemination of data on alternative methods of pest control. They noted that there have been several major efforts in the past decade to coordinate and consolidate these activities at an international level but that no one effort has adequately addressed the immediate information needs related to crop pest management programs in developing countries. Of the over 120 currently active and planned electronic computer data bases, they found only 10-15 that were of immediate value to crop protection specialists. These are accessible via computer facilities at most modern libraries and offer good potentialities as a means to more rapid access of published and current awareness, non-published information and also to supplement "manual" information searches.

However, the authors reported that many of these bases and services, especially those designed to meet the needs of developing countries, are currently still in the experimental phase, and several years will be required before their potential is realized. Moreover, other computer-based services are not available to, and probably could not be afforded by, many developing

countries. Three of the data bases that have been commonly used by crop protection specialists were evaluated and compared in the report to determine their specific value to a particular class of user. The results of this evaluation demonstrated the kinds of information obtained and some of the problems that might arise in any computer search. The report pointed out the advantages of conducting searches from two or more data bases when seeking more comprehensive bibliographic citations but also stated that these benefits had to be weighed against the additional expense involved for making a multidata base search.

The document also discussed several major organized efforts to improve information handling and coordination among countries, including AGRIS, AGLINET and CARIS. More detail was provided in the report for AGRIS, FAO's International Information System for the Agricultural Sciences and Technology, than the other systems because it presently is the only broad-based international agricultural information system that possesses many features which satisfy the overall information handling demands of all crop protection specialists and their organizations. There are already several national and regional agricultural information system concerns participating in the development of AGRIS' centralized computer-based network. Each network is conceived as a central computer data bank linked with a number of large documentation centers also using computers. Each of these centers is to be linked to a number of smaller local information centers that may or may not use computers. Clients will be able to obtain services from any of these centers depending upon geographic location, communication facilities and language employed. The system, however, is still relatively new, and its potential to the user and its impact on other information systems have yet to be determined.

Some of the positive and negative features of computer information retrieval were summarized in the report as follows:

(1) No one computer information retrieval system has available any combined data base that represents the whole universe of a given set of information

(2) Some data bases are simpler to use than others, but all require careful scrutiny and experience if their maximum capacity is to be utilized

(3) Retrospective literature searches which scan literature more than five years old are not currently possible for most fields of interest to crop protection specialists

(4) Current awareness searches of new literature and unpublished information often provide the only means of getting to information pertaining to on-going research projects and are an extremely valuable adjunct to other current awareness techniques

(5) Retrieval services facilitate more rapid speed of searching and offer the convenience of custom printed, personalized, bibliographic printouts

(6) These services allow access to data bases for some information which cannot be obtained from published hard copy and that can only be searched by machine. They also have the ability to combine or limit, in special ways, searches which may be impossible to perform manually

(7) Costs for these customized computer searches are high and vary with the services provided.

In conclusion, the authors suggested that scientific societies, information centers and organizations involved in providing assistance to these developing countries take a more sincere interest and active role in providing immediate solutions to the most pressing needs in information gathering and dissemination. They also urged that efforts be made to form consortia which embrace the participation of fraternal societies of a broad segment of the agricultural and biological sciences as a mechanism toward improving communication and as a device for establishing a more common ground for assisting developing countries with their information needs.

As a method of solving the situation described in the report, the authors recommended the formation of an international information project center for alternative methods of pest control. This center would consist of a network of participants from both developed and underdeveloped countries to assist in searching, collating and disseminating information. They believe that the principal responsibilities of coordination, dissemination, information referral, as well as other aspects, should be centrally headquartered at one institution and that the latter should have an exceptionally strong and modern library facility staffed with information science specialists. This institution should also have a staff of highly knowledgeable pest management specialists in the several relevant disciplines and adequate computer facilities for the development of an information system to meet the specific needs of the project.

According to the report, the responsibilities of this project would be to:

(1) Conduct an in-depth study of the whole spectrum of information requirements to meet the short-term and long-term needs of crop pest specialists involved in developing economically and ecologically sound pest management programs in the underdeveloped countries

(2) Determine the immediate needs and take necessary action for improving the gathering and dissemination of information as related to developing pest management programs

(3) Develop guidelines for the use and evaluation of available and future machine-readable data bases related to alternative methods of pest control

(4) Develop a worldwide network of specialists who would serve as resource persons to gather and communicate information in their areas of the world and their disciplines to augment existing data files and information concerning

current developments, and

(5) Cooperate with current and future international information systems and services to ensure compatibility of these systems and services as is feasible within the context of the project.

Potential Pesticide Contamination at Research Station in Colombia: At the request of USAID/Bogota, Project Director Ray F. Smith visited Colombia, May 10-14, 1976, to provide advice concerning the possible pesticide contamination of the fish ponds at the INDERENA Aquaculture Research Station near the village of Repelón in the Atlantic Province of Colombia. Prior to his visit, Dr. Smith discussed the situation at Repelón with Dr. Donavan D. Mos. of the International Center for Aquacultures, Auburn University and with colleagues in the University of California, Berkeley,

In his report, Dr. Smith noted that with the development of a new irrigation district in Repelón in 1973 and the subsequent introduction of cotton, tomatoes, platanos and other irrigated crops in the region, a great deal of concern arose about the compatibility of this agriculture and the research station. This was especially true with reference to the potential likihood of pesticide contamination of the fish ponds on the Repelón station from aerial spraying of cotton.

The Minister of Agriculture of Colombia appointed a special committee to study the situation and assist in resolving the conflict of interest involved. Dr. Smith was to provide an input to this committee through USAID/Bogota. To gather information on the problem, he discussed the subject with many concerned persons in Colombia and visited the station and its surroundings.

From these discussions and visits, Dr. Smith concluded that the technological problems of protecting the Repelón station from pesticide contamination did not seem to be difficult; therefore, he believed it most unwise to consider moving or abandoning the Repelón aquaculture station. However, he felt that if the farmers of the irrigation district were allowed to use pesticides for cotton in traditional patterns, without regard to the risks to the Repelón station, then a severe threat could exist for the station. In spite of this potential threat, he felt there were some steps that could be taken which would minimize, if not eliminate, the risks. These steps were:

(1) Establishment of a 200 meter barrier strip immediately surrounding the station planted with trees and other vegetation, together with an additional 600 meter strip in which application of pesticides by air would not be permitted. This plan had already been suggested and was fully endorsed by Dr. Smith

(2) Prohibition of the flight of agricultural aircraft over the station or barrier strips, whether they were spraying or not

(3) Complete prohibition from the station and barrier strips of the use of endrin, toxaphene, aldrin, dieldrin, endosulfan, arsenicals and heptachlor in any form in any application of pesticides, including combinations and mixtures, and

(4) Prohibition of the aerial applications of pesticides when wind speeds are greater than 12 km/hr.

Dr. Smith also recommended the elimination of cotton production from the barrier strips extending 800 meters from the station. In addition, he suggested that the personnel of the Repelón station should be prepared to take emergency actions in the event that the Repelón water supply became contaminated or was suspected of being contaminated, e.g., treatment of pesticide contaminated water prior to its introduction into the fish pond. Dr. Smith further stated that there appeared to be a great need for improved understanding in the local community as to the purpose of the Repelón station. He felt that steps should be undertaken to rectify this situation and to develop local goodwill.

While in Colombia, Dr. Smith took the opportunity to discuss several aspects of the UC/AID/PM Project's activities with officials of the Instituto Colombiano Agropecuario (ICA). He explained the pesticide residue laboratory quality control program to the staff in ICA and found that they were very eager to have both the public health laboratory concerned with occupational health and the ICA lab concerned with residue analyses and quality control become involved in their program. They were also very much interested in the presentation of a Pesticide Management Seminar/ Workshop in Colombia in September or October of 1977.

## G. SPECIAL PROJECT ACTIVITIES

Periodical Newsletter, PEST MANAGEMENT NEWS - Reference to the need and desirability of publicizing the activities of the Project was an item of discussion at several Project Ad Hoc Advisory Group meetings during the last two years. The general consensus was that the development and publication of a periodical newsletter would be a highly effective way of communicating the Project's activities to interested persons around the world and should be actively pursued. Therefore, Project Co-director David E. Schlegel and Donald J. Calvert visited the International Plant Protection Center (IPPC) at Oregon State University in Corvallis, Oregon on March 26, 1975 to hold discussions with IPPC project personnel concerning the possibility of integrating or incorporating this proposed newsletter with that of IPPC's own project. After considerable discussion of the pros and cons of the matter, the general feeling of the group was that the creation of a new and separate publication would be the best procedure to follow.

Accordingly, plans were made to design and develop an entirely new publication to be called Pest Management News. This newsletter would contain articles concerning pest management problems and programs, pesticide management and other items of interest to plant protection specialists throughout the world. The first issue of the newsletter was printed in September of 1975 and mailed to nearly a thousand crop protectionists worldwide. Thus far, four issues have been printed (see Appendix 4).

It is now being received by over 1,800 persons with additional names being continually added as people write in to request that they be placed on the mailing list.

Quality Control Program for Pesticide Analytical Laboratories - Through its sub-contract with the University of Miami in Florida, the UC/AID/PM Project initiated last year a long-range program of quality control for laboratories in developing countries that perform analyses to detect pesticide residues in man, food and/or the environment. The objectives of this program are to:

(1) assess the accuracy and precision of the analytical procedures used by the laboratory

(2) detect specific training needs within the laboratory and assist it in developing increased proficiency

(3) assist in upgrading and standardizing performance of each laboratory, and

(4) facilitate exchange of technical information between laboratories.

At the start of the program, a sample of four pesticides in a hexane solution were provided to fifteen laboratories in nine countries. Thus far, eight laboratories have sent in results, four labs have written in to explain why they couldn't perform the tests, and the remaining three labs have not responded. The laboratories that experienced difficulties with the analyses of these samples will be assisted by analytical chemists of the University of Miami in overcoming their problems. The results obtained by these laboratories will be made available to each participating laboratory for the purpose of comparing their performances. The data, however, will be presented in coded form so that strict confidentiality will be maintained.

A second sample, also of four pesticides in a hexane solution, was sent to twenty-four laboratories in fourteen countries. As of July 1, 1976, only five labs have sent in results. There are now twenty-six laboratories that have expressed a desire to participate in this quality control program. When completely operational, each laboratory will receive one or more unknown samples for analysis every three months. These participating laboratories will also be provided as available information on new analytical procedures and other material necessary for the operation of an effective residue laboratory.

UC/AID/PM International Plant Protection Library - As an outgrowth of the UC/AID Pest Management and Related Environmental Protection Project, an International Plant Protection Library was established several years ago in 117 Giannini Hall on the University of California Berkeley campus. This library contains documents, reprints, books and journals dealing with agriculture in developing countries of the world. There is also information on pesticides, plant diseases, pest control, ecology and the environment, the world food situation and related international institutions. Files of clippings are also maintained dealing with various social, political and cultural aspects of many different countries. The library is used by faculty, staff and graduate students of the Department of Entomological

Sciences, but because it is small and contains some privately owned material, it is not open to the general public.

Other Activities - Several members of the UC/AID/PM Project Ad Hoc Advisory Group devoted a considerable amount of time to the planning and organization of 2 workshops that were to be held in July and August 1976. The first of these was an International Workshop on the Ecology and Control of Bacterial Wilt Diseases caused by the bacterium Pseudomonas solanacearum. The purpose of this workshop is to coordinate worldwide efforts to obtain effective control of this disease on food crops of major importance by breeding, cultural practices and other biological methods.

The second workshop was a Special Training Workshop in Agricultural Pest Management for Entomologists from Developing Countries. It was to consist of instruction and field tours to observe pest problems, ongoing research and extension programs on forage, vegetable and fruit crops in the eastern United States. A discussion of these two workshops will be presented in the next Annual Report.

Appendix 1.

Financial Summary

Expenditures for the period January 1, 1975 to December 31, 1975, on Project AID/ta-C-1195, Pest Management and Related Environmental Protection, appear on the following table:

| | |
|---|---|
| Salaries and Wages . . . . . | $ 63,660 |
| Consultants . . . . . | 23,697 |
| Employee Benefits . . . . . | 9,467 |
| Overhead . . . . . | 51,592 |
| Travel, Transportation and Allowances . . . . . | 71,122 |
| Publications . . . . . | 3,285 |
| Newsletter (first issue) . . . . . | 510 |
| Mailing Costs . . . . . | 2,216 |
| Other Direct Costs . . . . . | 21,531 |
| Subcontracts . . . . . University of Miami | 43,066 |
| | $290,146 |

Upon termination of the first contract (csd 3296), a new three-year contract (ta-C-1195) was approved for the period January 1, 1975 - December 31, 1977, with total expenditures projected at $903,000 for the period.

## Appendix 2.

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Appendix 3.

Summary of Overseas Activities of Consultants and Project Personnel of the University of California/USAID Pest Management and Related Environmental Protection Project

July 1, 1975 - June 30, 1976

1. Drs. Ray F. Smith, Virgil Freed and John Davies - July 6-12, 1975, to Guatemala and El Salvador to evaluate the situation and to make preparations for a Pesticide Management Seminar/Workshop. Report submitted September 24, 1975.

2. Drs. Ray F. Smith and Dr. Stephen Wilhelm - August 18 - September 7, 1975, to Moscow to attend and participate in the VIIIth International Plant Protection Congress. Report submitted October, 1975.

3. Dr. Allyn Cook - September 8-20, 1975, to represent UC/AID project at the following important crop protection meetings: "Crop Protection in Horticulture," September 8-12, Reading, United Kingdom; The III International Congress of Virology, September 10-17, Madrid, Spain; and a conference on "Resistance to Virus Diseases in Vegetable Crops," September 15-18, Montfavet, France. Reported submitted October 17, 1975.

4. Dr. John E. Davies - September 27 - October 4, 1975, to Rome, Italy to represent the UC/AID project at the Meeting of the FAO/UNEP Consultation on Impact Monitoring of Residues from the Use of Agricultural Pesticides in Developing Countries. Report submitted January 23, 1976.

5. Drs. Roy D. Wilcoxson, M. T. AliNiazee, Edgar Dresner, Glenn W. Hedlund, and Richard C. Maxwell - October 7 - December 2, 1975 to Bangladesh to evaluate plant protection and formulate recommendations. Report submitted May 14, 1976.

6. Drs. Louis A. Falcon and H. David Thurston - October 13-23, 1975 to represent UC/AID project at the Meeting of FAO Panel of Experts on Integrated Pest Control and FAO/UNEP Consultation on Pest Management Systems for the Control of Pests of Cotton held in Karachi, Pakistan. Report submitted January 23, 1976.

7. Drs. Perry L. Adkisson, Andrew P. Gutierrez, F. Aubrey Harris, Harold T. Reynolds, Ray F. Smith and Theo F. Watson - October 25-31, 1975, to Cairo, Egypt, to participate in the US/Egypt Colloquium on Pest Management. Report submitted February 12, 1976.

8. Drs. Ray F. Smith and Donald Calvert - January 7-11, 1976 to Guatemala to make final preparations for the Pesticide Management Seminar/Workshop for Central America to be held in Guatemala. Report submitted March, 1976.

9. Drs. Virgil H. Freed, George Georghiou, George Chirstakis, Bruce Mann, Ray F. Smith, and Donald Calvert - February 1976 to participate in the Pesticide Management Seminar/Workshop for Central America held in Guatemala City. Report submitted March, 1976.

10. Dr. Donald Calvert - April 20-28, 1976, to represent UC/AID project at the IV Reunión Nacional de Técnicos en Control Biológico y Organismos Auxiliares de Sanidad Vegetal in Tapachula, Mexico and to Guatemala City to confer with ICAITI officials as a follow-up to the Pesticide Management Seminar/Workshop held in Guatemala February 2-4, 1976.

11. Dr. Ray F. Smith - May 10-14, 1976 to Bogota and Cartagena, Colombia at the request of USAID/Bogota to evaluate and make recommendations concerning possible pesticide contamination in fish ponds near Repelón, Provincia Atlantico, Colombia and to also discuss other matters related to plant protection. Report submitted May 1976.

Appendix 4.

## UC/AID Pest Management and Related Environmental Protection Project Publications

Anonymous, 1976. The Agromedical Approach to Pesticide Management. Compilation of papers presented at previous UC/AID Pesticide Management Seminar/Workshops. Available in either English or Spanish.

Adkisson, Perry L., et al., 1976. Pest Management and Pesticide Management in the Arab Republic of Egypt. UC/AID/PM Special Report.

Bottrell, D.G., C.B. Huffaker and R.F. Smith, 1976. Information Systems for Alternative Methods of Pest Control. UC/AID/PM Special Report.

Freed, Virgil H., 1976. Replacement Chapter on Handling, Transportation and Storage of Pesticides for the USAID Pesticide Manual, Part I (1972 edition).

Wilcoxson, Roy D., et al., 1976. Plant Protection in Bangladesh. UC/AID/PM Multidisciplinary Study Team Report.

Annual Report 1975. University of California/Agency for International Development Pest Management and Related Environmental Protection Project Contract No. AID/ta-C-1195. 1974-75 Annual Progress Report.

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