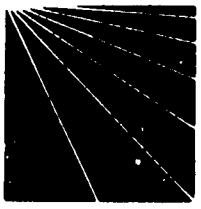

Consortium for International Crop Protection

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CONSORTIUM FOR INTERNATIONAL CROP PROTECTION

PEST MANAGEMENT & RELATED ENVIRONMENTAL PROTECTION PROJECT*

ANNUAL REPORT

TO

AGENCY FOR INTERNATIONAL DEVELOPMENT

OCTOBER 1980 - SEPTEMBER 1981

Ray F. Smith, University of California, Executive Director

Member Institutions:

Cornell University
North Carolina State University
Oregon State University
Texas A&M University
University of California
University of Florida
University of Hawaii
University of Miami, Florida
University of Minnesota
University of Puerto Rico
U. S. Department of Agriculture

* Contract No. AID/DSAN-C-0252

PDAAN591

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INTRODUCTION

BACKGROUND INFORMATION ON CONSORTIUM

The Consortium for International Crop Protection (CICP) is a public benefit, non-profit organization formed in 1978 by nine U.S. universities which were interested in, and concerned about, the increasingly serious food deficit problems occurring in developing countries. CICP was incorporated on August 15, 1978 in the State of California after a number of organizational meetings in which the nine universities agreed to combine their expertise, talent, experience and other resources in a concerted effort to respond to the crop protection needs of developing countries and assist them in the reduction of food crop losses. CICP's basic goal is to advance economically efficient and environmentally sound crop protection practices in these countries; consequently, its primary efforts are to encourage and support the development and adoption of programs of integrated pest management and to promote the safe and effective use of pesticides.

CICP provides training and technical assistance to personnel in the less developed countries of the world in the areas of pest and pesticide management. Through a variety of interrelated activities, CICP assists government officials, administrators, scientists, farmers, etc., in these countries in planning, developing and implementing plant pest and disease control programs in ways which will minimize human health hazards and other adverse environmental impacts. CICP also conducts appraisals of critical food production problems in the developing regions of the world through the use of multidisciplinary study teams composed of scientists with considerable expertise in crop protection. The function of these teams is to identify the most serious pest and disease problems of the most important crops in the

countries which they visit and evaluate them from the point of view of the needs of the area. Such appraisals are interdisciplinary in nature and the resulting recommendations serve as important bases for planning research, training and control programs intended to ameliorate the problems that were identified.

The goal of increasing the food supply in the developing countries cannot be realized until the major pests and diseases attacking important food crops are identified, studied, and brought under managed control. The estimates of food crop losses in less developed countries that are due to pest activity have been variously calculated from 20% to over 80%, depending on the country, crop, and season; these losses will undoubtedly decline as improved pest management programs are implemented. It is CICP's aim and purpose to assist the developing countries in adopting these improved programs and thereby permit recovery of a significant portion of these pest-related losses. In addition to increasing food production directly, adoption of these programs will result in greater safety for humans and an improved general environment because of the more rational use of chemical pesticides that is an essential feature of these programs.

Background Information on Consortium

The Consortium traces its origin and formation directly to an earlier organization - the University of California/U.S. Agency for International Development Project in Pest Management and Related Environmental Protection - which provided technical advice and assistance on pesticides and pest management to developing countries for USAID from 1971-80. The first six institutions named below were members, along with the U.S. Department of Agriculture, of this project. A decision to broaden and

expand the activities of this project and bring its administration under the structure of a new organization was reached in a series of planning and organizing conferences beginning in 1976 that ultimately led to the incorporation of CICP in August 1978 in the state of California. The following universities are founding members of CICP:

University of California
University of Florida
University of Miami (Fla.) School of Medicine
Cornell University
North Carolina State University
Oregon State University
Texas A & M University
University of Hawaii
University of Minnesota

During the year under review, the U.S. Department of Agriculture (in November, 1980) and the University of Puerto Rico at Mayagüez (in February, 1981) became members of the Consortium. Expressions of interest in joining CICP were also made by several other institutions.

The specific goals of the Consortium are:

- to increase and disseminate knowledge and understanding of integrated pest management and the economic, social, and educational aspects of international crop protection

- to develop and maintain an overview and current awareness of crop protection needs and problems in developing nations for the purpose of promoting the development and implementation of integrated pest management programs

- to promote coordinated interdisciplinary programs that utilize the combined expertise of the medical, nutritional, and agricultural sciences to improve the use and management of pesticides

- to initiate and cooperate in developing training programs and educational materials in crop protection and pesticide management and to encourage the exchange of students, staff, or academic credit between and among international institutions

- to provide professional consultants to assess, evaluate, and implement specific crop protection programs, and

- to plan, conduct, and supervise research programs in crop protection and pesticide management

CICP operates under the overall guidance and direction of a nine member Board of Directors. Each member institution appoints a representative to serve on the Board and this body determines general policy, sets priorities and approves programs. The daily management of the Consortium programs is conducted by an Executive Director and a small staff who implement policies and coordinate activities. The full-time staff includes three pest management specialists, a librarian, an administrative assistant, and secretarial support. Consortium headquarters are at the University of California, Berkeley; however, one of the pest management specialists is located in the Washington, D.C. area where he can interact more closely and quickly with officials in the various federal agencies involved with plant protection matters and the use and regulation of pesticides.

As stated above, CICP is a direct outgrowth of the UC/AID Pest Management Project; consequently, Consortium officials endeavored to continue

the same and similar activities of the previous organization and entered into negotiations with USAID officials to obtain the necessary funding. This effort was successful and a five year contract - which not only continued but broadened the scope and goals of the original pest management project - was signed and went into effect on October 1, 1980. This report will review and explain in some detail the progress and achievements of CICP'S activities and programs for the period October 1, 1980 - September 30, 1981, the first year of the contract. Anyone desiring further information about these activities should contact the Executive Director, Ray F. Smith.

RESPONSE TO USAID MISSION REQUESTS FOR TECHNICAL ASSISTANCE

LIBERIA

TANZANIA

INDONESIA

NICARAGUA

PERU

WINDWARD ISLANDS

Lofa County Agricultural Development Project (Phase III), Voinjama, Liberia, November 9-28, 1980

Entomologist and biological control specialist, Patricia C. Matteson, was employed as a consultant to visit Liberia for three weeks and conduct an Initial Environmental Examination (IEE) of the Agricultural Development Project being implemented in Lofa County. The purpose of this project is to assist 15,000 farm families increase food and cash crop production by means of agricultural inputs, credit, improved marketing structures, farm to market roads, disease control, etc. The proposed project (Phase II) is an expansion of the original Integrated Rural Development Project which provided production information and technical instruction on methods to increase the yields of cacao, coffee and rice; it also improved sanitation and instituted an antischistosomiasis campaign. Phase II proposed to continue the previous activities of Phase I in the Upper Lofa region in order to create a self-sustaining cooperative and extension system. In addition to the crops previously mentioned, cassava and ground nuts and livestock development and seed production technology were to be introduced. The basic structure and thrust of the project was to be oriented to provide help to the subsistence farmers to enable them to increase rice production and offer them the opportunity to produce cash crops.

During the first few days of her assignment, Dr. Matteson familiarized herself with the project design, its organization, procedures and problems. She was briefed on the agricultural problems, sources of information, pesticide use and marketing conditions and pesticide user training programs. She visited the WARDA library to obtain references on pests

and diseases of rice in West Africa and to review literature on applied research on rice in Liberia. She interviewed a number of scientists associated with the Lofa County project as well as those in the Ministry of Agriculture and the pesticide industry to discuss pesticide use problems and policies in Liberia and the possible environmental impact of project activities. Coffee and cacao plantations were toured with project staff to survey pest problems and damage; a schistosomiasis control unit was also visited. During her interviews with project scientists and Ministry officials, Dr. Matteson discussed in some detail pesticide use patterns, extension of chemicals to farmers, possible inclusion of safety equipment and clothing in the agricultural credit package, and the arrangement of periodic visits from other Liberian professional entomologists to advise project staff on proper handling of pest problems. She was informed of the improved rice paddy irrigation system being extended to farmers that was capable of controlling the water flow in and out of rice swamps, thus minimizing the pollution due to fertilizers and pesticides that could be flushed into streams from rice farms.

Dr. Matteson also visited the Agricultural Training Center to learn about safety problems, equipment, additional safety training and pest problems and to sit in on a training session with 25 farmers where much interest was displayed in the safety clothing and equipment that was to be made available as part of the credit package. In discussions with World Bank officials, a decision was made to recommend against insecticide and herbicide use in rice paddies altogether because of the possible pollution hazards of chemical use in rice paddies that drain into drinking water supplies.

In assessing the potential impact of the project on wildlife and natural ecosystems, Dr. Matteson stated that it would probably be small since the project stresses enhanced productivity of presently cropped land in areas that are heavily populated and where wildlife has already largely been eliminated. The animal husbandry component of the project consists only of a modest ongoing extension program, and no substantial increase in domestic animal populations is planned. To eliminate the danger of increased schistosomiasis incidence due to expansion of cultivated swampland that can harbor alternative snail hosts of the disease, the project created a Schistosomiasis Surveillance Unit under the supervision of a parasitologist. This unit collects baseline data, monitors snail populations and treats infected people at disease foci, and its activities are expected to have an overall beneficial public health impact.

There were five chemicals proposed for use in this project - captafol, chlorpyrifos, fluorodifen, glyphosate and propoxur - and they were to assist in the control of ant pests, mirid pests of cacao, blackpod disease of cacao, termites and weed control in rice, cacao and coffee. All of the pesticides chosen were stated to be the most effective, relatively nontoxic alternatives available and all but chlorpyrifos have been successfully tested on project crops in West Africa. The pesticides requested for use in the project are used widely in the U.S. and/or elsewhere for the same or similar purpose. Most are relatively nontoxic to warm-blooded animals, based on their acute oral toxicity values, and all were considered to be relatively safe for use by humans if used according to label instructions. Project staff were to ensure that adequate precautions and instructions were observed. None of the chemicals was the sub-

ject of present or foreseen EPA regulatory action. Project staff were to send cacao samples for residue testing to make sure that the appropriate Maximum Residue Level for propoxur was not exceeded on cacao for human consumption. Potential hazards to wildlife and the environment would be minimized by adopting appropriate dosages and safety procedures and by applying the pesticides selectively and judiciously, based on actual need. Application of pesticides to swamp rice would be discontinued to avoid fish kills and the pollution of drinking water. Nonchemical control methods are recommended by project staff where feasible, such as sanitation of cacao plantations and hand weeding of rice paddies.

Farmers are instructed to use insecticides only if a pest infestation is observed since economic criteria for pest control have not been established for the project area and little is known of the native complex of natural enemies. Applications were to be made by project personnel or by farmers who had received project credit for pesticides, and both of these groups will have had instruction in their safe use. Sprayers, safety equipment and safety clothing will be included in the agricultural credit packages and made available to the project staff.

Insect Control in Maize Production and Storage in Tanzania, November 9-December 15, 1980

Entomologists F. T. Turpin, Purdue University, and Z. B. Mayo, University of Nebraska, travelled to Tanzania to review the use of insecticides in maize production at the request of the AID Mission in Dar es Salaam. Their specific assignment was to assist in the development of an amended Initial Environmental Examination (IEE) for the use of insecticides in

the Resources for Village Production and Income Project, to review the use of endosulfan in that project, to identify possible substitute pesticides that might be more efficacious, less toxic to users or with less impact on the environment, and to formulate recommendations for the safe and effective use of those pesticides which are recommended.

In familiarizing themselves with maize production and pesticide use practices in Tanzania, Turpin and Mayo visited local small farms and several seed production farms and discussed cropping and storage practices with local farmers, research scientists, Ministry of Agriculture officials and AID Mission personnel. They reported that weeds were an especially severe problem wherever maize is grown and that a variety of other pests also reduce maize production. The control of weeds is done entirely by hand in subsistence farming operations while herbicides are used on large farms. Three species of stalk borers are important insect pests of maize and, of these, Busseola fusca is the most widespread and consistent pest. Under severe infestations, losses in maize range from 40-80% of the potential yield. The African armyworm, Spodoptera exempta, is also an occasionally severe pest.

Turpin and Mayo found that the number of insecticides used in any quantity in Tanzania is very limited and that application methods varied between crops and size of farms. Mechanical ground sprayers are available in larger farm operations while backpack sprayers are used to treat coffee and sometimes cotton. Aircraft are also used in some cotton areas. On small farms, dust formulations of insecticides are preferred because of the unavailability of application equipment and, in some areas, adequate water supplies. There were five insecticides available to control maize insect pests on small farms. The application method recommended by the

Ilonga Research Institute for the control of these pests was the use of a small shaker to sprinkle the insecticide dust into the whorl of each plant. However, in actual practice, many small farmers were using their hands to drop the insecticide into the plant whorls. Safety equipment, such as gloves, respirators, and protective clothing, was generally not available at the small farm level.

In their report, the two men discussed the USEPA registration status of the insecticides approved by the Tanzanian government for use on maize, the acute or long-term toxicological hazards associated with these products, their compatibility with target and non-target organisms, the provisions made for training users and applicators and other related considerations on safe use, and they concluded that the benefits to be derived from the use of insecticides for the control of maize stalk borers and armyworms significantly outweigh the human toxicological and environmental hazards associated with their use, provided that USEPA label directions are followed. Regarding the use of endosulfan in this project, they stated that if it were used according to U.S. label restrictions, it would be a suitable substitute for DDT in maize crop protection programs. However, under current methods of application in Tanzania, these restrictions would not be met; therefore, the use of this product would need to be accompanied by suitable training and the provision of acceptable application equipment.

In their evaluation, Turpin and Mayo found that there were no provisions within the project to monitor the use and effectiveness of pesticides nor was there a pesticide education program to teach users and applicators proper methods of pesticide application, handling, storage and disposal. Therefore, they recommended the implementation of training at the village

level to acquaint farmers with proper methods for safe handling of pesticides, hazards to the applicator, restrictions, and application instructions. Although they did not specify how this training should be provided, they did state that it was unrealistic to think that an effective training program could be conducted through the current extension system. They noted that endosulfan has an USEPA-established tolerance for maize, but since the application method is considerably different in Tanzania, residue analyses would need to be conducted to determine if these residues were within acceptable tolerance levels. They recommended this analysis be conducted on a random sampling of the raw agricultural commodity at the end of the program's first year in order to establish the average level of endosulfan residue resulting from its application in the whorl of the maize plant.

As a result of their assessment, the two consultants urged USAID and the Tanzania Rural Development Bank to develop an appropriate plan for phasing out the use of DDT and substituting alternative insecticides within the first three years of the Resources for Village Production and Income Project. They recommended a negative determination in the IEE for the use of endosulfan in this project provided that provision is made for appropriate training, specified application equipment is used, and residue data under the exact conditions of treatment are developed. The USAID Mission was also encouraged to develop support for long term programs aimed at implementation of pest management programs on crops in Tanzania. In addition, they recommended the support of research designed to determine damage thresholds for the major insect pests, to develop guidelines for timing insecticide applications relative to the stage of

insect development and to test a broader range of plant protection insecticides, including microbial pesticides like Bacillus thuringiensis.

LUWU Area and Transmigration Development Project, Indonesia, March 8-April 7, 1981

Charles R. Ward, pest management specialist, New Mexico State University, was named project consultant to travel to Indonesia and hold discussions with USAID mission officials in Jakarta, officials of the Government of Indonesia and Project LUWU consultants regarding pesticide regulations and use in the LUWU Area and Transmigration Development Project and to formulate an Environmental Assessment as required by USAID Regulations (Paragraph 216.3, Environmental Procedures). Discussions were held with representatives of each of these groups and an extensive on-site visit was made to the LUWU Project to obtain first-hand observations of pest severity, pesticide use and environmental conditions.

Although USAID funds are not being utilized in the procurement of pesticides for this project, USAID funding is being used to establish and operate the Farmer's Cooperative Centers which will be involved in the procurement, sale, and recommendation of pesticides and consequently, it was decided that an Environmental Assessment should be made to review the overall pesticide use in the total LUWU project. The LUWU Irrigation and Transmigration Project is headquartered in Palopo, South Sulawesi and the main project areas are near the town of Bone-Bone and Kalaena where Farm Cooperative Centers and Rural Extension Centers were built or nearing completion and where the irrigation improvement projects are located. The major crops of the area are rice, maize, soybeans, mung beans, other beans, and peanuts, cloves, bananas, coconut and coffee as

well as fisheries and animal production. The government of Indonesia recognized the need to regulate the manufacture and sale of pesticides and passed a comprehensive pesticide regulation program in 1976. They have initiated a pilot integrated pest management program in rice in which tentative economic thresholds have been established for the major insect pests and are being refined for the LUWU project area in ongoing research efforts. These thresholds are being utilized in rice by the extension workers to interpret pest population data being collected in sixteen representative rice fields in the project area. When pest populations approach the economic threshold, the extension workers alert surrounding ers to check their rice fields and apply appropriate control measures neir fields also are heavily infested.

The pesticides used by the farmers were largely dependent upon availability from the Farm Cooperative Center. Application was by a backpack or knapsack sprayer and no protective clothing was observed to be in use. In fact, the applicator usually was barebacked, wore shorts, and was barefooted. In addition, the spray was directed in a semi-circular pattern over the plants in front of the applicator, and he walked through the wetted, sprayed plants as he proceeded through the field being treated. The extreme personal hazards of these bad practices were pointed out, and Ward suggested that spraying could be accomplished by directing the spray to one side so that the applicator would not have to walk through the treated foliage.

Several problems were observed in the safety aspects of pesticide handling. First, many of the pesticides, especially granular formulations and rat baits, come in larger (5kg) packages. Since producers frequently

do not need nor can afford this quantity, the original containers are opened and small quantities measured out into unmarked plastic bags and sold without a label. Ward urged them to make copies of the labels and include them in the plastic bag, clearly mark them as being poisonous, and caution the farmer to store it properly when he returned to the farm. Second, they did not understand the labels in many cases, and often did not know how to interpret the toxicity range of the chemical from the label. Third, the label frequently does not contain the common name of the active ingredient nor limitations on number of applications allowed per season or timing of the last application before harvest.

He also found that there frequently appears to be an excessive time delay between finding economic population levels and action being taken because the plant protection specialist must coordinate his findings and recommendations through the local Rural Extension Center and regional representatives. He believed the system should be streamlined to allow a rapid dissemination of the information to local farmers so that the latter can take the appropriate action in a timely manner to prevent economic damage to the crops.

Discussion

One of the major short-term problems Ward encountered was the lack of a flow of information from the central Indonesian government agencies to the men in the field who are expected to apply the best IPM strategies. Several examples were given in the report where this lack of information flow resulted in improper pesticide use and management. He felt that special attention should be given in research and extension efforts on

vertebrate pest management. Considerable interest was evident in the rodent control program due to its national importance, and a National Rat Management project was being discussed. There was also a wild pig problem but it was more localized and, consequently, received less emphasis, and he stated that an alternative to the use of Temik and other toxicants for wild pig control was desperately needed and their use should be halted until safer methods were developed. None of the government of Indonesia officials mentioned birds as pests, yet almost every farm observed had evidence of some type of mechanical device designed to repel birds as the crops neared harvest. Visits to various health centers indicated a lack of adequate information on equipment, drugs, and reagents for the detection and treatment of pesticide poisoning cases. Since pesticide use is expected to increase in volume in the near future, this situation should be alleviated as soon as practicable to prevent an increase in the number of deaths from accidental poisonings.

Among his specific recommendations, Ward suggested (1) that plans be continued for the presentation of a short course in pest management, seminar/workshops on pesticide management and a research/demonstration project on biological control; (2) that a list of approved pesticides for use in the LUWU Project be immediately provided, along with information on proper storage, safety, use restrictions, container disposal and treatment for poisonings; (3) that funding continue to be provided for the research component of the LUWU Project to assist in the development of an optimum production package that is specific to the project area, and (4) that approval of the PID proposal for the new project on pest management for food crops for Indonesia be expedited.

The application of USAID Regulation 16 criteria was made to ten food

and estate crops with the following results: Basically, the pesticides must be registered for the same or a similar use by the U.S. Environmental Protection Agency, otherwise, acceptable daily intakes and tolerances must be established by the FAO/WHO or the pesticide must meet certain other requirements and specifications on a case by case basis. Applying these criteria to the pesticides registered for use on various crops grown in Indonesia and on the major food and estate crops grown in the LUWU Project area resulted in the elimination of a good number of them although, even so, those remaining will allow the continued effective control of the major pests in the LUWU Project area as well as those in most of Indonesia. Many of the registered products cannot be utilized for any use or are limited to use only on certain crops. Where pesticides were eliminated from use, alternate approved pesticides were suggested for testing and future use if they were to be found efficacious and were to be registered by the GOI.

(1) On rice, fourteen pesticides were tentatively approved for use in the project. Ward noted that research findings at the Moros Research Institute implicated diazinon and fenitrothion in brown and/or white-backed planthopper outbreaks when used to control other pests.

(2) On corn, six of the pesticides were approved for use and the use of Bacillus thuringiensis for the control of lepidopterous larvae was encouraged.

(3) On soybeans, eight pesticides were approved for use.

(4) On peanuts, only two of the products registered and/or recommended for use on peanuts received approval for project use.

(5) On citrus, six insecticides were approved for use and included at least one compound that is registered for the control of each of the three major nationally recognized pests.

(6) On bananas, only one insect pest--the leafroller, Eriopota thrax--is considered of economic importance nationally and one of the GOI registered insecticides has been approved for use in its control, i.e., trichlorfon.

(7) On cloves, none of the five GOI registered pesticides could be approved for use in this project because they were either labeled for restricted use or there was a lack of residue tolerance data. On the basis of a similar use in coffee, however, Ward suggested that diazinon could be approved if if turned out to be efficacious.

(8) On coconuts, also, none of the registered pesticides was approved for use, although nine other chemicals that could be approved for use lack EPA or FAO/WHO residue tolerances. He therefore recommended an immediate screening program for these latter pesticides to determine if they are efficacious on the important coconut pests and to obtain the necessary residue data.

(9) On coffee, a similar situation existed and he recommended that screening and residue studies should be initiated to obtain approval of alternate chemicals.

(10) The same situation was true of oil palm as the pesticide use patterns were similar to coconuts.

Ward raised a concern about the heavy use pattern indicated for carbofuran in rice which may result in excessive residues of this product appearing in the harvested grain. Residue studies were in progress at CRIA/Bogor and this data should be used to determine the maximum number of applications and the length of time required between the last application and harvest to assure that residue levels would be below established tolerances.

The application of Regulation 16 criteria to the registered herbicides resulted in the elimination of six compounds, one of which would be substituted for by glyphosate. The herbicide, dalapon, was approved for use in estate crops with the proviso that residue data would be required to assure that the harvested products would meet tolerance requirements.

With regard to other classes of pesticides, Ward stated that at least two of the GOI registered fungicides were approved for use in the major crops. Several rodenticides were approved for use in the project also and as rats were generally regarded as the No. 1 pest by most people in the project area, he stated that all possible support should be given to the development of a comprehensive rat control research and development program. He gave stress also to the importance of developing an adequate research program to seek alternative methods for the control of wild pigs. Since the project area involves opening new land to cultivation and wide expanses of undeveloped lands are nearby, wild pigs are frequently ranked as the second or third most important pest in the area. The technique in present use involved the placement of 1-2 grams of aldicarb (Temik ®) into

a hole cut into sweet potatoes which were then placed around the edges of the fields as bait. In most cases the pigs never make it back into the uncultivated areas after eating the poisoned bait and are found dead in the vicinity of the treated fields. However, if a marginal lethal dose is consumed, a pig could make it back into the forest, be killed, slaughtered, prepared for human consumption, and eaten without the hunter being aware of the possible hazard. For these, and other considerations of the possible non-target effects of this control practice, the use of aldicarb for this purpose in the project area has been disapproved.

Conclusions

The basic framework for the development of a comprehensive total cropping system integrated pest management program is already in place in the project area. However, there has been a tendency toward overdependence on pesticides and, as a result, there has been some indication of pest resistance to carbofuran, which has been heavily used in the project area. Earlier, there had been developed a comprehensive IPM program for Indonesia by a team of CICP consultants which directly addressed many of the pest and pesticide problems Ward observed while visiting the LUWU project area in preparation for writing the Environmental Assessment. This project proposal was strongly supported by the government of Indonesia officials he consulted during his stay.

He stated that the success and expansion of the pilot scouting program would be greatly enhanced by the approval and funding of this proposed project, predicting the technical assistance, training and research/demonstration phases of the project would result in a pest

management program that is less dependent upon pesticides and result in the least possible pesticide load on the population and the environment.

Evaluation of Hazards Associated with Building a School Complex in Nicaragua, January 11-29, 1981

A risk assessment of the potential environmental hazards associated with the building of an integrated educational complex in Chinandega was requested by the AID Mission in Managua after it was learned that the site selected for construction was in an area of intensive cotton production and heavy insecticide use. The individual selected to perform this Environmental Assessment was entomologist Winfield L. Sterling of Texas A & M University. The Chinandega school was one of four schools approved for funding as part of a Rural Education Development Project whose purpose was to educate primary school teachers and mid-level technicians and managers in agriculture and industry. The three other schools were to be built in Juigalpa, Ciuma and Bluefields. During his stay in Nicaragua, however, Sterling was only able to visit the Chinandega site.

In his efforts to obtain information about the potential hazards presented by pesticides and their use in the region surrounding the proposed school site, Sterling visited the site, obtained maps of the area and talked with personnel in the AID Mission in Managua, staff of several government Ministries and individuals in the private sector. From these visits and interviews, he learned that the risks of being poisoned by chemical pesticides in the Chinandega area is much higher than for other areas of Nicaragua, e.g., the San Vicente hospital in Chinandega treated 70% and 50% of all pesticide poisoning cases reported

in Nicaragua during 1972 and 1973, respectively. Furthermore, about 50% of all insecticides used on cotton in Nicaragua is methyl parathion; thus, individuals working in or around cotton fields in Chinandega would likely be exposed to a pesticide that is highly toxic to humans. As evidence of the intense activity sustained by aerial spray programs, Sterling cited the fact that there were 17 landing strips in the area, one of which is within 1 km. of the proposed school site.

Sterling's report contains a map which depicts the location of cotton fields in relation to the proposed school. It was quite obvious that the school site is surrounded by cotton fields, some of which are within 1 km. of the site, and he reasoned that considerable insecticide drift could occur from pesticide applications made on fields located west of the proposed site. He also noted the existence of four commercial insecticide formulating plants located within 1/2 km of the proposed school. Among the pesticides being formulated at these plants were methyl parathion, Nemacur®, DDT, toxaphene, and ethyl parathion. Sterling expressed the belief that the presence of these formulating plants posed an unnecessary real and potential risk to students and faculty from accidents or disposal of wastes.

A cotton grower informed Dr. Sterling that three shallow water wells on the property of one of the chemical companies had been contaminated with agricultural chemicals and were no longer used. Consequently, well water was also sampled at two locations on the grounds of the nearby Chinandega Agriculture Institute, and these samples were also found to be contaminated with trace amounts of several pesticides.

After examining other evidence of potential hazards, including the

potential for accidental spills of toxic chemicals that were being transported on a nearby major highway and railroad line near the school site, he concluded that the real and potential hazards associated with the proposed site at Chinandega were sufficient reasons for recommending that the school be built at another, safer site. A list of criteria for selecting an alternate site was prepared and left at the AID Mission. Although he was unable to visit the other three proposed sites for schools, his discussion with individuals familiar with those areas revealed no unacceptable hazards associated with these sites. Lastly, Dr. Sterling recommended the use of activated carbon filters for water systems in the Chinandega area if additional testing of the well water demonstrates that it presents a high health risk.

Upper Huallaga Regional Development Project, Peru, May 4-22, 1981

This project has two principal objectives: (1) eradication of coca plants in the region, utilizing a herbicide, and (2) establishment of alternate crops as a substitution for coca production. Since both activities involved the use of pesticides, an Environmental Assessment of their probable impact was required and was performed by consultant William P. Morrison. The report was divided into two parts - the first part dealt with the environmental effects of using the herbicide 2,4-D in the coca eradication effort while the second part examined the anticipated pesticide use pattern in the proposed crop substitution program.

Dr. Morrison stated that a low volatile ester of 2,4-D had been selected by USDA scientists for use in this project based upon the criteria of potential environmental impact, efficacy and availability. They had also determined effective rate, carrier and method of application.

A detailed and thorough environmental evaluation of 2,4-D was conducted in conjunction with the marijuana problem in Mexico and, therefore, only those aspects of its usage that were unique to the coca eradication project were discussed in the report.

The herbicide, with kerosene as a carrier, was to be applied as a basal treatment to individual clumps of coca plants with knapsack sprayers. Morrison considered that the method of application being proposed would assure that only the target coca plants would be directly affected and that the rate at which the herbicide would be applied was being refined and should ultimately reflect the minimal effective rate. Morrison concluded that the proposed herbicide and the method of application appeared to present minimal environmental risks. However, to insure that these risks remained minimal in actual implementation, he recommended that a training element be incorporated in the herbicide use aspect of this project for those in supervisory capacities; he further recommended that the minimum efficacious herbicide rate and the presence of herbicide residues in the leaves of treated plants be researched.

The use of herbicides in this project was to include a mechanism whereby the pesticide would be distributed only to those growers participating in the voluntary eradication program and to the government employees who would be applying herbicides in the subsequent eradication program. The herbicide and kerosene should be stored in locked facilities and not near food or water supplies. Pesticide containers and leftover pesticides will be disposed of in a manner considered safe. Provisions will be made to monitor the use and effectiveness of herbicides used within the coca eradication program.

Before the program is implemented, he stated the following issues

should be resolved: (1) Field research should be conducted to determine if herbicide rates of less than 4 pounds of active ingredient per 100 gallons of kerosene are effective; (2) the extent of 2,4-D translocation from treated stems into the leaves needed to be determined; (3) the logistics of safely transporting, storing and distributing large quantities of kerosene had not been given adequate consideration; and (4) no plan had been presented for training those individuals who would be involved in supervising the use and/or application of the herbicide.

In the second part of the report, he noted that the pest management strategies, including pesticide usage, that were anticipated in this crop substitution project were being presented with only minimal research having been conducted. It was expected that pest problems would be less intense the first few years as this is typical of a new agricultural production system; thus, he felt it was important to conduct a concomitant research effort in the area of crop protection since it was quite possible that one or more serious pest problems would be encountered in the future in which the only viable means of economically producing significant yields would be by intensified use of pesticides. To minimize this possibility, he encouraged examination of alternate nonchemical means of pest suppression in the system.

Through discussions and interviews with several Peruvian crop protection personnel and information provided in a recently completed study by the Fundación para el Desarrollo Nacional (FUNDEAL), Dr. Morrison obtained information on the insect and disease pests occurring in the Upper Huallaga Valley and the pesticides currently being used to control them. Based on this information, he identified those pesticides which

were acceptable for use and which might potentially be needed in order to provide effective control of the anticipated pest complex. Factors considered in selecting these pesticides were primarily based on minimal hazard to the applicator, environmental considerations and efficacy. Judgment of a compound's efficacy was based on the historical performance of the compound elsewhere or on the research, experience and opinion of plant protection specialists in Peru. He noted that for some crop/pest combinations, there was no research base from which to accurately predict pesticide usage patterns.

Morrison also noted that the proposed pesticide uses are not part of an integrated pest management program per se, but that additional research in the area of crop protection would provide a basis to establish which pesticides could be used wisely and effectively in the proposed crop substitution program. He remarked that the project should address the matter of IPM and attempt to provide some assistance in this area. The pesticides selected should present minimal adverse effects on target and non-target ecosystems since they had been selected on the basis of efficacy, safety to the applicator and reduced environmental risk.

Morrison stated that there is a very limited research effort in the Upper Huallaga Valley and only limited extension resources in Peru, and the need for research/extension in IPM for this project was significant. It appeared that the Universidad Nacional Agraria de la Selva and the Ministry of Agriculture could serve as focal points to initiate some activities in IPM. The need for these activities was demonstrated by the coffee berry borer, a serious pest of coffee grown in the project area. Although small farmers apply 3-5 insecticide applications per

year for this beetle, in other coffee growing regions of the world it has been demonstrated that pest populations can be greatly reduced by using various cultural practices, thus reducing the need for pesticide applications.

In summary, Morrison proposed that a concomitant IPM research and extension effort be incorporated in the crop protection portion of the agricultural development program. Even though a number of pesticides were listed for potential use, this did not imply their indiscriminate use was endorsed or anticipated. The only effective long-term approach to agricultural pest problems in the Upper Huallaga Valley will be an integrated one incorporating cultural, biological and chemical factors.

Pest and Pesticide Management Practices in Banana Culture, Windward Islands, West Indies, April 21-May 10, 1981

At the request of the USAID Mission in Barbados, CICP was asked to provide assistance to the Windward Islands banana industry and make an evaluation of the banana leaf spot problem, assess the aerial application techniques used by the banana industry and evaluate other pest management practices involving bananas. To comply with this request, a team composed of a pesticide chemist, an aerial pesticide application expert, and a banana pest specialist was assembled and sent to the Windward Islands (St. Lucia, Grenada, Dominica and St. Vincent). Each of these islands has its own banana grower's association which is responsible for extension, ground spraying for leaf spot disease control and the collection of leaf spot monitoring data. In addition, the associations serve as a centralized source for needed inputs, such as pesticides, fertilizer, sprayers, etc.

The three man team (Carroll Collier, Paige Taylor and Carrol M. Voss) conducted their evaluation by visiting WINBAN headquarters, the WINBAN Research and Development facility, the office of the four island banana growers associations, and all major warehouses, airstrips, hangars, fuel and fungicidal-oil depots on each of the four islands as well as numerous banana growing sites. During these site visits, the team also viewed the actual spraying of banana plots with benomyl-oil mixtures. Several short visits were also made to officials in the Ministries of Health and Agriculture in Dominica to obtain a broad perspective on the human health and environmental problems associated with the use of pesticides in the Windward Islands banana program.

As a consequence of their discussions with plant protection personnel and administrators, several site visits, and an evaluation of the organization and effectiveness of the banana leaf spot control program, the team expressed the view that the spray program for Sigatoka control should be developed based upon disease indices as related to infection levels rather than on the basis of geographic areas and calendar date. They also recommended removal of infested leaves to reduce the inoculum source and proper plant spacing to avoid overlapping of leaves, thereby reducing the humidity and facilitating the coverage of leaves with aerial sprays. They recommended that an alternative to the repeated use of benomyl in the Sigatoka control program should be developed to reduce the problem of post-harvest disease organisms becoming resistant to it; furthermore, they urged establishment of a monitoring program which would detect development of this resistance.

In addition to a review of the Sigatoka disease control program, the team's report also considered various aspects and phases of banana

culture, from planting and fertilization to sleeving and propping, as well as the control of other important pest species. Among the many specific recommendations contained in the report which were meant to improve the banana production practices of the area, the following may be highlighted:

- Use of clean planting material for the control of nematodes
- Develop a rapid technique for the evaluation of nematode infestation through root and/or rhizome surveys
- Maintain regular surveys for detection of bacterial wilt in Grenada and determine alternate hosts
- Increase rate of nematocides at planting to standard rate and develop closed system of application which is both safe and accurate
- Undertake an economic survey of root borer infestation to determine loss in regard to cost of treatment, and
- Determine relationship between weed problem areas, fertility balance and soil type; if bananas are grown on mountainsides, a cover crop should be developed to help suppress weeds and prevent erosion.

In their report, the team also expressed the opinion that the current level of effort on leaf spot and moko disease was not adequate to meet the needs of the industry and should be increased. They urged that efforts should be made to bring the field monitoring aspects of leaf spot disease directly under WINBAN so that an effective quality

control program could be maintained. They suggested further that funds be found to employ an additional plant pathologist to study the potential resistance of fungi involved in leaf spot and crown rot, to test fungicides for leaf spot and crown rot disease control, to determine optimum aerial spray droplet size and coverage, etc. Thus, the field aspects of disease control and development would be the responsibility of one plant pathologist while the second would handle the laboratory and limited field work.

The three men also examined various human health and safety problems associated with pesticide use, distribution and management, e.g. pesticides being transferred from their original well-labeled containers into smaller unmarked containers as provided by individual users; lack of segregation of pesticides from food commodities in warehouses; workers dispensing chemicals in warehouses without using protective equipment, etc., and they made a number of recommendations to improve the situation, including:

- Inclusion of a Pesticide Safety Officer in WINBAN's communication center
- Training of all extension agents in pesticide safety
- Development of a slide show training course in pesticide safety
- Development of pesticide safety posters and leaflets for use in the Banana Growers' Association extension activities
- Monitoring of cholinesterase levels in pesticide applicators applying the more toxic pesticides
- Training of more extension workers, and
- Providing pesticide safety training to all farmers receiving and using pesticides

In their report, the team discussed the risks and benefits for six of the most commonly used pesticides in banana culture and recommended their continued use or substitution with safer materials, as appropriate. They noted that there were recent attempts to reactivate local country pesticide boards where representatives of agriculture and health could meet jointly on a regularly schrduled basis to discuss these and other topics of mutual concern and interest.

A separate report evaluating the aerial application procedures and equipment used for the control of Sigatoka disease on bananas was prepared by specialist Carrol Voss.

In this report, Voss made various recommendations intended to improve the disease control program, including:

- Updating of aircraft through purchase of newer models
- Studying optimum droplet size of spray to obtain best coverage
- Continuing research on chemicals and formulations
- Organizing spraying operations under one directorate, and
- Training of pilots on techniques and methods of spray operations

PROGRAM EVALUATION OR DESIGN

KENYA

PERU

BURMA

SAHEL

Research Project on Plant Resistance to Insects, ICIPE, Nairobi, Kenya, April 30 - May 19, 1981

Patricia C. Matteson, CICP pest management specialist, travelled to Kenya during the time indicated as part of a review team that included John Baritelle, USDA agricultural economist, University of California, Riverside, and Cal Martin, REDSO/EA Agricultural Development Officer to review an USAID-funded project, "Bases of Plant Resistance to Insect Attack," and make recommendations which would allow the Agency to determine whether continued funding of the project was desirable. The team was to review the following aspects of the program: progress of the research, organization, effectiveness, adherence to project plan and objectives and potential research applications. The review was performed utilizing personal interviews, on-site inspection, and the review of project documents.

The original research goals were evaluated and changes were recommended that more emphasis should be placed on the economics of pest management as a basis for evaluating resistance, prioritizing research and the future design of IPM programs. They also found that participation of other projects is important to this program, such as the cooperative research being conducted with IRRI, ICRISAT, IITA, CIMMYT, WARDA and the Kenyan Ministry of Agriculture, while the ICIPE Crop Borers Programme does complementary research on the same crops and pests. The location of the research program at Mbita Point Field Station proved to be an excellent site for conducting adaptive research work whose results could be tested under farmers' field conditions.

In their recommendations, the team stated that it would be

necessary to write a detailed project statement so that future reviews can focus on specific areas of responsibility and accountability and to facilitate the attainment of project goals. They urged all ICIPE funding provided by AID should be administered from a central point in Nairobi to simplify and facilitate monitoring, reduce potential duplication of efforts and enhance the AID/ICIPE working relationship. They also recommended that funds should be committed for a minimum of three years to insure continuity of research effort and that funds designated for research should be administered and accounted for by the Programme Leader to achieve better planning, increased efficiency, higher morale, and more effective research.

The purpose of the project was the successful establishment of a productive, well-balanced, well-managed ongoing research program in the area of bases of host plant resistance which would confirm resistance reported by other research centers, determine the mechanism of resistance and identify the genetic or physiological mechanisms responsible for conferring resistance. This work was being conducted in regard to seven pests on four major food crops: maize, rice, sorghum and cowpeas and was done partially under cooperative agreements with other international agricultural research centers--ICRISAT (sorghum), CIMMYT (maize), IRRI (rice), IITA (cowpea) and WARDA (rice). The team found, however, that the program had not been fully staffed and the research scientists working in the program were overburdened by the large number of commitments.

As far as research progress was concerned, the team considered that good progress had been made with screening for determination of promising plant selections resistant to sorghum and maize borers;

although some progress had been achieved in designing techniques for mass rearing of the phytophagous pest species involved, results were not yet satisfactory. Also, some progress had been achieved in the determination of resistance mechanisms and identification of the responsible genetic or physiological factors, but because of program understaffing and emphasis on screening work, some tentative hypotheses drawn from field experiments had not been verified and quantified, and some research avenues had been abandoned before useful data had been collected. A contributory problem was inadequate supervision of the nine technicians, decreasing their ability to make meaningful research contributions.

The evaluation team found the level of reporting to account for expenditure of funds to be inadequate for the effective monitoring of the program by REDSO/EA, as disbursement of funds was reported in three broad categories without itemization. They found a pattern of deviation from the project budget that hindered vital aspects of the research program, e.g., a far lesser amount is being expended for scientists' salaries and travel, and a far greater amount for supplies and equipment. Interviews with many individuals revealed disagreement and conflict between scientists/technicians and administrators concerning the staffing of the research programs, expenditure of funds, etc., with scientists feeling that the ICIPE administration plays too strong a role in decisions that should be based on technical considerations, and this interferes with the effectiveness of programs.

The team found liaison between project staff at Nairobi and Mbita Point to be adequate and after completion of office, laboratory and living facilities at Mbita Point, the Programme Leader would be based there for close supervision of research activities. In their report,

they stated that the entomological work at ICIPE is to be integrated by the Kenyan Ministry of Agriculture into overall crop management schemes and that resistant varieties needing adaptation to the Kenya environment should be given to Ministry breeders.

National Institute of Agricultural Research and Development, Lima, Peru, May 9 - 15, 1981

CICP Executive Director, Ray F. Smith, and consultant, J. Lawrence Apple, plant pathologist, North Carolina State University, were invited to Peru by the head of the National Institute of Agricultural Research and Development /Instituto Nacional de Investigación y Promoción Agraria (INIPA)/, Dr. Alexander Grobman, to discuss possible collaboration and development assistance in the implementation of a national program on integrated pest management. INIPA is the public institution charged with the responsibility for agricultural research, extension, farm mechanization and rural marketing development in Peru.

The government of Peru has placed a high priority on increasing agricultural production and had recently negotiated several large loan contracts dealing with improving production. One of these was an Agricultural Sector Development Loan with the Interamerican Development Bank (BID), signed in early May 198[illegible] for $80 million, $24 million of which was for programs in INIPA. The World Bank was developing another agricultural loan for $60 million to support regional development and USAID was processing a loan for $30 million to support development in the Piches/Palcazu area of the jungle to be signed in September. BID had also made an $8.6 million grant to INIPA but the funds had not been released, apparently

pending establishment of the Research, Education and Extension (REE) system, a program also funded by USAID.

In view of these major new investments for the agricultural sector of Peru, the inclusion of improved crop protection programs in the efforts to increase production was considered highly desirable and necessary. A proposal for one such program, entitled "Profile of a Project for Integrated Control of Pests of Crops in the Coast, Sierra and Jungle of Peru," was discussed at the meeting between Smith, Apple, Grobman and several INIPA administrative officials and research scientists and a representative from the World Bank. This proposal had apparently been developed in expectation that a Title XII Collaborative Research Support Program (CRSP) for Peru would be funded, an assumption that Smith and Apple indicated would probably not be fulfilled. After this notification, the meeting adjourned without further progress.

Given the opportunity to review the proposal in more detail, in subsequent meetings Smith and Apple stated that they felt the proposal was too general and covered more crops than could be addressed simultaneously in an integrated pest control program, given the scarce human resources in Peru. They indicated that candidate crops should be prioritized for inclusion in this program according to the following criteria: (1) resources available (financial and technical); (2) available information applicable to integrated pest control on a given crop in Peru and elsewhere; (3) the potential for development of integrated pest control on the crop, taking into account the number and seriousness of key pests, availability of control tactics, etc. and (4) the importance of the crop to the basic food supply of the country.

Based upon these criteria, the crops included in the proposal were prioritized and, after considerable discussion, it was accepted that corn, rice and potatoes were logical candidate crops for development of integrated pest control programs. It was pointed out that these are three of the commodities included for emphasis in the Research, Education and Extension (REE) loan agreement with USAID. Execution of this REE project had been delayed pending the completion by INIPA of certain conditions precedent required by USAID. In further discussions, it was acknowledged that funding availability would not be a constraint for the development of these programs; the principal constraints would continue to be a lack of cooperation between the involved institutions, inadequate organizational structure and a lack of sufficiently trained technical personnel.

In a final meeting with Dr. Grobman on May 14, he indicated his support for the approach outlined in a new proposal, "Guidelines for Integrated Control of Pests in Maize-Sorghum, Potatoes, Rice and Small Grains in Peru." Smith and Apple expressed their opinion that outside experts on integrated pest control would be most helpful to his crop protection personnel in developing detailed projects for the crops selected. They pointed out that one or two consultants could be provided by CICP if a request was made to the the USAID Mission in Lima and concurred in by USAID headquarters in Washington, D.C. Dr. Grobman expressed interest in this possibility and indicated his intention to make the request. The possibility of supporting integrated pest control projects through loan funds that will be available to INIPA was also discussed as was the desirability of using loan funds for a host

country technical assistance contract to backstop the implementation and conduct of needed research and extension efforts.

Maize and Oil Crop Production Project, Burma, May 15 - June 2, 1982

The Project Identification Document (PID) for this activity was approved early in 1981 with the stipulation that an integrated pest management specialist serve on the Project Paper design team in order to incorporate IPM techniques in the project design and to perform an environmental analysis required by USAID environmental regulations on any pesticide proposed for use in the project. The individual identified to participate in this project design as a CICP consultant was entomologist Edward H. Glass of Cornell University. He and a second consultant met with USAID officials in Rangoon, FAO Plant Protection Officers, personnel of the Agricultural Corporation, extension personnel, Agricultural Research Institute officials and representatives of the local pesticide industry to review the current status of pest problems and pesticide use on maize and oil crops in Burma. From these discussions and visits to farms and demonstration plots, they learned that current pest losses were generally lower than expected, although there were frequent pest outbreaks that required pesticide treatments. The two men also learned that more than 60% of all pesticides applied to maize and oil crops consisted of endrin, aldrin, lindane and DDT, yet there was no evidence that such use had caused toxicological problems to applicators or harmful environmental consequences, although lack of careful monitoring for such problems did not rule out the possibility. Farmers relied on these chemicals to control such important pest species on maize and oil crops as Spodoptera

litura, Diacrisia obliqua, Anomala antigua and Maruca testualis.

Upon careful consideration of the known long-term environmental impact of DDT use and the known or suspected human and environmental hazards of the other pesticides commonly used in Burma, the two men concluded that use of these compounds in the project was undesirable, and they examined five alternative schemes for their replacement by other materials. Since there were no known or proven substitute pesticides for the control of several of these pests, consideration of an immediate and complete change to alternative materials was not contemplated. Furthermore, it was believed that a rapid change would cause confusion and ill will among the farmers as well as economic hardships for some, thus placing the project's success in jeopardy and diminishing the opportunity for developing and implementing integrated pest management programs in other situations. Therefore, the Environmental Assessment (EA) document prepared by these two consultants recommended that uses of endrin, aldrin, lindane and DDT be continued in the project area for those uses for which there were no known alternatives, but that they be phased out as rapidly as effective substitutes could be found. In this manner, an orderly phase-out of these pesticides could be accomplished. The EA also recommended that appropriate training in pesticide management be provided for users of pesticides and that the project provide technical assistance in developing pest management programs.

The two men, in assessing the project, examined the present complement of pests of maize, groundnut, sesamum and sunflower; present control practices, including pesticide use; ecological factors and agronomic practices that impact on pest problems, and project needs in integrated pest management. They noted that the project provides for backstopping

research by the Agricultural Research Institute at Yezin to develop appropriate pesticide use efficacy data for pest problems encountered in the project; the Institute was also to conduct practical field trials of pesticides as well as other production technologies. As a result of their assessment, the two consultants indicated that research in the following areas would be required:

(1) The importance of each species reputed to be a pest should be determined,

(2) The project area should be monitored for evidence of an increase or decrease in pest populations and the appearance of new pest organisms,

(3) Appropriate control tactics for the management of important pests should be devised,

(4) Monitoring techniques practical for use by field personnel to anticipate pest outbreaks in time to take suitable remedial measures should be developed, and

(5) Practical delivery systems, training programs and pest management leaflets with aids in pest identification and control information should be developed.

To assist in the coordination of all crop protection research and extension activities with other phases of the project, they recommended a broadly trained integrated pest management specialist be provided. They also recommended the provision of short-term experts in weed science, entomology, plant pathology, stored products pest control, and, perhaps, rodent control to assist local scientists in the more technical aspects of integrated pest management.

Sahel Regional Food Crop Protection (RFCP) Project and CILSS/FAO/USAID Project on Research and Development of IPM for Basic Food Crops in the Sahel, July 17 - September 17, 1981

In April, 1981, CILSS/FAO/USAID policy makers decided to engage a team of experts to evaluate the administrative and technical progress of two large, complementary, plant protection projects in the Sahel region of West Africa -- the Regional Food Crop Protection (RFCP) Project and the CILSS/FAO/USAID Project on Research and Development of Integrated Pest Management for Basic Food Crops in the Sahel.

These two crop protection projects are part of a larger effort and comprehensive program for crop and post-harvest protection for the Sahel region that had been planned and devised for the region as a direct consequence and humanitarian response to the tragic drought that had afflicted the area from 1968-1973. A significant occurrence that originated as a consequence of this drought was the establishment of two international and regional organizations expressly formed for the purpose of increasing and insuring a stable supply of food and accelerating economic and social development in the region, i.e., Club des Amis du Sahel and the Comité Interétats de Lutte Contre la Sécheresse au Sahel (CILSS). After extensive discussions, CILSS was awarded management responsibility for the implementation of the IPM Project.

The team of experts which was to conduct the evaluation of the two projects was composed of seven individuals, specialized in the following areas: plant protection, budget analysis and programming, engineering, agricultural research administration, integrated pest management, agricultural economics and management systems analysis. CICP pest management

specialists, Dale G. Bottrell and Patricia C. Matteson, were members of the team. In broad outline, the evaluation team was asked to review management structures, technical capabilities, and coordination-liaison relationships as related to both projects. They were to determine the progress achieved, identify the constraints discovered in the achievement of project objectives and prepare the appropriate recommendations concerning the technical, administrative, financial and operational aspects having a direct impact on the effective implementation of the projects. These recommendations were to serve as guidelines for the work of the design team on Phase III of the RFCP Project and were also to provide a basis for the revision and restructuring of research in the IPM Project.

The report prepared by the evaluation team stated that the RFCP project had unquestionably succeeded in strengthening the organization, training and equipping of the National Plant Protection (NPP) services in each of the participating countries. It also had increased awareness throughout the Sahel and surrounding areas of the importance of pest problems and the need for crop protection. The team found that it failed, however, to show significant progress in developing and strengthening a system for extending the IPM technology to farmers. They considered that this was a serious deficiency and one that needed to be corrected; otherwise, the new IPM technology that may evolve under the complementary CILSS/FAO/AID IPM project would remain confined at the experimental level and never reach its intended beneficiaries.

The evaluation showed that the RFCP Project had focussed heavily on the use of pesticides, and the primary beneficiaries to date had been the NPP services; in fact, the latter were not generally involved in any

aspect of crop protection other than intervention with pesticides. The team concluded that, potentially, the most harmful impediment to IPM in the Sahel was the continuing proliferation of extension and intervention efforts which favored increased pesticide use. As presently structured, the RFCP Project was fostering a climate favorable to increased use of the chemical control strategy.

Because of administrative and management problems in the CILSS/FAO/AID Integrated Pest Management Project, project activities did not commence until about September, 1980. Chad was not a participating country because of its civil war and the The Gambia did not participate due to administrative conflicts. Therefore, the participating countries were Mauritania, Senegal, Cape Verde, Mali, Upper Volta and Niger. This Project was created to strengthen national research capability toward developing appropriate IPM techniques for extension to farmers. Phase I was started to build laboratories and other infrastructure, establish an IPM research program, evaluate crop losses and the relative economic importance of pests, set up a surveillance system on the occurrence of major pests and develop a system of demonstration and extension. Most national programs trained observers in 1981 and either established observation posts or chose their sites. Therefore, at the time of the project review, the team found progress was just beginning and that an extension of Phase I to June, 1985 would be necessary to attain project objectives.

The evaluation, after addressing problems of adequate provision of funds for training counterparts, produced a number of general recommendations on research orientation and staffing, including means to ensure coordination of regional crop protection training, an adequate extension

effort, and better regional and international liaison, both within the project and between the IPM Project and other plant protection programs.

With respect to the liaison and coordination of the RFCP and IPM Projects, the team recommended against merging the two projects at present. Instead, they suggested a certain synchronization supplemented by closer coordination and linkage among the AID project managers and their CILSS/FAO and national colleagues. This synchronization would take the form of a postponement of the initiation of Phase III of the RFCP until June 1982 when redirection of the IPM project should be completed and Phase II of that project would begin; then both projects would run in tandem through June 1985 allowing for three successive field campaigns for IPM research and corollary re-orientation of NPP services toward IPM principles and methods.

For coordination purposes, they recommended that AID organize a joint IPM/RFCP office in Upper Volta, transferring RFCP direction and resources from Dakar, thus encouraging a firm link between both projects through this joint office. They also recommended the transfer of the Regional IPM (CILSS) office with its Sahelian and FAO staff from Bamako, Mali to Ouagadougou, Upper Volta and the appointment of the Regional Director by the CILSS Executive Secretary. They further recommended that CILSS and AID agree to vest in FAO the technical direction of the IPM Project to include budget and financial management responsibilities.

Overall, the evaluation team provided 71 recommendations which provide great detail and substance for support of the following five general recommendations:

(1) A combined tripartite management team, consisting of a strengthened CILSS Director's office, an adequately staffed USAID joint project

office and an FAO advisory component at regional and national levels with increased project execution authority and responsibility, should be organized to implement the two coordinated and mutually supporting projects in food crop protection.

(2) Phase III of the RFCP project should be re-designed to emphasize the delivery to subsistence and food crop farmers of effective and economic IPM systems, developed by the IPM Project. This should be accompanied by a consequent reduction in intervention with pesticides except in an IPM framework.

(3) The IPM Project should be closely linked to the RFCP Project with emphasis on producing, through research and training, IPM systems that will feed into the RFCP project's work with extension services, crop protection services and individual farmers.

(4) The 3 principals must mutually develop life of project and annual budgets that reflect agreed project execution schedules and agreed activities. Financial management must be made an effective tool, at the disposal of the management team.

(5) At working levels, USAID and CILSS project managers and FAO advisors should institute coordinated approaches to day-to-day problems of project administration and technical operation.

A more comprehensive examination of the evaluation team's review of these two projects follows:

Evaluation of the Sahel
Regional Food Crop Protection Project

The Regional Food Crop Protection Project (RFCP) is an outgrowth of the Sahel Food Crop Protection Project (Phase I) which was in existence June, 1975 to March, 1979. The countries involved are Senegal, The Gambia, Cameroon, Cape Verde, Mauritania and Guinea-Bissau. Chad was a member participant during the first phase of the Sahel project (until March, 1979). Phase I of the RFCP Project, authorized on June 20, 1975, provided $3.125 million for a four-year period. A three-year extension of the project, known as Phase II, was authorized on March 19, 1979 and provided $8.323 million. Phase II was to terminate on June 30, 1982.

The purpose of the RFCP Project was:

(1) to encourage and facilitate the extension of IPM concepts and techniques to small food crop farmers through (a) a strengthening of the organization, training, and equipping of the National Plant Protection (NPP) services in each of the participating countries; (b) the development and strengthening of a system for extension to farmers of IPM concepts and techniques by means of training and demonstration; (c) the utilization of national agricultural training facilities as elements in the above system.

(2) to strengthen the capacity of the NPP services to anticipate pest infestations, resurgences, and other pest crises through surveillance and applied technology capability.

(3) to strengthen the capacities of the NPP services to combat and control pest infestations of major threat to food crops, which are beyond the control capacity of individual farmers.

The progress of this project was evaluated near the conclusion of Phase I in 1978 and showed that the most significant accomplishment during this phase was the buildup of the NPP services' infrastructures. This was achieved by training NPP service personnel at U.S. universities, increasing the services' staff of technicians and crop protection brigades, supplying the services with vehicles, pesticide application equipment and sponsoring some construction required for office, teaching, laboratory, and storage facilities. In addition, the Project has sponsored work to determine the losses caused to food crops by various pests; pest surveys to determine the kinds and seasonal abundance of pests on selected crops; a limited amount of research on alternative methods of pest control; and some work on extension of pest management techniques to farmers.

A major activity of Phase I involved constructing two regional training centers, at Dakar, Senegal and Yaoundé, Cameroon. Phase I also sponsored various in-country and regional short courses, seminars, and workshops on the application of pesticides and other topics related to crop protection. The evaluation considered that the project suffered delays due to language training needs for advisors, delays in recruiting advisors, construction slippage, and difficulty in getting delivery of all required commodities on a timely basis, but that it had achieved the most important elements essential for embarkation on Phase II.

The Project was sponsoring academic training for 24 participants but, at the time of the review, the team considered it was too early to judge the success of their training as only three individuals had completed their period of training. The two regional training centers at Yaoundé and Dakar were staffed and equipped to effectively handle a

variety of training activities and could effectively handle about twenty trainees each at one time. They found the Yaoundé center had been utilized almost exclusively for training persons from the Cameroon while the Dakar training center was somewhat more involved in regional training. In 1980, both centers had been utilized about 50% of the time for training purposes.

The team found that the centers had produced many useful training materials, i.e., fact sheets, 35mm slide sets, and short course syllabi related to pest identification and crop protection. In cooperation with selected resource specialists, the centers were developing several comprehensive manuals and handbooks on special topics to be used in training. From discussions with project participants, it was generally agreed that the two centers were not making much effort to train personnel in project countries other than Senegal and Cameroon. They felt the centers should collaborate more with various national and international organizations involved in training related to that being done at the Centers. These persons emphasized the need to boost training efforts on the regional level to meet training requirements of the other countries and stressed the importance of such efforts in stimulating greater regional awareness and interest in IPM. Other than the activities conducted at the regional centers, there were training programs provided in-country that were aimed to increase the capacity of the NPP services and extension agents to handle pesticides properly. This was accomplished through short courses on pesticide safety, storage and proper calibration and use of pesticide application equipment. The training included field demonstrations on the application of pesticides and recognition of pest damage. The team found the in-country training focussed heavily on the use of pesticides and

that the primary beneficiaries of this training were the NPP services. The training had not been structured so as to increase the capacity or readiness of the extension services or the NPP services to receive and extend IPM technology that may eventually evolve from the CILSS IPM Project.

The evaluation team found that surveys to determine the major kinds of pests and their seasonal abundance have been carried out in certain food crops in some of the RFCP countries. Studies on crop loss assessment were carried out at several locations; in Cameroon, they concentrated on quantifying losses caused by grasshoppers, sorghum smuts and the parasitic weed, Striga, on sorghum; in The Gambia, studies were conducted to determine the impact of insect pests on yields of sorghum, millet, maize, rice and groundnut; similar studies were carried out on millet in Senegal. However, the team felt the results were too preliminary to reach conclusions concerning the relationship of insect pest management and yield loss for the crops being studied and that crop economists should be consulted about the economic realities of their work.

As regards extension, the team found that the Project had made no significant progress in the area of developing and strengthening an extension delivery system which would be required for transmitting IPM technology to farmers. The national extension services were not geared up to handle IPM delivery, and there was a serious lack of properly trained extension personnel. This lack was a serious deficiency and one that had to be corrected. They stated that some of the information required to begin a modest IPM effort in West Africa already exists, that the ecological principles were already well known and could form an important foundation for any extension effort in crop protection.

Although the primary role of the RFCP Project is develop training and extension programs, the team considered that its involvement in some aspects of applied research was desirable and commended the project participants for taking part in research on control of smuts of sorghum using a water treatment to the seeds as opposed to insecticides, use of treatments with neem tree leaves, palm oil and groundnut oil as possible controls to protect cowpeas in storage, integrated control of the parasitic weed, Striga, on sorghum and the testing of the protozoan parasite, Nosema, against grasshoppers. The team felt that it was important that steps be taken to ensure effective coordination of this research with the research being developed by the CILSS IPM Project while the work on biological control of grasshoppers should be coordinated with any similar work being done by CCLALAV and OICMA.

The evaluation team noted that AID's Regulation 16 did not seem to have much beneficial effect in the RFCP countries. Most of the countries in the Sahel and surrounding area have no legislation to effectively control pesticide use, and the government agencies are not equipped to monitor and to ensure human and environmental protection from the pesticidal treatments. Furthermore, the team found that these agencies are not prepared to conduct field monitoring in order to determine when treating with pesticides is economically justifiable.

The Project is being supervised and directed by a Regional Project Manager located at Dakar, Senegal. In-country activities are managed by a Country Project Officer (CPO) and there are CPO's located in Mauritania, Senegal, Cameroon, and The Gambia. One CPO handles both Guinea-Bissau and Cape Verde and is located in Guinea-Bissau. The CPO's were employed under an USDA Participating Agency Service Agreement (PASA) arrangement

with USAID. However, some CPO's reported that they were not certain who their bosses really were or who was responsible for evaluating their job performances. Among the possibilities listed were the Regional Project Manager, the AID Mission Director of the country in which they resided, the AID Mission Director in Dakar, Senegal, and the USDA in the United States. No clear performance rating plan was known to any of the CPO's contacted. In each of the RFCP Project countries, there is a country counterpart who works with the CPO. The latter works full time for the Project, but his counterpart generally devotes much less time to it.

Annex B (The Integrated Pest Management Project), Annex G1 (Establishment of a Regional Unit for Information on the Protection of Crops and Harvests) and Annex G2 (Establishment of a Regional Unit for Training in Plant Protection) of the CILSS Plant Protection Program, are closely related in scope to that of the RFCP Project. The objective of Annex G1 is to develop and disseminate extension information related to crops and harvest protection. The objective of Annex G2 is to establish a regional unit for training plant protection field assistants and laboratory technicians.

For the third phase of the RFCP Project, the team recommended that a six man team composed of agronomists, researchers, socioeconomists, etc. be contacted to perform a redesign of this phase. In the opinion of the team, the overall objective of Phase III should be "to develop training programs and delivery systems that will lead to increased use of socially, economically and environmentally sound systems of IPM for small crop farmers which deemphasize the use of chemical pesticides." Among the specific objectives that this phase should undertake are the following:

1) Socio-economic analysis as required to determine the costs and benefits of IPM systems being developed under the CILSS IPM Project.
2) Conduct demonstrations on the fields of small food crop farmers and to mobilize IPM techniques and systems shown to be effective in the CILSS IPM Project.
3) Develop certification criteria and training programs required for an "OAU/FAO Certified Training Program for Plant Protection Managers" and to develop other regional and in-country training programs as required to mobilize the concept and application of IPM.
4) Secure effective coordination of Project activities with all Annexes of the CILSS program.

The evaluation team, after assessing the progress and status of the Project, chose to provide a number of suggestions and comments for the consideration of the re-design team. First of all, they identified those countries that should participate in the Project's Phase III as follows: Cameroon, Cape Verde, Guinea-Bissau, Mauritania, Senegal and The Gambia. They recommended that the re-design team should critically examine the capacity of each country for carrying out specific roles and that each country should be assigned only those roles most appropriate to the capacity of its existing infrastructure. They also suggested that the re-design team should determine the desirability of participation by Mali and Chad in Phase III.

The team continued on to make pertinent observations and suggestions regarding the staffing of the Project, academic training, surveillance

and crop loss assessment, extension, research, pesticides policies and liaison. These comments may be summarized as follows:

Staffing: The AID Regional Project Manager should be re-located to Ouagadougou, Upper Volta. The need for country project officers should be determined by the Phase III design team. The latter should clearly show the lines of authority and job descriptions for all project staff members, specifying procedures for reporting and job performance evaluations. The design team should carefully determine the existing indigenous capacity for IPM development and execution in each Project country and devise ways for most effectively utilizing the talents of the national participants.

Training: Universities and training centers in Africa, Latin America and Asia should be identified that could be recommended for training at the pre-B.S. level. The Yaoundé and Dakar training centers should be appropriately upgraded with staff as required to mobilize training in IPM in all the Project countries. The centers should develop greater Portuguese language capability as required to meet training requirements in Cape Verde and Guinea-Bissau. The centers should cooperate more closely with the WARDA training center in Liberia and other national and international organizations involved in training in crop protection. The design team should give guidelines on other ways to ensure effective cooperation between the Project training centers and other relevant training activities. For in-country training, the design team should specify all kinds of training needs in the countries and devise means for best utilizing the regional training centers in complementing the in-country efforts.

Surveillance and Crop Loss Assessment: All work under Phase III in this area should be carried out collaboratively with the CILSS IPM Project.

Extension: The design team should clearly specify all extension activities required to augment effective IPM techniques and coordinate them with the extension work group being developed under the CILSS IPM Project.

Research: The kinds of research to be sponsored during Phase III should be clearly specified and the manner in which the participants should coordinate their research with other groups in the CILSS IPM Project should be indicated.

Pesticides Policies: Support of Project activities related to pesticides or pesticide application should be restricted to: applied research on selective use of chemicals, analyses of the cost and benefits of pesticides to small food crop farmers, and extension efforts which emphasize pesticide hazards and procedures to minimize these hazards. Strict guidelines on the use of pesticides in Phase III should be developed. The cooperating donors involved in the procurement of pesticides should be encouraged to develop cohesive policies and programs for pesticide regulation and management in the Sahel region.

Liaison: All appropriate means for ensuring effective collaboration between particpants in the RFCP, CILSS IPM and other projects should be specified. Sponsorship of conferences, workshops, and seminars on special topics related to crop protection should be encouraged. The CILSS Plant Protection Program should employ one person to work full time to ensure effective collaboration among the national and international organizations involved in food crop protection in the Sahel and surrounding area.

Evaluation of the CILSS/FAO/USAID Project on the Research and Development of Integrated Pest Management for Basic Food Crops in the Sahel

Although this is a distinct, self-contained project, it is also part of the large, comprehensive CILSS program for protection of crops in the Sahel region which was mentioned earlier. This project was designed to develop an integrated pest management capability for the protection of food crops within the CILSS member countries and consists of three components - applied research, extension and regional coordination. The research objectives were to develop and validate the most effective integrated pest control techniques for each of the major food crops of the Sahel while the extension phase of the project was to focus on preparing the mechanism for the transfer of the results of the field-tested research to the small farmer through the national plant protection delivery system. For the regional coordination component, the project was to provide specialized expertise to establish a central coordination office in Ouagadougou, Upper Volta.

Specific objectives of the project were to:

(1) establish a surveillance system on the occurrence of major pests,

(2) evaluate the relative economic importance of these pests through the organization of crop loss assessment experiments,

(3) establish demonstration study areas to study and demonstrate the benefits to be obtained from integrated pest control,

(4) develop a mechanism to implement results at the farmer level in close collaboration with national plant protection services, and

(5) establish a research team to study the bionomics of the major pests

and develop integrated control techniques for their management.

Under this project, it had been intended that all CILSS member countries, the Senegal and Niger River and the Lake Chad Basins would participate as national and sub-regional components, respectively. However, Chad did not participate as planned due to their civil war and donor support was available only for the Senegal River Basin; therefore, the participating countries in the project were The Gambia, Mauritania, Cape Verde, Upper Volta, Niger, Mali, and Senegal.

Although the CILSS IPM project was to have started in August 1978, due to administrative and management problems, project activities did not commence until about September 1980. The evaluation team found that modest scientific programs had been initiated and were in their first season in all of the countries involved, except for The Gambia where administrative conflicts had frozen operations. Thus, at the time of their visit, progress was just beginning, and the team concluded that an extension of the project's Phase I to June, 1985 would be necessary to attain project objectives. The reasons for the delay in project start-up are too complex and intricate to review in detail but suffice it to say that important conditions were established by the funding agency, USAID, which were to be met by the grantee, CILSS, and the executing agency, FAO, prior to disbursement of funds. The delay in meeting these conditions was caused by administrative and bureaucratic requirements and procedures. In its evaluation, the team reported that the project delays and the reasons for these delays were indelibly imprinted in the minds and documents of the principal parties and became a source of constant irritation, resulting in "litanies of name-calling, blame-laying and finger-pointing," when

team members talked to participants about the project. The report noted that CILSS functionaries at all levels were confused and frustrated by the seemingly endless bureaucratic need for documentation, waivers and more documentation while the FAO specialists were frustrated by the absence of clear guidelines that defined their roles and relationships. On the other hand, the AID Mission Directors in the countries involved and the Project Managers were found to be either passive in their views or overly engaged in the day-to-day problems of the project.

Regardless of the reasons for the original delay in the initiation of the project, the evaluation team stated that a management style had been adopted, at all levels, which stressed subsequent actions, rather than parallel actions, and this led to management decisions or management attitudes that contributed further to the delay and reinforced it. They further noted that if these attitudes were not recognized and dealt with, it could cause further slippage in the execution of the project.

The team, therefore, recommended that the Project Management Unit should adopt a conscious policy of parallel management action so that, if a project implementation action is held up, other actions would continue, thus avoiding further delay that might follow resolution of the first problem.

Responsibility for management of the project rests with three organizations: CILSS, FAO and USAID. The administrative structure of CILSS consists of an Executive Secretariat which executes decisions, negotiates with donors for economic and social development assistance and coordinates programs among member countries. The Executive Secretary had been authorized to organize a small Regional Management Unit to monitor all of the components of the CILSS Program for Crop and Post Harvest

Protection but, in actual operation, the Unit concentrated almost exclusively on the activities of the IPM Project, and exercised fiscal and budget management authority over the donor resources for this project. The Unit was located in Ougadougou, Upper Volta. A project coordinating center was to have been established but apparently had not been. In its stead, a Regional Project Direction Office was set up in Bamako, Mali as a satellite of the Sahel Institute but it did not have any real structure, authority, or resources. In fact, the evaluation team believed that the administrative burdens imposed on this office by the hierarchical structure of internal CILSS relationships limited the efficiency and stifled the initiative of the regional technical personnel. Problems and difficulties in liaison and coordination between the regional office and the national components on matters of common administrative and operational interest were also attributed to the same causes.

The individual in charge of the implementation of this project for USAID was a Project Officer assigned to the USAID Mission in Upper Volta. He had had some entomological training but had not received any management training nor any training in USAID procedures before his assignment. Although he is responsible for advising CILSS on the administrative and financial execution of the project, the team found that his time seemed to be taken up entirely by problems of finance and supply. He had not been recruited and assigned until the project was already two years behind schedule and, for understandable reasons, the attitude of many USAID personnel toward the project was one of frustration. Although the various Country USAID Missions occasionally supported the project through engineering reviews or supply assistance, as a practical matter the

evaluation team found that the local USAID staff looked upon the project as a nuisance and an imposition as well as a waste of important staff time.

The relationships between the three principals made up the basic design structure of the project. USAID is the funding agency and FAO entered into a contract with CILSS to provide technical experts to advise at regional, subregional and national levels on the execution of the programs. The estimated cost for the life of the project was $25,280,000, of which $9,900,000 of USAID funds had been committed at the time of the project review.

In their evaluation of the fundamental concepts of the project, the team arrived at the conclusion that the basic elements of the project design were sound. Only when they examined the details of the project's daily operations did they find problems. The principal technical problems were: (1) since there was no project direction, the FAO experts were not using their talents effectively, (2) the Regional Management Unit had become involved in day-to-day management operations and (3) the national components had been prevented from starting their programs in the absence of effective guidance or management support. To overcome these problems, the team recommended that the Regional Management Unit be taken out of the day-to-day operation of the project and given the task of developing administrative, management and financial guidelines for all the CILSS crop protection projects. They also recommended that the Regional Project Office be given authority, staff and resources to manage the project effectively and that an Assistant Director, who would be the senior FAO advisor to the project, be named. This latter individual would serve as liaison with FAO headquarters in Rome to assure that programmed resources

and personnel recruited and assigned to the field are available on a timely and effective basis.

The evaluation team conducted an extensive review of all aspects of the CILSS IPM project, both technical and administrative, and devoted 110 pages of its report to a discussion of their status and problems. Their most significant observations and comments regarding the technical aspects - staffing, training, program of work, coordination and liaison - will be summarized in some detail below while their recommendations and discussion of the administrative aspects - budget management, accounting, procurement, construction and travel - will be only briefly presented.

Staffing: Progress in recruiting FAO experts in IPM, entomology, plant pathology and weed science for national research teams was slow and only 10 of 22 posts had been filled. The team recommended that the current French language and experience requirements for FAO experts should be relaxed so that outstanding young researchers in appropriate specialty areas, including new Ph.D.'s, could be sought. Intensive French language training could subsequently be made available. They suggested that farming systems agronomists should be recruited to assist with intercrop experiments. The employment of an additional crop loss assessment expert should also be considered.

In most of the participating countries, the chief of the crop protection service was the leader of the national contingent and was expected to continue his previous programs while assuming project counterpart responsibilities. However, they were too busy with official duties and pesticide interventions during the cropping season to participate as full time researchers and, consequently, the team recommended that all research

counterparts should be full time researchers of Sahelian nationality.

Training: The team stated in its report that there would be problems meeting project goals in the short and medium terms because of insufficient provision of scholarships and the lack of candidates for training. Some of the countries did not have enough trained researchers to provide counterparts for the national level FAO experts and the country plans of operation did not provide sufficient funds to train more. A program to help alleviate the lack of plant protection technicians over the long term was to begin in 1981 to train three crop protection technicians and two laboratory technicians per CILSS country per year.

In their recommendations, the team remarked that funds provided for training counterparts for FAO regional staff should be reviewed to determine if they are sufficient, and that CILSS, FAO and USAID must arrange for bilateral funding to train research counterparts. The future government plant protection employees that finish their course work at national agricultural schools should be placed with the IPM project for six months, as research technicians, as part of their one year internship in the crop protection service. They also recommended the establishment of a permanent CILSS Crop Protection Training Working Group to include training officers from the IPM project, the RFCP project, national agricultural schools and other organizations in order to provide regional coordination of this training.

Work Program: Research - As indicated earlier, modest work programs had only just begun in 1981 in Mauritania, Senegal, Cape Verde, Mali, Upper Volta and Niger, although these activities were very limited because equipment had not yet been purchased. A summary of previous

plant protection research had been compiled in each country for orientation and as a basis for planning. Project experts were doing initial surveys, making a collection of field pests and their natural enemies and gathering limited information on traditional pest control methods. No field experiments were being conducted in Mali and Upper Volta because of the lack of vehicles but, in Mauritania and Senegal, this difficulty was overcome by the use of borrowed vehicles and borrowed and improvised equipment. In the latter countries, the evaluation team was only able to assess those few experiments for which detailed experimental plans were available.

Although crop loss assessment experts were not yet in place, the team found that IPM researchers had already begun their investigations. In Senegal and Mauritania, promising experiments were planned on crop losses and economic injury levels associated with scarab and meloid beetle attack on flowering sorghum and millet. A version of the traditional control method for these pests was also being tested in Mauritania. The team noted that all of these studies were timely because much of the farmers' use of insecticides in the Sahel was for the control of these insects, even though their pest status had not been examined closely.

The team was able to observe a second category of entomology experiments being conducted in those two countries. These studies involved the use of traps to monitor insect pest populations in order to determine the periods of most acute insect attack and crop loss. Oversights in the design of these experiments were discovered that limited their usefulness. Although pests were being counted and borer damage was being measured systematically, no attempt was made to separate the effects of different pests on final yields nor did the sampling provide for a clear correlation between numbers, damage and final yields for many phytophagous species.

Observations on natural enemy activity were also being relatively neglected. In Senegal, an experiment with late planting of cowpea to escape attacks of the caterpiller, Amsacta maloneyi, was underway while other experiments addressed host plant resistance, pest biology and population dynamics, sampling techniques and minimum pesticide trials.

The report noted that counterparts who were already members of national research efforts were generally continuing their previous programs and cautioned that this could run counter to the IPM goals of the project since Sahelian crop protection research had emphasized various aspects of pesticide use. Although pesticides can play a role i. IPM systems, the team felt it was important to orient project counterpart research toward non-chemical methods of pest control. The team expressed their conviction that experiments should be carried out in farmer's fields with traditional cropping systems and counseled that the tendency to avoid experimentation in intercrops should be resisted.

The team also recommended that pesticide residue monitoring activities in the project should be implemented rapidly with project observers and cooperating farmers participating in an ongoing sampling program in the field environment and for food stuffs. Finally, the team suggested that the CILSS IPM Project should give research responsibility for rice to WARDA insofar as possible.

Work Program: Surveillance and Forecasting - A network of observation posts was being built in the participating countries so that the IPM project could collect data on pest infestations and meteorological conditions. Using crop loss assessment data, observers would be able to estimate losses to pests in surrounding fields and decide whether infestations were above economically injurious levels. The ultimate goal of the

project was to develop pest population models and forecasting techniques by correlating the meteorological and biological data. During their visit to the region, the team found that observation posts will sometimes be used by personnel of more than one organization. In Senegal, for example, the crop protection service was building some of them and had adopted a general policy of placing them where possible at the same sites where national agricultural staff were based. As past surveillance efforts had been completely oriented toward pesticide intervention, it appeared that some conflict over the role intended for the posts might develop and to preclude this and to facilitate a regional conversion to an IPM approach, the report emphasized that the very different function of IPM project observation posts must be firmly defined and strictly adhered to, i.e. observation, sampling and advice to farmers.

Work Program: Extension - A system of farmers' field demonstration study areas was to be established as an essential part of the IPM project. These fields were to have a dual purpose: researchers were to use them to develop and test new IPM methods while demonstration/liaison officers were to use them to evaluate the methods economically and to organize demonstration activities for collecting comments and advice from farmers. The evaluation team indicated that within the structure of the Sahelian countries, there were no extension services per se, or if they did exist, they were new and not yet well established. Extension agents were often ill-trained and badly paid, and thus not properly motivated. The team thus believed that the weakness of the Sahelian food crop extension apparatus posed a serious problem for the achievement of the project's goals and recommended that the IPM extension effort be supported and shared by staff of the RFCP project and the IPM project. Extension

liaison between the two projects would be accomplished through joint membership in an IPM project work group.

Their report also stated that no mechanism existed for taking the information developed by the various annexes of the CILSS Crop Protection Program and incorporating it into effective extension aids for use at the national level; therefore, it recommended that a Regional Unit for Information on the Protection of Crops and Harvests, as proposed in Annex G1 of the CILSS program, be established.

Coordination and Liaison: From interviews with representatives of many organizations during the course of the evaluation, the team determined that only an imperfect coordination was being achieved among the various national,international and regional plant protection programs operating in the Sahel. To remedy this, the team recommended that a number of working groups be formed with participation of staff from both the RFCP and IPM projects as appropriate. The areas suggested for work groups were crop loss assessment/surveillance and forecasting, biological control, modification of cropping techniques, IPM systems and evaluation and extension of IPM systems. They also recommended the presentation of an annual CILSS Plant Protection Research Conference to serve as a regional forum of information exchange. The published proceedings of this conference would serve as a valuable reference and a record of regional plant protection activities.

Budgets: The evaluation team, in the most critical and important recommendation in its report, recommended that USAID should take action to extend the IPM project until June, 1985. They further suggested that USAID, FAO and CILSS should jointly prepare a revised life of project budget and that this budget should then serve as the basic

management tool for both financial and administrative planning. In harmony with the above, they recommended also that the USAID Project Officer, the CILSS financial manager, the Regional Project Director and the senior FAO technical advisor should immediately meet to finalize the FY 1982 budget as a first step in centralizing budget responsibility in the Regional Project Office. In order to facilitate the latter, they urged that the necessary personnel resources be made available for that office.

Finances and Accounting: The team reported that all project accounting was based on a system that supported a quarterly replenishment of local currency advances. Because of delays built into the system and some unimaginative or unresponsive management in USAID, they found that the system had broken down and replenishments of advances had consistently been received at the end of the quarter, not the beginning. In addition, the accountants at the national component level were not assigned to the project but were borrowed from other national government agencies and consequently their other responsibilities always took priority. As a means of correcting the deficiencies apparent in the system, they made the following recommendations:

(1) the strengthening of the system by the addition of an encumbrance journal,

(2) selection of the calendar quarter as the period for financial reporting and accounting,

(3) immediate processing of end of the quarter requests for advance fund replenishments so that they could be received by the first day of the next quarter,

(4) a project-funded administrative assistant/accountant should be hired for each national or sub-regional component,

(5) conduct of an internal audit of each component at least annually,

(6) audit of the full project by an external audit firm before the end of CY 1982,

(7) replacement of the separate accounts for each national component by a global account for the CILSS Project Directorate, and

(8) establishment of a close working relationship between the CILSS financial officer, the FAO financial advisor and the USAID controller.

Procurement: The major procurement elements in the project are vehicles, laboratory equipment and equipment for the field, offices and for observation posts. Due to various misunderstandings and other problems, project procurement had already been delayed by about two years when the team arrived. They stated in the report that the one overriding problem was the lack of procurement plans and recommended that these be drawn up as soon as possible but no later than the first quarter of FY 1982. These plans were to specify what is procured when, by whom, by what methods and were to be drawn up for each category of material and equipment. Motor vehicles were to be procured using a separate plan which would show what motor vehicles remained to be procured, their source or origin, and who would procure them, with what funds, when and upon what authority. Waivers were to be sought for motor vehicles in a timely manner and after an objective survey of dealers, other users and facts of maintenance, repair and fuel use records. They recommended that these procurement plans be prepared jointly by the CILSS Project Director's Office, USAID and FAO.

Construction: As with the other technical and administrative aspects of this project, the construction programs had been considerably delayed by the general delay in implementing the project as a whole. The team mentioned the fact that other reasons for this delay were USAID's regulations pertaining to construction work and the lack of input from local USAID engineers. In an attempt to prevent further delays in construction because of bureaucratic requirements, the team candidly discussed the need for these regulations and concluded that, considering the simple nature and relatively low cost of many of the planned buildings, USAID control of the construction process should be limited to approval of contracts. They further recommended that USAID's engineers at the local level be held directly responsible for the implementation of the IPM construction program planned for their respective country of assignment.

Even though the proposed budget of $3.1 million was more than twice the original budget ($1.5 million) approved in the Project Agreement, the team explained that this was due to increases in costs resulting from high inflation factors during the three years delay in project implementation, and they recommended that USAID approve the proposed construction program and budget. They also suggested that the fixed amount reimbursement (FAR) method should be adopted whenever possible, especially for construction of the observation posts. Additionally, they recommended that the countries involved make a real effort to reduce construction costs by all possible means, including the use of simple, efficient designs and local materials whenever possible. Another recommendation was that the Regional Project Directorate play a more active role in the technical coordination and supervision of construction designs and commodity selection in order to ensure that expenditures are strictly

limited to needs appropriate and necessary to the success of the project.

Travel: The team felt that travel was an important element of project expenses. In fact, budget projections for the second and third years of operation indicated that travel costs would take up as much as one-third of the national component budgets. In their assessment of this issue, the team recommended that the Regional Project Director and the new FAO financial/administrative advisor conduct a quick review of per diem rates to determine whether they were adequate, fair or excessive. They also recommended that national, CILSS and FAO travel regulations should be reviewed to assure that they are very flexible with regard to acceptable modes of travel in remote areas. A final recommendation was to subject the travel advance system to an internal audit near the middle of FY 1982, or after a particularly busy travel period.

TRAINING ACTIVITIES

SHORT COURSES ON INTEGRATED PEST MANAGEMENT

PERU

TRINIDAD

INDIA

KENYA

PESTICIDE MANAGEMENT SEMINAR/WORKSHOPS

BARBADOS

PANAMA

Second Intensive Course on Integrated Control of Agricultural Pests and Diseases, Centro Internacional de la Papa, La Molina, Lima, Peru, February 2-27, 1981

Following a postponement from October, 1980, this course was presented at the International Potato Center in La Molina under sponsorship of CICP, the Universidad Nacional Agraria and the U.S. Agency for International Development. The course was attended by twenty-seven trainees from Peru, four from Paraguay, three from Bolivia and two from Brazil.

Divided into five phases, the four-week course consisted of lectures, laboratory exercises and field demonstrations. The first phase involved a brief introduction to the course, a presentation of the history of integrated pest control and a review of the orders and families of insects of agricultural importance. The second phase was devoted to a review of the basic principles of pest management and the fundamentals of the major plant protection disciplines while the third phase considered practical aspects of the various pest control tactics used in integrated control programs. The fourth phase of the course involved a detailed analysis of the implementation of integrated pest management programs in specific agroecosystems, such as cotton, citrus, maize, sugarcane and potato. The final phase was devoted to a presentation by participants of reports on the present crop protection situation in the several geographic regions of Peru and in the neighboring countries of Bolivia, Brazil and Paraguay, with an analysis of future prospects and needs for the development of integrated pest control programs in those countries.

In addition to the instructors provided by the Universidad Nacional Agraria, a number of lectures were also presented by technical experts

from Colombia, Brazil and the International Potato Center as well as by professors from four U.S. universities. At the end of the third week of the course, a two-day field trip was made to the Chancay Valley along the coast and to the high altitude region of the Andes near Huaraz to visit experimental research stations and farmers' demonstration fields and view management practices in maize, cotton, sugarcane, citrus and wheat. The following week, the participants were taken to the Cañete Valley and shown the integrated pest management program that had been developed for cotton in that region. At the conclusion of the course, trainees were awarded a certificate in recognition of their participation.

Short Course on Integrated Pest Management of Tropical Crops, The University of the West Indies, St. Augustine, Trinidad, August 10-21, 1981

This two-week course was presented in response to a recommendation for increased training in pest management for plant protection officers of the Caribbean which was adopted at the Seminar/Workshop on Pest and Pesticide Management in the Caribbean held in Barbados, November 3-7, 1980. The course was given in collaboration with the University of the West Indies (UWI), the Interamerican Institute for Cooperation on Agriculture (IICA) and the Caribbean Agricultural Research and Development Institute (CARDI) and was attended by twenty-one participants from thirteen countries - Jamaica, Haiti, Dominican Republic, St. Kitts-Nevis, Antigua, Montserrat, Dominica, St. Lucia, St. Vincent, Barbados, Trinidad, and Guyana. There was also one participant from the Philippines who was in Trinidad undergoing a training period at the Commonwealth Institute of Biological Control (CIBC) and attended the course at the suggestion of Dr. Fred D. Bennett, Director, CIBC. Several

other persons attended various parts of the course as auditors comprising staff and post-graduate students of UWI as well as staff from CARDI and other local institutions. Lecturers for the course were drawn from CICP institutions, CARDI, UWI, the Ministry of Agriculture, Lands and Food Production, Trinidad and Tobago, IICA, CIBC and the Caroni Research Station, Trinidad.

During the first week of the course, the basic concepts and principles of integrated pest management were emphasized. Among the concepts discussed were such traditional and nontraditional control techniques as cultural control strategies, biological control, chemical control, including the selective use of pesticides, host plant resistance and use of pheromones and insect pathogens. These control measures were discussed in relation to the development and implementation of an integrated pest management program. Several individuals expressed disappointment on the first day of the course about the approach and apparent direction taken, which was not what they had expected. It appeared that they were expecting technical packages to be presented which could then be implemented as a solution to various pest and disease problems in the region. After some discussion, it was generally agreed that the basic objective of the course was not to provide any IPM technological packages, but rather to discuss and understand the basic principles of IPM and to perhaps indicate how an IPM strategy for a particular crop or pest situation is planned and developed and then implemented. Once these course objectives were clearly understood, most participants then appreciated the format of the course.

During this first week also, economic considerations for the development of such a program were also reviewed, using a cost/benefit analysis

as a basis for discussing the economic consequences of selecting a particular pest control strategy. The second week of the course was devoted to a consideration of the major pest and disease problems of selected crops in the region, e.g., grain legumes, sugarcane and coconuts, with a review of existing control measures. These lectures were followed by a period of discussion in which the possibilities for developing an integrated pest management program for the crops under consideration were debated. These discussions provided an opportunity for the various participants to present information on the many pest and disease problems common to the islands of the region and to exchange ideas and opinions concerning the needs and constraints involved in development of these programs.

Participants evaluated the course on the final day and arrived at the following conclusions:

- There was a general agreement that the course was very beneficial.
- It was recognized that there are many constraints existing locally which inhibit the ready development of pest management strategies.
- Existing constraints were identified, and it was recommended that they be examined in the context of small-scale, multicropping systems present in the region.
- A specific recommendation that a "Curriculum for Pest Management Training in the Region" be developed was made.

First National Training Course on Biological Control of Pests, CIBC Indian Station, Bangalore, India, November 17-December 13, 1980

This training course was organized by the Commonwealth Institute of Biological Control (CIBC) with financial support from the Commonwealth Foundation and presented in collaboration with the University of Agricultural Sciences, the National Center for Biological Control of the Indian Institute of Horticultural Research and the Central Biological Control Station of the Directorate of Plant Protection, Ministry of Agriculture in Bangalore. The course was designed to impart necessary basic knowledge and appropriate practical in-service training to 12-15 personnel of agricultural and public health departments of countries in Africa, Southeast Asia and the Pacific Region. At the request of the CIBC director, Dr. Fred D. Bennett, CICP agreed to provide a lecturer for the course who would deliver talks on invertebrate pathology. The entomologist selected to attend was Dr. Lowell Etzel, University of California, Berkeley. His lectures in the course consisted of nine hours on insect pathology and microbial control, two and one half hours on insect pest management, one hour on a historical review and discussion of the current status of biological control in the United States, one hour on U.S. rules, regulations and procedures for the importation of beneficial insects, and one hour on the design of biological control facilities.

Dr. Etzel learned that CIBC had encountered problems with issuing timely publicity announcements for the course because of time constraints and that many of the participants had learned of the course through the CICP newsletter, PEST MANAGEMENT NEWS. Following his participation in the course and, prior to his return to the U.S., Dr. Etzel visited

Kasetsart University in Bangkok, Thailand, and met with three of the students who had attended the Bangalore course. These students provided him with details of their participation in the Thai-German Crop Protection Program. While at Kasetsart, he was shown the Biological Control Section of the Department of Agriculture and met briefly with the Director of the National Biological Control Research Center.

Group Training Course on Components Essential for Ecologically Sound Pest and Vector Management Systems, International Center of Insect Physiology and Ecology, (ICIPE), Nairobi, Kenya, July 19-August 8, 1981

This course was sponsored and organized by ICIPE and the United Nations Environment Programme (UNEP) for young African scientists actively engaged in pest and vector management or who are starting their careers in this field. At the request of the scientific coordinator for this training course, Dr. Anthony Youdeowei, CICP agreed to provide two lecturers for the course. The speakers selected were Harold T. Reynolds, entomologist, University of California, Riverside and Jerry L. Stimac, entomologist, University of Florida, speaking on the Development of Integrated Pest Management for American Cotton Pests and Use of Computers in Pest Forecasting, respectively.

Drs. Reynolds and Stimac did not attend the whole course but actively participated in lectures, discussions and field trips during the period July 27-August 4, 1981. Based on this participation, the two men felt that the training course was a very worthwhile experience for both trainees and lecturers and that the presentation of their lectures on the newest developments of pest management in the United States was of great benefit to the course. They strongly

CICP continue to participate in the group training course, particularly by supplying lecturers with specialized expertise not available from other participating countries.

Seminar and Workshop on Pest and Pesticide Management in the Caribbean, Bridgetown, Barbados, November 3-7, 1980

Presentation of this seminar/workshop had been suggested by the Environmental Officer of the Bureau for Latin America and the Caribbean, USAID/Washington; acting on his recommendation, Ray F. Smith, CICP Executive Director, and Dale G. Bottrell, Pest Management Specialist, travelled to Barbados in February, 1980 to meet with USAID and government officials to determine the need for and interest in this activity. On February 19 and 20, they met with representatives of the USAID Regional Development Office/Caribbean, the Caribbean Agricultural Research and Development Institute (CARDI), the Ministry of Agriculture of Guyana, and the Pan American Health Organization (PAHO) to discuss planning and organization of this event. It was agreed that the seminar/workshop would be sponsored by CICP and USAID in cooperation with the Ministries of Agriculture, Food, and Consumer Affairs and the Health and National Insurance of the Government of Barbados , CARDI, the Caribbean Community Secretariat (CARICOM), PAHO and the University of the West Indies (UWI).

A planning committee for this event was established, composed of representatives of the above organizations and chaired by CARDI's Chief of Programmes, John L. Hammerton. At their first meeting, the committee discussed the objectives and procedures of the seminar/workshop, divided up responsibility for various aspects of its implementation, and developed an annotated draft working agenda which identified tentative topics and

speakers. The seminar was being organized primarily for the benefit of medium-level professional workers (B.S. or M.S. degree) in agriculture and health. The sponsors agreed to cover the costs of travel and per diem for two participants from each of the sixteen countries invited to attend the seminar. In addition, other countries of the region were invited to send representatives from the agricultural and health sectors, although no provisions for funding of travel or per diem were offered. Sponsored participants would be requested to prepare in advance a position paper describing the pest/pesticide use situation and pest management activities in their country, and these papers would be published as part of the seminar proceedings.

The seminar/workshop was held at the Dover Convention Centre in Christ Church and attended by more than 100 specialists of the region working on pest and pesticide management problems affecting agriculture and public health. Countries represented were: Antigua, Bahamas, Barbados, Belize, Curaçao, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Montserrat, St. Kitts-Nevis, St. Lucia, St. Vincent, and Trinidad. Representatives from Mexico and the United States also attended. Specific objectives of the seminar were:

- To review the principles and techniques of pest and pesticide management
- To examine the status of pesticide use and other pest management activities in the Caribbean
- To stimulate better dialogue and exchange of information among agricultural and health specialists working on pest and pesticide management programs in the Caribbean, and

- To develop recommendations for needs in pesticide regulation, extension and teaching, agromedicine and research which will lead to improved pest and pesticide management programs in the region.

The opening session on November 3 began with a speech by the Minister of Health and National Insurance of Barbados who challenged the participants to develop recommendations regarding steps that the Ministries of Agriculture and Health and various other institutions in the Caribbean could take to foster more environmentally sound and safer pest control programs. Following this, the keynote address was given by the Deputy Chancellor of Texas A & M University on the subject of the essential role of pest control in human health and food production, including an overview of the global pest situation. The remaining sessions of the seminar/workshop were devoted to presentations by individual lecturers and panel members of talks on the pesticide situation in the Caribbean, current perspectives in pest control, concept of the agromedical approach to pesticide management and related topics. On Thursday, the participants met in workshop groups to consider the following topics: pesticide regulations, extension and education, the agromedical team approach, and research on pest and pesticide management. The function of these groups was to examine the problems and needs within their area of responsibility and develop recommendations.

On Friday afternoon, a plenary session was held in which the recommendations of the workshop groups were presented. One of the priority needs identified by the participants was an increased emphasis on training in pest and pesticide management at all levels - farmers, extension officers, researchers, and government officials. Many of the participants

expressed interest in a follow-up seminar/workshop in 1-3 years. The Planning Committee was designated as the group to communicate the recommendations to various national and international institutions responsible for pest and pesticide management policies and programs in the Caribbean. At the closing session, the Parliamentary Secretary in the Ministry of Agriculture, Food and Consumer Affairs of Barbados assured participants that the Barbados government would do its utmost to conduct follow-up activities and to implement the seminar/workshops's recommendations, as appropriate.

Seminar on the Use of Pesticides in Panama and Its Effect on Health and the Environment, Divisa, Panama, April 22-24, 1981

At an informal meeting in Guatemala in 1980 between CICP Regional Pest Management Specialist, E. E. Trujillo, and several functionaries of the Panama government, the desirability of presenting a national seminar on the subject of health, nutrition, and pesticides was discussed. Subsequently, in January 1981, CICP Executive Director, Ray F. Smith, met with various representatives of Panama's Ministry of Agricultural Development and Ministry of Health to discuss the scope and content of the three-day seminar. At this meeting, it was agreed that the objectives of the conference would be to:

(1) Analyze the national problem of pesticide use,

(2) Create sufficient public awareness of the problems associated with the use of pesticides,

(3) Promote the necessary support for the solution of the problems through the effective help of the public and

private agencies involved, and

(4) Collaborate in exposing the necessity to protect our own environment.

The seminar was presented in the facilities of the Center for Regional Instruction in Divisa and was attended by close to 100 interested persons from throughout the country. Each morning's session was initiated by a keynote speaker who presented a talk on the subject selected as that day's theme. The three speakers were from the United States and participated in the seminar as CICP consultants. The subjects they discussed included a general overview of pesticides and their impact on man and the environment, the problems associated with pesticides and the agromedical approach to their rational use, and the role of laws and regulations in pesticide management. Following their talks, there were three or four related speeches presented by national speakers. In the afternoon sessions, the participants met in five small working groups to discuss and develop resolutions and recommendations on the day's topic.

Among the recommendations proposed by the seminar participants were the following:

- Creation of an interdisciplinary and interinstitutional body that would guarantee the harmonization of the regulations on pesticide use in Panama by means of a Code of Environmental Protection
- Creation at the provincial level of oversight commissions and technical-scientific studies that guarantee the enforcement of existing environmental protection laws
- Organization of periodic seminars for the purpose of

showing pesticide salesmen, farmers, and the general public the most adequate techniques and methods for applying pesticides

- Creation of a laboratory that would permit the determination of toxic residues in food and meat
- Creation of a commission that would be charged with the assignment to require that the existing regulations on the use of pesticides in Panama be followed; this commission would be interinstitutional in character, composed of professional unions or associations in general that had an interest in the protection of human health and the environment.

REGIONAL PEST MANAGEMENT SPECIALIST ACTIVITIES

TECHNICAL ASSISTANCE

BLUE MOLD OF TOBACCO

PINE TREE NURSERIES

CARDAMOM MOSAIC

VEGETABLE PRODUCTION

PLANT DIAGNOSTIC WORKSHOPS

PANAMA

GUATEMALA

Regional Pest Management Specialist Activities in Central America and Panama

The position of Regional Pest Management Specialist (RPMS) was established in late 1979 before the initiation of the present CICP Pest Management Project contract. Since the Consortium was awarded the contract to provide this individual's services, a review and account of his activities since the start of his assignment would be appropriate. The period covered in this report is from November 1979 to September 30, 1981.

The desirability and usefulness of having an individual stationed in a developing country to provide technical advice and assistance in the area of pest management and management of pesticides to USAID Missions and national and regional institutions was recognized and advocated by CICP's predecessor organization - the UC/AID Pest Management Project - in a number of discussions with USAID officials. A proposal for the establishment of a regional pest management specialist position in Central America was later reviewed and taken under consideration by the Agency and in late 1979, authorization of this position was approved and funds were allocated. Subsequently, AID's Latin America Bureau entered into a cooperative agreement with CICP, giving it responsibility for providing the services of this specialist for a period of two years.

The RPMS was to be assigned to AID's Regional Office for Central American Programs, (ROCAP) in Guatemala, and his basic responsibility was to advise and assist ministry officials and plant protection workers in El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica and Panama in the development and implementation of pest management and crop protec-

tion programs. Specific duties of this individual were:

(1) to provide technical assistance regarding site and crop specific pest management and crop protection activities,

(2) to assist in developing and establishing integrated pest management programs in Central America for crop protection in basic food crops,

(3) to provide initial environmental examinations, environmental assessments, and environmental impact statements for those country and regional projects involving the supply and/or use of pesticides,

(4) to assist ROCAP and USAID Missions and national institutions in Central America and Panama in establishing priorities in crop protection,

(5) to assist in organizing and directing pest and pesticide surveys and field identification of pests, particularly of crops of economic importance to small farmers, and assist in the design of appropriate pest prevention and control measures in cooperation with other regional and national agencies working in plant protection,

(6) to provide assistance to Central American countries in the formulation and implementation of uniform, technically sound policies, laws, and regulations governing the registration, labelling, packaging, use and disposal of pesticides,

(7) to develop and participate in seminars, symposia, short courses and workshops on integrated pest management and management of pesticides in cooperation with appropriate country and regional institutions,

(8) to assist in the development of the agromedical approach to pesticide management including the prevention, diagnosis, and treatment of pesticide poisoning by medical and paramedical personnel, and

(9) to develop suitable publications for use in training and educating crop protection personnel.

The person selected to carry out these duties was Dr. Eduardo E. Trujillo, a plant pathologist with the University of Hawaii and a specialist in the study of soil borne diseases of tropical crops. He had been a member of the faculty of the University of Hawaii since 1962 and had had extensive experience conducting plant disease surveys on various islands in the South Pacific. In recent years, he had become interested in the use of plant pathogens for the biological control of weeds and was responsible for the introduction into Hawaii of a fungus that produced a remarkable degree of control of an exotic rangeland weed.

After obtaining an administrative leave of absence from the University of Hawaii, Dr. Trujillo visited Berkeley, California and Washington, D.C. in December 1979 for orientation briefings and to obtain background information on his assignment. Shortly thereafter, in January 1980, he took up residence in Guatemala. His first task upon arrival was to become acquainted with the government officials and technical personnel of the principal plant protection organizations in the region, become familiar with the major agricultural programs and problems in Central America, exchange information and ideas about the pest management practices and policies prevalent in the region and identify appropriate areas of mutual interest that could benefit from collaborative efforts. Thus, after a brief period of adjustment and establishment in his new post, he scheduled a visit to Honduras, Panama and Costa Rica from February 4-16 to confer with key crop protection officials and inform them of the purpose of his assignment. Subjects discussed during this trip and in subsequent visits led to Dr. Trujillo's participation in a variety of activities and programs, in ensuing months.

Rather than provide a complete review of all of the activities Dr. Trujillo participated in during the year, the following discussion will only examine those that may be considered as being important examples of the kinds of technical support and assistance that he provided the countries of the region. These examples are:

(1) Blue mold of tobacco - The RPMS was requested in March 1980 to visit Honduras and make emergency control recommendations to contain a severe outbreak of blue mold disease infesting the 1980 tobacco crop of cigar wrapping Havana varieties in that country. This outbreak was first noticed on February 18 and during two weeks of weather favorable for disease development, the full impact of this epidemic became evident. In the San Pedro Sula - Santa Rosa de Copán tobacco growing area, more than 1,200 manzanas of sun and shaded Havana tobacco were affected, with losses estimated from 90-100%. After reviewing the situation, the RPMS discouraged the planned use of aerial spray applications because of possible drift contamination and the need for large quantities of water to apply the fungicide. Instead, he recommended ground application of the systemic fungicide, Ridomil, on the seed beds as a soil drench every 10 days and as a field drench 10 days after transplanting in a single application.

His recommendations were followed and used to grow a new crop of wrapped Havana tobacco after the February-March epidemic. Dr. Trujillo returned to Honduras in late May and learned that there had been a second outbreak of the disease in early April due to cool, overcast weather but that those farmers who had followed his recommendations successfully protected their late crop from this fungus.

(2) Pine tree nurseries - In April 1980, Dr. Trujillo spent two weeks in Panama conducting a survey of seven pine tree nurseries to

evaluate their pest problems and to make recommendations on how to improve their operations and productivity. These nurseries were under the management of the Ministry of Agriculture's Office of Natural Resources (RENARE) and were being used to supply trees for a reforestation project in the Panama Canal Watershed. Upon site inspection, however, the RPMS found few pest problems and he considered that more important constraints to the productivity of these nurseries were the poor soils and severe drainage problems characteristic of several nurseries. These problems were discussed with the supervisors of these nurseries at a meeting that was also attended by other government officials.

After this meeting, Dr. Trujillo gave a presentation of the principles of soil fumigation and pest management in nurseries from preplant seed treatment to control of pests after germination. Emphasis was placed on good seedbed preparation and proper fumigation with methyl bromide and chloropicrin to control parasitic soil flora and fauna that are nursery pests. He stressed the adequate selection of nursery sites with alluvial soil types that can be readily fumigated as a first step to an effective pest management program. He also discussed application of fungicide drenches at later stages of tree development as well as judicious insecticide applications that may be required to control pests. Besides making a number of specific recommendations for the improvement of several of the nurseries to increase their capability for producing plants in an economic and efficient manner, he also recommended the hiring of a technical advisor specialized in the development and mechanization of forest tree nurseries and a forest pest management expert.

(3) Cardamom mosaic-virus - The government of Guatemala conducted a survey of the cardamom growing areas in early 1980 and discovered that the occurrence of a mosaic virus disease had reached epidemic proportions in some areas of the Pacific Coast. Plant protection officials conferred with the RPMS about the problem, and the latter recommended that a plant virologist with experience in diseases of tropical crops and expertise in serological techniques be brought to Guatemala for 1 - 2 weeks to study the problem.

The consultant selected for this assignment was Dr. Dennis Gonsalves, New York State Agricultural Experiment Station in Geneva. He arrived in Guatemala on August 11, 1980 and for the next 12 days, accompanied by the RPMS, made a preliminary survey of the extent of occurrence of this disease in the southern and northern region of the country. The two-man team was transported to different cardamom growing areas by helicopter, and they found cardamom mosaic in all the farms visited in the southern region although its prevalence varied from farm to farm. Some farms had nearly one hundred percent infection while others had much less. Two days were devoted to an inspection of cardamom plantations in the northern region but very little mosaic was found; only one infected plant was found in the ten or so farms visited.

As a result of this survey, Gonsalves found that the mosaic virus was a very serious disease of cardamom plantations in the southern region of Guatemala and appeared to be established in most plantations. Hundreds of acres were infected in some plantations and many more acres were being infected through its spread by propagating material and aphids. He believed that the mosaic virus disease was not well established in the northern part of the country and that it could be eradicated there if action

was taken quickly. On the other hand, he felt that the virus was so prevalent in the south that the growers would have to employ control measures that would enable them to live with the disease.

At a meeting of 15 technicians of the government's plant protection division, Dr. Gonsalves presented a talk on plant viruses and the ELISA (enzyme-linked immunosorbent assay) method and also demonstrated the initial steps of this technique. He also presented a seminar to representatives of the Cardamom Growers' Association in which he discussed the principles of virus diseases, their control and the potential use of the ELISA method to control the mosaic virus disease of cardamom. This method is used as a rapid technique for differentiating symptomless disease carriers from healthy plants to insure that only disease-free plants are used for propagation purposes. The Association later agreed to provide Dr. Gonsalves with a $13,000 grant to allow him the opportunity to purify the virus, produce antisera to the virus and adapt the ELISA technique for the rapid detection of infected plants.

(4) Vegetable research and production - Responding to a request from the director of the plant quarantine service in Suriname, the RPMS visited that country in January 1981 to meet with government officials and scientists, tour research stations and growers' fields and evaluate the principal constraints observed in their vegetable production practices. In the week he spent in Suriname, Trujillo visited a number of cabbage, bean, tomato and other vegetable fields in the major areas of the country, met with growers and presented lectures at various agricultural research experiment stations. The subjects of his talks varied from general aspects of vegetable production in the humid tropics and disease control in bananas

to a manipulation of biological control of pests, especially the use of plant pathogens in the control of weeds. He also engaged in a number of discussions of practical problems, such as the proper type of material to use in plastic roof shelters for greenhouses, drip irrigation systems and other methods of environmental modifications. In his recommendations for the improvement of vegetable production, Dr. Trujillo strongly urged the use of cultivars and varieties that were resistant to such important diseases as anthracnose, Fusarium wilt, black rot and powdery mildew. So that these resistant varities of cabbage, cucumber, tomatoes, bell peppers and pole beans could be imported, he provided government officials with a list of possible seed supply companies.

(5) From May 18-26, 1981, the first of a series of CICP sponsored Plant Disease Diagnostic Workshops was presented in Cerro Punta, Panama under the direction and supervision of the Regional Pest Management Specialist. The workshop was devoted to a consideration of nematodes and was offered for plant protection personnel from the five Central American countries and Panama. It was held at the IDIAP (Instituto de Investigación Agropecuaria) Estación Experimental Agrícola in the Chiriquí Province and was was attended by 16 persons -- six from the host country and two from each of the other five countries in the region.

The workshop was presented in collaboration with another AID-funded program, the International Meloidogyne Project, which funded the participation of the three instructors for the course, i.e. Joseph N. Sasser, Director, IPM Project, North Carolina State University; Parviz Jatala, nematologist, Centro Internacional de la Papa, Lima, Peru; and Jesse Román, nematologist, University of Puerto Rico, Río Piedras. Necessary arrangements and coordination for the event were made by the RPMS in

previous trips to the country, and he assisted in the conduct of the laboratory demonstrations, and acted as interpreter and course coordinator. The workshop schedule consisted of morning lecture sessions from 0830 - 1200, afternoon laboratory exercises from 1400 - 1700 and several evening sessions at which movies and slide presentations were shown. The subject material covered in this course included the following topics: early history and recent developments in nematology; characteristics of nematodes, i.e., gross morphology and anatomy; life cycles; general feeding habits; techniques for working with nematodes, such as separating them from soil or plant tissue, methods of preparation for microscopic studies; plant-nematode relationships; and the systematics of important genera of plant-parasitic species. A great deal of attention was also given to the life history, biology and control of specific important pest species, e.g. the potato cyst nematode, the burrowing nematode and the reniform nematode. On the final day of the workshop, integrated control methods were considered, with a discussion of plant resistance, crop rotation, chemical, physical, biological control, etc.

(6) The second Plant Disease Diagnostic Workshop, on Bacteriology, was held at the Hotel Ramada Antigua, on the outskirts of Antigua, Guatemala from June 28 - July 8, 1981. Thirteen individuals from the CAP countries attended the course - 4 Guatemalans, 1 Nicaraguan and 2 representatives from each of the other countries in the region. Seven of the participants had also attended the previous Nematode Workshop in Cerro Punta.

The workshop was a practical course in plant bacteriology and was taught by Anne Alvarez, plant pathologist, University of Hawaii, assisted by the RPMS. Lectures were presented during the morning sessions from

0830 - 1130 while laboratory exercises were conducted in the afternoon from 1330 - 1630. Lecture material covered such topics as nature of the disease causal agent; nutrition and growth; taxonomy of important genera, e.g. Erwinia, Pseudomonas, Xanthomonas, Agrobacterium and Corynebacterium; serology; immunofluorescence; integrated control; bactericides and factors that affect infection and resistance. Laboratory sessions provided instruction on how to make preparations of culture media; techniques of diagnosis and isolation; preparation and purification of inoculum; techniques of inoculation and detection of bacteria in plant tissues.

The participants who attended the two workshops were high in their praises of their organization and content and, in their written evaluations, generally expressed great satisfaction at the quality of the courses, and their usefulness and applicability to the trainees' work.

PESTICIDE RESIDUE ANALYTICAL TRAINING PROGRAM

QUALITY CONTROL PROGRAM

TRAINING ACTIVITIES

MIAMI

GUATEMALA

CHILE

TECHNICAL ASSISTANCE

GUATEMALA

JAMAICA

TANZANIA, ZIMBABWE

UNIVERSITY OF MIAMI TRAINING AND QUALITY CONTROL PROGRAM IN PESTICIDE RESIDUE ANALYSIS

The UC/AID Pest Management Project--CICP's predecessor organization--in 1974 entered into a subcontract agreement with the University of Miami's School of Medicine, Florida, in which the latter proposed to develop a coordinated program of training and technical assistance in analysis of pesticide residues for chemists in developing countries. The establishment of a quality control program that was designed to develop and maintain uniform standards of operation among a network of analytical pesticide residue laboratories in developing countries was to form an integral part of the technical assistance provided by this Florida institution and its activities became an important component of the UC/AID Pest Management Project; therefore, when CICP was founded in 1978, it continued to sponsor and support this program.

The purpose of the quality control program was to measure the overall performance of each participating laboratory, to evaluate the methodology used in residue analysis, and to determine any specific training needs that would be required to upgrade and standardize their performance. The program began in late 1975 when 15 laboratories in nine countries were sent the first quality control sample. Eventually, a ceiling of 45 laboratories was established to permit the most effective management of this program. This ceiling was reached in a short time and, for the period under review, the program was at its maximum level of participating laboratories.

The results of the analysis of three samples (UM-010, UM-011 and UM-012) by responding laboratories were evaluated and reported by the University of Miami during the year, although the first two samples had

been mailed out prior to the beginning of the contract period. Sample UM-010, which was analyzed by 12 laboratories, consisted of a solution of several chlorinated hydrocarbon insecticides that was to be added to 100 grams of vegetables. Sample UM-011 contained a solution of a similar mixture of pesticides and was to be added to a liter of water; it was analyzed by 10 laboratories. The third sample, UM-012, was also similar to UM-010 and was also to be added to 100 grams of vegetables. Methodology for performing the analysis was included with the samples, but the laboratories could use other methods as long as they specified the method used. The laboratories were asked not only to identify what pesticides were in the sample, but also to determine the concentration of each pesticide present.

After the date for submission of results on the analysis of a sample had passed, the University of Miami prepared a constructive critique of the data submitted and sent it to each participating laboratory in order to help it improve its performance. These critiques included a statistical evaluation of the results and an analytical performance rating which compared the performance of all the laboratories. Strict confidentiality of the results was maintained by use of a coding system that precluded the individual laboratories from being identifiable to each other even though they could still compare their performance with the others.

The number of laboratories actually performing the analysis on any of the three samples averaged slightly more than 25% of those inscribed in the quality control program. Only three laboratories analyzed all of the samples sent to them while nine performed the analysis on two samples. There were three laboratories that only participated in the analysis of one sample. The majority of the participating laboratories successfully

identified all of the pesticides present in the samples they analyzed; however, they had more difficulty in determining the precise quantities of each pesticide present. Laboratories were asked to return the recorder chart paper used in their analysis as a way for the University of Miami staff to determine possible sources of error in their qualitative or quantitative identifications. The most common errors encountered in the analyses of these samples were found to be: (1) incorrect standard concentrations, (2) improper use of gas chromatograph, e.g., wrong column, (3) poor recoveries through improper use of methodology, and (4) mathematical errors. Evaluation of the results submitted by participating laboratories enabled program staff to determine the type of training necessary to improve their performance as well as to identify laboratories in need of training.

Training Activities

As a complement to the quality control program, short training programs were initiated in 1977 at the University of Miami for particular individuals selected from participating laboratories. This specialized training gradually evolved into formal six-week courses that were presented at the rate of two or more a year, depending on the number of potential trainees and availability of funding. These courses provided practical knowledge in sample extraction and clean-up, use of analytical equipment and identification/quantification, pesticide safety practices and basic information on the chemistry of herbicides, fungicides and insecticides and their fate in the environment. Three courses were presented in 1981 for ten participants from seven countries. Individuals taking part in these courses were chemists assigned to pesticide analytical

laboratories of government institutions or universities in El Salvador, Dominican Republic, Chile, Colombia, Philippines, Egypt and Tanzania. An evaluation test was given to the participants at the beginning of the course to determine their level of knowledge and, based on the results, each course was adapted as much as possible to meet their individual needs. The extent to which the participants were able to learn and assimilate the information and techniques presented during the training course was clearly evident in the marked improvement in the scores achieved on the post-training test (82.0 - 98.5) compared with those obtained in the pre-training examination (2.5 - 47.0). The dates for presentation of these courses were March 30-May 8, 1981; April 29-June 10 and September 4-October 23, 1981.

The director of the quality control program, J. Bruce Mann, also travelled to Guatemala and Chile during the year to present training sessions for residue chemists in those countries. After making a preliminary trip to El Salvador and Guatemala in late October to visit laboratory facilities, assess training needs and select a training site, Mr. Mann returned to Guatemala from December 1-12, 1980 to conduct a two week training course in the analysis of beef for pesticide residues for participants from several Central American countries. The course was held at the Laboratorio Unificado para Control de Alimentos y Medicamentos of the Instituto de Nutrición de Centro América y Panamá and was attended by 12 persons--five from Guatemala, four from El Salvador, two from Honduras and one from Costa Rica. Since the principal purpose of the course was to provide training in the analysis of pesticide residues in beef, participants were asked to analyze several beef samples using the screening method employed by the USDA. The trainees were shown how to pack the column

properly, inject the sample after extraction and taught the limits of sensitivity of the method. Four days were devoted to the actual analysis of the samples after which discussions were held on the results obtained. A demonstration of the Mills-Onley-Gaither method for analyzing beef was also given but there wasn't enough time for the participants to use the method. A field trip to a meat packing plant gave the trainees an opportunity to see where the samples originated and to appreciate the problems associated with delays in the analysis of samples.

At the request of Fundación Chile, a non-profit organization for providing technology transfer and assistance to food producers and processors, Mr. Mann also presented training in pesticide residue analysis from January 19-30, 1981 in Santiago to the foundation's chemist. This training included a determination of the sensitivity of the method used, calibration of a Florisil column, demonstration of extraction methods and actual analysis of fruit that had been spiked with various pesticides. The purpose of the training was to ensure that the chemist would be able to monitor fruits and vegetables for residues of various organophosphate and chlorinated hydrocarbon insecticides and safeguard that tolerance levels for them were not being exceeded.

Apart from the quality control program and formal training activities, the staff of the analytical laboratory at the University of Miami also responded to requests for technical assistance from USAID Missions and institutions in developing countries. In particular, the Miami Laboratory analyzed a beef sample for the Laboratorio Unificado para Control de Alimentos y Medicamentos in Guatemala and found it contained 2.1 ppm of endrin. They also analyzed a sample of an ale-type beverage for a forensic laboratory in Kingston, Jamaica and confirmed the presence of

2.5% azodrin in the beverage. As it was a criminal matter, they were asked to analyze the stomach contents and viscera of three recently deceased persons and found that these tissues contained the insecticide also.

In response to a request from USAID, Bruce Mann went to Tanzania and Zimbabwe from August 13 - 28, 1981 to visit several pesticide residue laboratories and evaluate their equipment, facilities and capability to analyze pesticides. In general, he found that the laboratories he toured were fairly well equipped, with good equipment and a good variety of chemicals and solvents although the latter were often not available in large quantity. In one laboratory, the solvents were of an analytical reagent grade and not suitable for pesticide residue analysis. He also noted in his report examples of equipment that was either not working or was not calibrated and, in one instance, that was not being used because no one knew how to operate it. Asked to evaluate the results of monitoring studies, he found that the gas-liquid chromatograph column used to analyze one sample would not separate dieldrin and DDT although both pesticides were reported. In another study, he questioned the quantitative results obtained for toxaphene because there was considerable background interference from the reagent used in the analysis. Overall, he felt that the assessment of these laboratories was valuable in establishing the training needs for those persons who were to participate in the training course presented in Miami in September.

CONFERENCES

CHIANG MAI

NAIROBI

International Conferences

The Consortium has continued to promote and encourage attendance at various important international meetings and conferences by members of the project and consultants as a necessary and vital activity. One of the primary benefits of this activity is the opportunity it affords for liaison and contacts to develop between project members and officials of various international organizations such as FAO, UNDP, WHO, EPPO, etc. who are responsible for planning and implementing programs in the field of pest management. A review of two of these conferences follows.

Twelfth Biennial Meeting of the FAO Plant Protection Committee for Southeast Asia and the Pacific, Chiangmai, Thailand, October 27 - November 3, 1980

This meeting was attended by Michael E. Irwin, entomologist, INTSOY, University of Illinois and an alternate member of CICP's Board of Directors, at the invitation of the FAO Regional Representative for Asia and the Pacific. This committee has 22 country members in the region and meets every two years in one of the member countries to consider various plant protection activities in the region and make recommendations to both member governments and FAO. In addition to consideration of the regular agenda items, the Committee often invites individual authorities on particular subjects of topical interest to prepare papers and present them at its meeting.

As there was considerable interest in increasing the cultivation of soybeans in the region and several countries were importing soybean materials from abroad, the Committee was deeply concerned about the

inadequate safeguards for preventing the transportation of seed-borne pathogens and pests among member countries as a result of the importation of germplasm through their participation in international variety experiments conducted by various international organizations, including INTSOY. Increased pest problems had also occurred in the region on this crop; consequently, there was much interest in learning about soybean pest management problems and programs in other areas.

Dr. Irwin's invitational talk was entitled "Soybean Pest Management and the International Soybean Program (INTSOY)." The introductory part of this talk was essentially a discussion about the INTSOY organization, its purpose, programs, operations and procedures. The principal objective of the talk, however, was to provide information on the development of a pest management program on soybeans beginning with the proper identification of the major pest species, design of sampling procedures, establishment of economic injury levels, chemical control recommendations and the implementation of the preliminary pest management package. As an example of such a program, he discussed the approach INTSOY used when it investigated the problem of soybean mosaic virus.

Second International Conference on the Impact of Viral Diseases on the Development of African and Middle East Countries, Nairobi, Kenya, December 1-6, 1980

Plant pathologist T. Jack Morris, University of California, Berkeley, attended this conference as a representative of the Consortium for International Crop Protection. The conference was jointly organized by the Government of Kenya and the International Comparative Virology Organization under the auspices of the World Health Organization. The aim of the

conference was to provide a forum where scientists from developed countries could interact with scientists from Africa and the Middle East and discuss the serious virus disease problems affecting man, food crops, and animals in that part of the world.

Some 300 scientists from 53 countries attended the conference, two-thirds of whom were from Africa and the Middle East. Several hundred papers were presented covering all areas of virology, many of these discussing the prevalence and impact of important virus diseases of man in Africa. A session dealing specifically with control of human viruses emphasized the need for development and use of anti-viral vaccines in Africa. There were many reports on newly identified African diseases, and it became apparent that new plant viruses were continually being discovered, with members of the POTY virus and GEMINI virus groups being the most common and causing the most severe crop losses. There were also reports on the diagnosis and detection of important animal viral diseases, with an emphasis on the development of vaccines that would protect against African strains of the viruses. It was remarked that vaccines developed in Western or European countries may not be effective in Africa and therefore new vaccines would have to be developed at considerable expense to affect control.

Along with three other scientists, Dr. Morris organized an all-day workshop at the Kenya Agriculture Research Institute where they demonstrated and discussed the use of new diagnostic methods for a group of about 30 African plant virologists. The difficulties under which the latter must work was vividly demonstrated in an exercise on gel electrophoresis that could not be completed because of technical and electrical problems. Dr. Morris considered that the major obstacle to disease control in the

region was a lack of maintainable laboratory facilities and trained personnel, and, in his opinion, by providing these scientists with new and simpler approaches to virus detection and diagnosis, many of the problems would be improved. He expressed the conviction that the most significant event of the conference was the establishment of an African Society of Virologists which proposed the construction of four central facilities in Africa to train people and to handle problems of major importance.

PUBLICATIONS

NEWSLETTER

INTERNATIONAL CONFERENCE MEETING LIST

ACRONYM LIST

PROCEEDINGS

PERU

BARBADOS

PANAMA

Project Publications

The Consortium issues publications containing the results or proceedings of all the major activities it conducts, such as short courses in integrated pest management, seminar/workshops in pesticide management, surveys of multidisciplinary study teams, etc. These publications are distributed free upon request to interested individuals (except for a small number of priced publications). The Consortium also distributes publications issued previously by the UC/AID Pest Management Project.

Project Newsletter - A periodical newsletter, entitled PEST MANAGEMENT NEWS, was created and developed in late 1975 for the UC/AID Pest Management Project. The first issue was published in September, 1975. There are four issues per volume; the first issue published under the auspices of the Consortium was Number 2, Volume 4 in June, 1981.

The purpose of the newsletter is to present information on major pest management projects being implemented in less developed countries, to inform readers of printed resources pertaining to crop protection and pesticide management, to announce the presentation of training courses in crop protection-related disciplines, and to provide dates and sites of presentation of conferences, meetings and symposia that deal with topics in pest management. Another objective of the newsletter is to keep technical personnel in developing countries informed of the activities and accomplishments of the Consortium and, consequently, articles that discuss the results of seminar/workshops on pesticide management and report on the short courses in pest management sponsored by CICP appear in many issues.

The articles contained in the Volume 4, Number 2 issue include an introduction and background information to the regional pest management specialist stationed in Guatemala who was assigned to USAID's Regional Office for Central American Programs and whose basic responsibility was to advise and assist ministry officials and plant protection workers in El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica and Panama in the development and implementation of pest management and crop protection programs. Other articles reviewed several important publications - the 1979 Council on Environmental Quality report on Integrated Pest Management, the Office of Technology Assessment report on pest management strategies in crop protection in the United States, and the proceedings of the International Organization for Biological Control's Conference on Future Trends of Integrated Pest Management held in Bellagio, Italy in June, 1980. Recent publications issued by the Consortium were also announced in this issue.

List of International Conferences Related to Pest Management - The Consortium prepares a list of international conferences related to pest management that appears quarterly - in January, April, July and October. It is sent to a selected number of interested persons and has proven to be of valuable assistance to scientists in developing countries in planning for their participation in such meetings.

Acronym List - This 124-page publication lists the complete name and corresponding acronym of over 600 organizations and institutions world-wide concerned with agriculture, economic development and pest management. It was compiled for the purpose of assisting individuals interested in technical assistance programs and international development activities to

locate the name and address of organizations and institutions involved with these activities.

Other Publications - The proceedings of a short course on integrated pest management presented in Peru and two seminar/workshops on pesticide management presented in Barbados and Panama were published in 1981. A description of these events is given elsewhere in this report.

APPENDIX

SUMMARY OF OVERSEAS ACTIVITIES OF CONSULTANTS AND PROJECT PERSONNEL

OCTOBER 1, 1980 - SEPTEMBER 30, 1981

October 4-12, 1980	Donald Calvert, Michael Irwin, and Fausto Cisneros - Conducted a follow-up evaluation with the attendees of the Short Course on Integrated Pest Control for Small Farmer Cropping Systems which was held in Turrialba, Costa Rica, August 27 - September 21, 1979.
October 5-8, 1980	Rene Bodegas, K. L. Heong, Banpot Napompeth, and Edward Tukahirwa - Participated in the meeting "Perception of Pests and Pesticides in Integrated Pest Management" held at Clark University, Worchester, Massachusetts, USA.
October 11-31, 1980	Dale Bottrell - Led a team of experts in preparing a report upon which the WARDA programme on integrated management of insect pests and diseases of rice was to be based. Traveled to Senegal, Ivory Coast, Upper Volta, and Nigeria.
October 25 - November 3, 1980	Michael Irwin - Represented CICP at the Food and Agriculture Meeting of the Committee on Plant Protection for Southeast Asia and the Pacific, Chiang Mai, Thailand.
October 26-31, 1980	J. Bruce Mann - Made a preliminary assessment of pesticide requirements and facilities for Guatemala.

October 31 - November 4, 1980	J. Bruce Mann - In El Salvador held discussions with the USAID Mission regarding the possibility of training in the area of pesticide residue analysis.
November 1-8, 1980	Perry Adkisson, Dale Bottrell, B. Currie, John Davies, Roger Drummond, Virgil Freed, George Georghiou, Walter Howard, Ronald Lacewell, Marshall McGlamery, and Ray Smith - Participated in the Seminar/Workshop on Pest and Pesticide Management in the Caribbean held in Bridgetown, Barbados.
ber 8-11, 1980	John Davies and Virgil Freed - Consulted with officials in Trinidad and Tobago and of CARDI concerning pesticide residue analysis and pest management, and the agromedical approach to pesticide management.
November 9 - January, 1981	Patricia Matteson - Made studies and prepared an Environmental Examination for LOFA County Rural Development II; Monrovia, Liberia.
November 9-15, 1980	Dale Bottrell and Ray Smith - Held discussions in Guyana concerning pest and pesticide management with personnel of the Guyana Ministries of Agriculture and Health and with the Guyana Pharmaceutical Corp., Guyana Rice Board, and the Guyana Sugar Corp.
November 9 - December, 1980	Z. B. Mayo and Frank Turpin - Reviewed the use of endosulfan for the protection of maize in the Tanzania Resources for Village Production and Income Project, and reviewed the use of pesticides and planned research on maize in other AID-sponsored projects in Tanzania.

November 25 - December 16, 1980	Lowell Etzel - Participated as a lecturer in a Training Course in Biological Control of Pests, sponsored by CIBC and held in Bangalore, India.
December 1-6, 1980	T. Jack Morris - Participated in the Second Conference on Impact of Viral Diseases on Development of African and Mid-East Countries held in Nairobi, Kenya.
December 1-12, 1980	J. Bruce Mann - Conducted a course in pesticide residue analysis of beef at LUCAM which took place in Guatemala City.
January 5-10, 1981	Ray Smith - Traveled to Panama to hold discussions with Government of Panama about the scope and content of an upcoming seminar designed to reconcile differences in pesticide use between the Panamanian Ministries of Health and Agriculture.
January 7-24, 1981	Dale Bottrell - This was a continuation and completion of his October assignment in Africa as team leader of a mission of WARDA to establish an IPM project for rice in West Africa. Visited Senegal, Sierra Leone, Liberia, and Ivory Coast.
January 11-24, 1981	Winfield Sterling - Assessed environmental and human health hazards associated with cotton spraying, its proximity to training centers and to surrounding terrain in Nicaragua.
February 1-7, 1981	J. Bruce Mann - In Costa Rica evaluated procedures and equipment at a pesticide residue analysis lab, and in Nicaragua did a follow-up on the 1980 residue analysis training course.

February 2-27, 1981 — Virgil Freed, Carl B. Huffaker, Fowden Maxwell, William Ruesink, H. David Thurston, Michael Irwin, Donald Calvert, Elkin Bustamante R. and Saul Risco B. - Participated in the CICP/USAID training short course on integrated pest control held in Lima, Peru.

February 16-22, 1981 — Richard Johnson - Attended the International Seminar on Pesticides for Control of Stored Grain Pests at Slough, Buck, England.

March 8 - April 7, 1981 — Charles Ward - Consulted USAID/Jakarta in Indonesia about pest and pesticide management problems associated with the Luwu Project. Consulted briefly with IRRI in Manila, The Philippines.

March 12-18, 1981 — John Davies and Virgil Freed - Participated in the Sixth International Workshop of the Scientific Committee on Pesticides of the International Association on Occupational Health held in Buenos Aires, Argentina.

March 23-27, 1981 — G.A. Carlson, Ray Smith and Ray Frisbie - Attended the 10th Session of the FAO/UNEP Panel of Experts on Integrated Pest Control which convened in Rome, Italy.

April 1-5, 1981 — Janice Reid - Met with John Davies in Miami, Florida to work out details on the course content for the "Train the Trainer" Certification Programme to be held in Jamaica, June 1981.

April 4-12, 1981 — Donald Calvert - Met with officials of the Ministerio de Agricultura of Guatemala and the Centro Agronómico Tropical de Investigación y Ensenanza in Turrialba,

Costa Rica to discuss the organization of a training short course on integrated pest control for the Central American region to be held in Guatemala, October - November 1981.

April 20-25, 1981 — Theodore Granovsky, Nathan Chandler and Leopoldo Caltagirone - Presented papers at the "Uso de Plaguicidas en Panama y su efecto en la Salud y el Medio Ambiente" Seminar held in Divisa, Panama.

April 21 - May 8, 1981 — Paige Taylor and Carrol Voss - Reviewed and assessed the current recommendations of WINBAN research. Traveled through the Windward Islands of the Caribbean.

April 27 - June 6, 1981 — Dale Bottrell - In the South Pacific, conferred with AID, the South Pacific Commission and GTZ concerning the development of a short course on Integrated Pest Management to be sponsored by CICP and others in the South Pacific in early 1982. Visited Monrovia, Liberia to participate in an annual WARDA review, and present an invitational paper on IPM in rice. In Rome met with Lukas Brader to discuss implementation of the WARDA project, "A Regional Programme on the IPM of Insect Pests and Diseases of Rice in West Africa."

April 30 - May 20, 1981 — Patricia Matteson - Reviewed the ICIPE Project on "Bases of Plant Resistance to Insect Attack," Nairobi, Kenya

May 8-17, 1981 — Ray Smith and J. Lawrence Apple - Met in Lima, Peru with Alexander Grobman, Loren Schulze, Fausto Cisneros

and others to discuss proposed collaborative efforts in research, extension and training.

May 9 - June 7, 1981 — William Morrison - Participated as a member of a team making an environmental assessment of an agricultural development project in the upper Huallaga Valley of Peru.

May 15 - June 1, 1981 — Edward Glass - Traveled to Burma to participate in a project design team on maize and oil seeds production.

June 7-14, 1981 — John Davies, Virgil Freed and Erica Koehler - Participated in the "Train the Trainer" Agromedical Certification Programme in Kingston, Jamaica.

June 9-13, 1981 — Joel Meltzner - Evaluated the "Train the Trainer" Agromedical Certification Programme in Kingston, Jamaica.

June 11-21, 1981 — Edwin Johnson - Participated in the CODEX meeting held in the Hague, Netherlands.

July 12-15, 1981 — Donald Calvert - Met with officials of ICTA in Guatemala to discuss training short course to be held in Guatemala, October 26 - November 21, 1981.

Mid-July - September, 1981 — Dale Bottrell and Patricia Matteson - Participated in a team which reviewed the Sahel Project in Africa.

July 23 - August 5, 1981 — Jerry Stimac and Harold Reynolds - Traveled to Nairobi, Kenya, to act as instructors in the ICIPE/UNEP Group Training Course.

August 1981 — Carl Barfield, Donald Calvert, Richard Farnsworth and George Teetes - Participated as instructors in the "Short Course on Integrated Pest Management of Tropical Crops," held in St. Augustine, Trinidad.

August 13-26, 1981	J. Bruce Mann - Evaluated training needs in pesticide residue analysis at the East African Tropical Pesticide Research Institute in Arusha, Tanzania, and with the Ministry of Agriculture in Zimbabwe.
August 28 - September 6, 1981	Ray Smith - Discussed collaborative arrangements between CICP and the Philippine National Crop Protection Center in Manila, the Philippines.
September 11-16, 1981	Ray Smith - Participated in the International Symposium "Insect Control of Tomorrow" held in Wageningen, the Netherlands.