A Description of the Project "Integrated Pest Management" in Honduras[1]

Keith L. Andrews[2] *and Carl S. Barfield*[3]

The magnitude of pest and pesticide-related problems in Honduras are largely undocumented, but are likely to be as great as in the neighboring Central American republics. Farmers perceive pests to be among the most important limiting factors with which they must deal (eg. Galt, et al, 1982).

Honduran plant protection capabilities are less well developed than those of the neighboring countries. Farmers rarely receive the kinds of information and support they need in order to best protect their crops. Government agencies are undersupported and subject to constant restructuring and personnel shifts. Research in plant pathology and entomology has historically been deemphasized in favor of agronomic studies, especially in the area of plant breeding. Weed science, was, for all practical purposes, nonexistent until very recently.

Current teaching programs at the university level do not adequately prepare students either technically or philosophically to address the pressing needs of crop protection (Anon, 1983). Plant protection programs are still heavily dependent upon foreign information and specialists. Curricula oftentimes include improper emphases as well as erroneous data.

During 1981-2, a number of preliminary documents were developed by personnel of the Escuela Agrícola Panamericana (EAP) and the University of Florida (U of F) to address the

---

1 MIPH Publication number 8. USAID/Honduras Project number 522-0222.

2 Leader, Project IPM in Honduras; Profesor, Escuela Agrícola Panamericana, Apartado 93, Tegucigalpa, Honduras; and Assistant Research Scientist, Department of Entomology and Nematology, University of Florida, Gainesville, FL 32611 USA.

3 Associate Professor, Department of Entomology and Nematology, University of Florida, Gainesville, FL 32611 USA.

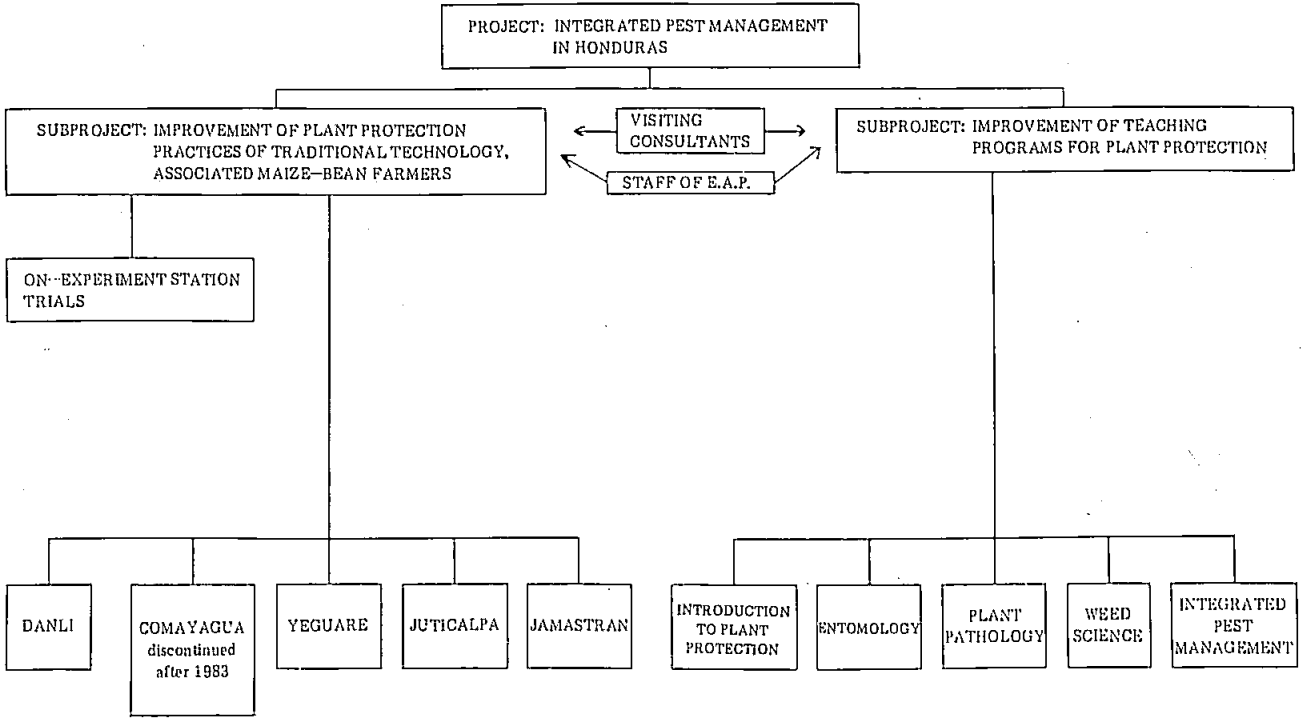
above-mentioned needs. These documents were reviewed by the U.S. Agency for International Development/Honduran mission (AID/H) staff and on 1 May 1983 a project entitled "Integrated Pest Management in Honduras: A Two Part Project" was launched. This project is to last for three years, is headquartered on the campus of EAP in El Zamorano, Honduras, and is financed in common by AID/H and EAP. The former's contributions are in the form of local currency made available through the Economic Support Funds program. Activities are carried out with the collaboration of the Ministry of Natural Resources and with the full support of the Honduran government (GOH). The project is divided into two subprojects.

RESEARCH EXTENSION SUBPROJECT

The subproject on the left-hand side of Figure 1 is entitled "Improvement of Plant Protection Practices of Traditional Technology, Associated Maize Bean Farmers". Initially, activities are research-oriented, but during the third year technology transfer will become an important component. During 1983, on-farm research was carried out by project employees in three areas of the country (Figure 2) as well as on EAP grounds. Collaborative work was done in Yoro by personnel of the Ministry of Natural Resources/Honduran Agricultural Research Project. Work in Juticalpa and Jamastran was initiated in 1984. All on-farm trials are carried out on "asentamientos"; that is, on collective farms established through the intervention of the National Agrarian Institute (INA). Cooperating "asentamientos" are all financially solvent, well-organized internally, have at least a short history of successful cooperation with research entities, and report significant problems with all or nearly all of the pests of concern to this project.

The purpose of this subproject is to develop and validate regionally-tailored, prototype, insect and mollusc pest-management programs and subsequently transfer the programs to GOH and interested private-sector entities, who will be charged with popularization among farmers. Initially the project will focus on a limited number of pests. In maize, the whorlworm (fall armyworm), *Spodoptera frugiperda;* the maize-grain weevil, *Sitophilus zeamais;* and the stem-boring weevil, *Listronotus (=Hyperodes)* sp. will receive priority. The former two pests are well known by virtually all farmers and are of considerable importance throughout the low and middle elevation neotropics

Figure 1. Organization of the Project IPM in Honduras.



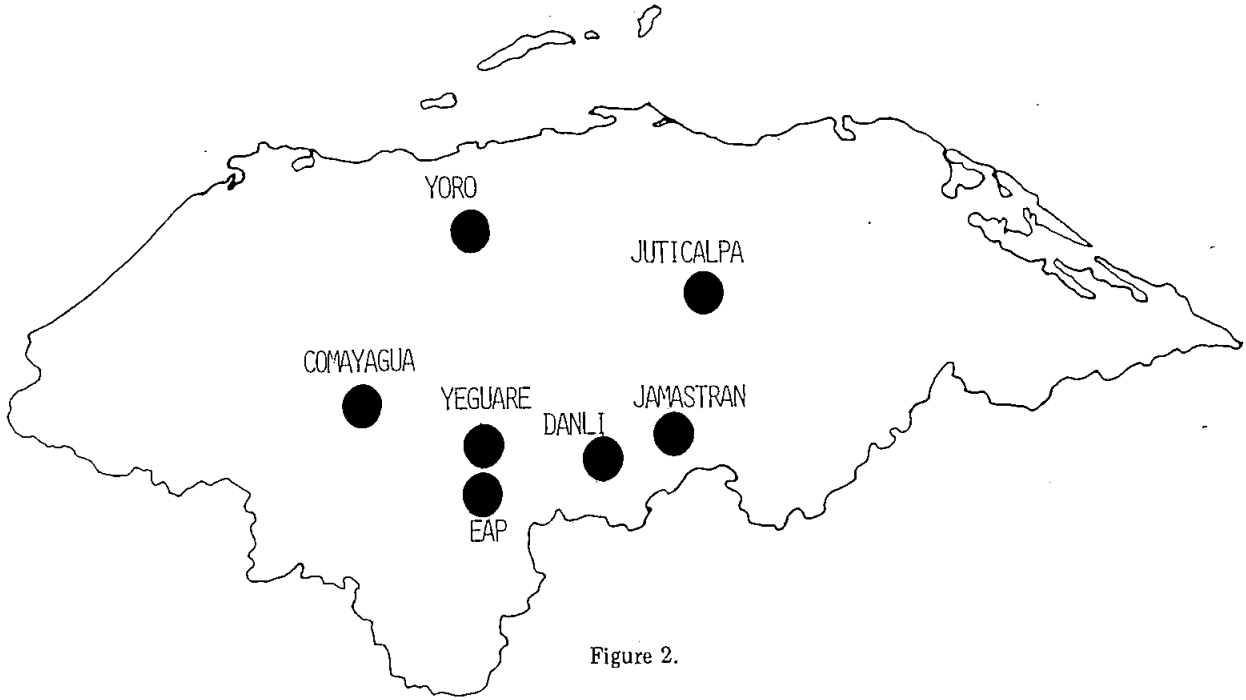


Figure 2.

Map of Honduras showing principal on-farm research sites. Work was discontinued in Comayagua after the 1983 season and relies upon the collaboration of the Honduran Agricultural Research Project/Ministry of Natural Resources team in Yoro. Experiment station trials are carried out at the Escuela Agrícola Panamericana.

(Andrews, 1980) while *Listronotus* sp. is almost universally overlooked but appears to cause considerable seedling mortality. In beans, the principal pests to be studied in approximate order of emphasis are the bean slug, *Vaginulus (=Sarasinula) plebeius;* leafhoppers of the genus *Empoasca;* loopers, principally *Pseudoplusia includens;* and the bean-pod weevil, *Apion godmani.* In both crops other invertebrate pests will be included should they be found to be as important as the preceding species. The fact that heavy emphasis is placed on insect and mollusc pests during the first years of the project does not mean that we overlook the importance of weeds and pathogens in these crops. Instead, the decision reflects the reality of current research capabilities at EAP and the project leaders' perception that overly ambitious projects which grow too large too fast rarely accomplish what they set out to do. On the other hand, after laying a solid groundwork during the first three years, the project will be expanded to include other noxious organisms in the future. The project leaders and the administration of EAP view the research subproject as the beginning of a permanent, self-supporting element of EAP's activities.

Experimentation during year one focused on several goals: 1) characterize the environment, attitudes, perceptions, needs, and opportunities of the client farmers, 2) catalogue the insect pests which affect the two crops and confirm estimates of their relative importance, 3) measure the population dynamics of these species and their natural enemies, 4) identify important elements in the traditional production system which aid in protection and therefore need to be preserved, and 5) compare the efficacy and economic value of traditional versus the EAP-derived protection program for pest-population suppression.

The EAP program is an amalgam of techniques and recommendations derived from various sources, the most important being the publications of the Nicaraguan PNUD—FAO—INTA project (eg. Anon., 1976), CATIE-sponsored research (eg. King and Saunders, in press) and work of Andrews and his collaborators as summarized in Andrews (1982) or Andrews (1984).

The importance placed on understanding the socioeconomic context of the farmers is highlighted by the inclusion of social scientists in the "sondeos" carried out in areas where experiments are conducted. Sëë Anon. (in press) for results of the "sondeos".

The principal experiment in 1983 involved comparison in large plots ($\geq$0.5 ha) of the following treatments: 1) traditional technology or farmer-managed plots, 2) EAP technology or researcher-managed plots, and 3) intermediate technology or plots managed according to farmer-researcher interaction and incorporating elements of both traditional and EAP programs. Other supportive experimentation was carried out on the "asentamientos" and at EAP. Upon completion of research in 1983, a series of dry-season workshops were held in which international, GOH, and private-sector representatives collaborated with the project leaders in evaluation of 1983 research results and in establishment of research plans for 1984.

During its first year the project entered into two cooperative agreements with U.S. universities in order that the latter might support the research subproject. The first subcontract with the Department of Entomology and Nematology of the University of Florida, Gainesville, has facilitated research planning efforts and made possible relatively sophisticated data analysis. The other subcontract was signed with the Department of Biology of the University of New Orleans. Work will be undertaken both in Louisiana and Honduras by Dr. Dee Dundee and collegues on the biology and ecology of the bean slug. Two MS-level graduate students will be supported.

TEACHING IMPROVEMENT SUBPROJECT

The second subproject "Improvement of Teaching Programs for Plant Protection" (right-hand side of Figure 1) aims to develop didactic techniques and educational aids for use in EAP as well as in other agricultural schools and universities of the region. It is our belief that only through the development of a cadre of agricultural specialists who are thoroughly prepared philosophically and technically in the science and art of IPM will we have the human resources necessary to conduct productive research and to carry extension/implementation programs to fruition. If future scientists and technicians are not prepared thoroughly and in large numbers, progress in plant protection will not be made at the farm level.

The EAP plant protection program at the start of the project was among the best in Central America and will be considerably improved by the end of the three-year period. The guiding principles involved in this curriculum are: 1)

theory and practice must be thoroughly integrated, 2) disciplines should be treated in isolation only as it may be advantageous for didactic purpose, but the student must be constantly reminded of the theoretical and field-level interrelations between the various production and protection disciplines, and 3) the student must become thoroughly aware of basic IPM procedures and outlooks so as to be able to rapidly assimilate and utilize new IPM technologies as they become available.

The EAP teaching curriculum is summarized in Figure 3. First-year students receive a one-credit introductory theoretical course in which the ecological, technical and economic aspects of plant protection are introduced but not studied in detail. Disciplinary interactions are highlighted. First-year students working in small groups over a three-week period also receive 70 hours of practical experience in pest management in horticultural and fruit crops. Emphasis is placed on in-field recognition of pest problems and sampling as well as the practical aspects of chemical, cultural, and biological control. Pesticide safety is heavily stressed.

Second-year students take theoretical courses of three or four credits in weed science, plant pathology, and entomology. These courses are all oriented toward agricultural needs and are complemented by a nine-week "hands-on" field laboratory series in which students gain practical experience in weed science (identification and control), plant pathology (recognition of symptoms, diagnosis, epidemiology, and control), and entomology (field identification, sampling, decision making, and control). The capstone experience to the series is a three-week practical course in IPM in which each student is put in charge of citrus, maize or sorghum, beans or soybeans, a fruit crop of the student's choosing, an optional crop, and 8 to 15 horticultural crops (depending on seasonal availability). Scouting reports are filed daily and students are quizzed weekly on their understanding of the bioecological and technological aspects of their work.

At the beginning of their third and final year, students take the three-credit Integrated Pest Management course which refines, deepens, and integrates their understanding of plant protection. During their third year, students may carry out a year-long special project and many opt to work on some phase of plant protection. This project may carry from one to four credits and may be either production or research-oriented. In

Figure 3. Plant Protection Curriculum at the Escuela Agrícola Panamericana.
Trimester Credits are given in parenthesis and optional courses are followed by asterisks.

	FIRST YEAR	SECOND YEAR				THIRD YEAR	TOTAL CREDITS
Theory	Introduction to Modern Plant Protection (1)	Introduction to Weed Science (3)	Introduction to Plant Pathology (3)	Introduction to Entomology (4)		Integrated Pest Management (3)	14
Practice	Plant Protection (1)	Weed Science (2/3)	Plant Pathology (2/3)	Entomology (2/3)	IPM (1) Instructor in Plant Protection (1*)	Instructor in Weed Science, Plant Pathology or Entomology (1*) Special Project (1-4*)	4 to 10
Concurrent supportive courses	Basic science and mathematics courses, vegetable and fruit crop production	Agronomic Crop Production, Ecology, Genetics, Agricultural Economics, Statistics, Plant Breeding, Management				Animal Sciences; advanced, specialized production courses	

the latter case, investigations are generally integrated into the research subproject. Also during their third year, select students are provided the opportunity to work as instructors in the second-year field laboratories, just as some second-year students supervise certain of the activities of first-year students in the Plant Protection field laboratory.

During the three year life of this project, all the above mentioned courses and laboratories will be attended to. It is expected that each field laboratory will make use of a guidebook, audiovisuals and workbooks. A guidebook for second-year entomology students has been published (Andrews, 1984). The theoretical entomology course will be centered on the translated and modified materials of the audiovisual program developed by Matheney, et al. (1980) and currently distributed by the Entomological Society of America. The IPM course will utilize as a text the book *Manejo Integrado de Plagas Insectiles en Centroamérica: Estado Actual y Potencial Futuro*, edited by Keith L. Andrews and José Rutilio Quezada. This book includes contributions by almost 30 Central American plant protectionists and is now nearing completion.

Short term, outside consultants have and will continue to play key roles in development of elements of the curriculum. The principal subcontract is one to the Department of Entomology and Nematology of the University of Florida for the development of IPM—related audiovisuals and written materials. Initial emphasis is on development of three modules. The first addresses the relationships between temperature and development of cold-blooded organisms. This module teachs how to use weather data to predict when organisms like insects, weeds, pathogens, etc. will be in specific developmental stages. Such information is applicable to time-sampling intervals, imposition of biological controls, or applications of pesticides. The second lesson focuses on sampling and teachs the basic concepts of how to establish and evaluate a sampling plan useful in IPM programs. A third audiovisual program is a technical discussion of pesticide formulations. All lessons will be accompanied by a laboratory manual. A second subcontract has been signed with the International Plant Protection Center of Oregon State University to strengthen the Weed Science Curriculum at EAP. The IPPC will produce a field laboratory guidebook and syllabus for the theoretical course.

Audiovisual materials already completed at EAP include "Introduction to IMP", "Why Use IPM in Citrus?", "Calibration and Dosification of Pesticide Application Equipment" and "Extraction of Nematodes". Audiovisuals nearing completion are "Insect Pests of Maize" and "Entomopathogens in Insect Pest Management". Slide programs to be developed in 1984 include "Integrated Pest Management in Tomatoes", "Insect and Mollusc Pests of Common Bean", "Pests of Coffee", "Classification of Pesticides", and "Pests of Crucifers". Where possible, existing audiovisuals (eg. those developed by CIAT) are utilized.

Every effort is made to relate the activities of the research subcontract to the teaching improvement efforts in order to assure that present as well as future students benefit. Means whereby other institutions of the region might acquire the materials are being sought.

LITERATURE CITED

ANON. 1976. Guía de Control Integrado de Plagas de maíz, sorgo y frijol. MAG/FAO/PNUD Proyecto Control Integrado de Plagas, Managua, Nicaragua. 63 p.

ANON. 1983. Memoria del taller de trabajo para revisar el programa docente para fitoprotección de la EAP. Proyecto Manejo Integrado de Plagas en Honduras publicación número 1.

ANON. (in press). Resultados de los "sondeos" llevados a cabo en Linaca, El Paraíso y Comayagua. MIPH publicación número 9.

ANDREWS, K. L. 1980. The whorlworm, *Spodoptera frugiperda*, in Central America and neighboring areas. Florida Entomologist 63:456-467.

_____. 1982. Guía para el laboratorio de campo en entomología. EAP mimeo. 92 p.

_____. (1984). Guía para el Manejo Integrado de Plagas Invertebradas en Cultivos Agronómicos, Hortícolas y Frutales. 96 p. MIPH publicación número 7.

GALT, D., A. DIAZ, M. CONTRERAS, F. PEAIRS, J. POSNER, and F. ROSALES. Farming Systems Research (FSR) in Honduras, 1977-1981: A Case Study. MSU International Development Papers, Department of Agricultural Economics, Michigan State University. 49 p.

KING, ANDREW B. S. and J. L. SAUNDERS. (in press). Invertebrate pests of Annual Food Crops in Central America.

MATHENEY, E. L., D. R. MINNICK, J. N. WEBB, AND K. L. STEELE. 1980. Methodology of developing an audio-tutorial program for teaching entomology. ESA Bulletin 26:81-83.