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CLASSIFICATION

PROJECT EVALUATION SUMMARY (PES) - PART I

Report Symbol U-447

1. PROJECT TITLE Regional Integrated Pest Management	2. PROJECT NUMBER 596-0110	3. MISSION/AID/W OFFICE ROCAP
	4. EVALUATION NUMBER (Enter the number maintained by the reporting unit e.g., Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY) <input checked="" type="checkbox"/> REGULAR EVALUATION <input type="checkbox"/> SPECIAL EVALUATION	

5. KEY PROJECT IMPLEMENTATION DATES			6. ESTIMATED PROJECT FUNDING A. Total \$ 7.50 M B. U.S. \$ 6.75 M	7. PERIOD COVERED BY EVALUATION	
A. First PRO-AG or Equivalent FY 84	B. Final Obligation Expected FY 88	C. Final Input Delivery FY 89		From (month/yr.) July, 1984	To (month/yr.) October, 1986

B. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

A. List decisions and/or unresolved issues; cite those items needing further study. (NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., alrgram, SPAR, PIO, which will present detailed request.)	B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
1. Design a standardized set of criteria for measuring project impacts.	CATIE Proj. Coordinator and ROCAP	9/87
2. Develop plans for research activities during the remainder of the project and focus more project resources on research.	CATIE Proj. Coordinator	3/87
3. Develop a standard IPM curriculum for short-term training.	CATIE Proj. Coordinator	9/87
4. Determine whether to fund a second phase IPM project including a stronger pesticide management project. (Action Plan to be presented to AID/W)	ROCAP Proj. Coordinator	4/87
5. Design a standardized criteria for ranking economic pests and crops, and assessing level of losses.	CATIE Proj. Coordinator	9/87
6. Design a system to ensure that requests for technical cooperation are prioritized and fall within the scope of the project.	CATIE Proj. Coordinator	6/87

(Cont'd.)

9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS

<input type="checkbox"/> Project Paper	<input type="checkbox"/> Implementation Plan e.g., CPI Network	<input type="checkbox"/> Other (Specify) _____
<input type="checkbox"/> Financial Plan	<input checked="" type="checkbox"/> PIO/T	_____
<input type="checkbox"/> Logical Framework	<input type="checkbox"/> PIO/C	<input type="checkbox"/> Other (Specify) _____
<input checked="" type="checkbox"/> Project Agreement	<input type="checkbox"/> PIO/P	_____

10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT

A. Continue Project Without Change

B. Change Project Design and/or Change Implementation Plan

C. Discontinue Project

11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles)

John McMahon, ARADO (draft)

Gustavo A. Ruiz, APPD

Gordon Straub, RAD

Michael Lofstrom, PDO

12. Mission/AID/W Office Director Approval

Signature *W.P. Schoux*

Typed Name William Schoux, ADIR

Date _____

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6. ESTIMATED PROJECT FUNDING			7. PERIOD COVERED BY EVALUATION	
A. Total \$ _____			From (month/yr.) _____	
B. U.S. \$ _____			To (month/yr.) _____	
			Date of Evaluation Review _____	

8. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

A. List decisions and/or unresolved issues; cite those items needing further study. (NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., airgram, SPAR, PIO, which will present detailed request.)	B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
7. Solicit funding support for national institutions included in pest diagnostic laboratory network.	CATIE & ROCAP Coord.	6/87
8. Provide country coordinators with computer equipment to meet data analysis needs.	CATIE & ROCAP Coord.	6/87

<p>9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS</p> <p><input type="checkbox"/> Project Paper <input type="checkbox"/> Implementation Plan e.g., CPI Network <input type="checkbox"/> Other (Specify) _____</p> <p><input type="checkbox"/> Financial Plan <input type="checkbox"/> PIO/T _____</p> <p><input type="checkbox"/> Logical Framework <input type="checkbox"/> PID/C <input type="checkbox"/> Other (Specify) _____</p> <p><input type="checkbox"/> Project Agreement <input type="checkbox"/> PIO/P _____</p>	<p>10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT</p> <p>A. <input type="checkbox"/> Continue Project Without Change</p> <p>B. <input type="checkbox"/> Change Project Design and/or <input type="checkbox"/> Change Implementation Plan</p> <p>C. <input type="checkbox"/> Discontinue Project</p>
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<p>11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles)</p>	<p>12. Mission/AID/W Office Director Approval</p> <p>Signature _____</p> <p>Typed Name _____</p> <p>Date _____</p>
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PROJECT EVALUATION SUMMARY (PES) - PART II

REGIONAL INTEGRATED PEST MANAGEMENT PROJECT (596-0110)

1. Overall Quality of Report, Including Adherence to Scope of Work, Utility of Evaluation and/or ROCAP Plans to Use Evaluation

A mid-term evaluation of the project (27 months after project initiation) was conducted by a four person team during September and October 1986. The objectives of the evaluation were to review progress toward achievement of project purpose ("strengthen regional and national capability to develop and implement effective integrated pest management in Central America and Panama") and contribution to the project goal ("help increase agricultural productivity in the C.A. region and thereby enhance the living standards of rural families"); determine if the project purpose would be accomplished by the PACD; determine whether implementation plans, project management and institutional backstopping were adequate; and provide findings and recommendations for possible changes in project design and direction.

The report reviews in detail all of the project's major components (ie. research, training and technical cooperation) as well as related concerns (ie. institutional relationships, project management, environmental issues and project sustainability). Evaluators conducted personal interviews, reviewed project documents and made on-site visits to project activities in four of the participating countries. The evaluation provides overall findings and recommendations for improving performance of the project, monitoring project's impact, and identifies the need for a sustained effort in integrated pest management with greater emphasis on pesticide management for the CA/P region.

Evaluators noted that the sustainability of the IPM program is heavily dependent on several factors including: decisions to be taken by CATIE in the near future concerning long-term program emphasis, CATIE's ability to recover from its current financial difficulties (including the need for a stronger core budget and improved financial systems), and availability of donor funding.

The evaluation did not develop a monitoring and evaluation plan as initially requested in the statement of work. However, it provides useful suggestions to CATIE and ROCAP on what to include in such a plan. All parties agreed that the development of a more complete monitoring and evaluation system could best be done at a later date by CATIE and ROCAP.

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ROCAP considers that the evaluation adequately covers the tasks specified in the statement of work. Both ROCAP and CATIE have found the evaluation to be extremely useful in making adjustments in project implementation and determining the need for longer term efforts in crop protection.

2. Evaluation Recommendations Including Explanation for Non-acceptance of Any Recommendation

Evaluation recommendations were provided by component and are attached as Annex A. ROCAP accepts all project evaluation recommendations. Key recommendations and proposed timeframe for actions by ROCAP or CATIE are given in section 8 of the PES.

3. Adequacy of Executive Summary

The executive summary presents an overview of the project, the purpose of the evaluation and methodology used, and general conclusions and recommendations for each project component. Overall the executive summary is fairly well done and provides in a succinct manner the principal results of the evaluation. The project overview section could have been more comprehensive to enable persons unfamiliar with the project to more readily understand its nature and the context under which it is being implemented.

4. Quality and Accuracy of Development Impact and "Lessons Learned" Section of Report

Development impact is addressed in a specific section. While it is too early to quantify the project's impact (ie. the research program which will provide data on production and farm income increases from adoption of IPM technologies was only recently initiated), evaluators consider potential impact to be significant for all countries and collaborating institutions. This is based on several factors: first, the acceptance and demand for the project in the region is extremely great; second, national institutions' personnel are improving skills in crop protection through training and collaboration with CATIE personnel under the project; and third, the preliminary results of research show tremendous potential for increasing agricultural productivity through use of better pest management practices.

The evaluation does not provide a specific lessons learned section. However, many lessons are implicit in the report which could be useful to other projects. These include:

1. the need for long-term funding commitments for research/development programs, particularly when dealing with complex problem areas;

2. the importance of having a highly qualified, deeply committed team of specialists working full time and over the long-term;
3. the importance of effective technical and administrative backstopping on the part of both funding and implementing institutions;
4. the need to carefully develop and implement monitoring and evaluation systems to measure the impact of project interventions; and
5. the importance of including professional staff at various levels for planning and implementation decisions, and the need for performance incentives.

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PROJECT EVALUATION SUMMARY (PES) - PART II

Regional Integrated Pest Management Project (596-0110)

Evaluation Recommendations

General

1. That the project director be commended for his effective low-key method of dealing with central team and country coordinator members, given the variable personalities and the difficult circumstances under which they work. It is recognized, however, that the project has progressed to a point whereby stronger direction from the project leader is now warranted in certain instances in order to maintain a strong regional project thrust.
2. The perceived impact of this project on the rural Central America/Panama region is so great that immediate steps should be taken to initiate project renewal and funding commitment for an additional 5-years, but modified to include a strong pesticide management component. This would: a) provide a more realistic time frame for achieving the goals of the ongoing project; and b) put into a functional unit a much-needed pesticide component circumventing the costly and time-consuming start-up phase of an entirely new and separate project.
3. It is very important that more time be devoted to the coordination and planning of project activities through an improved permanent communication between the country representatives and the central team. The central IPM team needs to coordinate research plans as closely as possible in order to assure and expedite the integration of research components.
4. Project members, under the leadership of the economist, should design and implement a standardized set of criteria for measuring project impacts.
5. That every effort be made to increase national professional and support staff salaries and make them competitive with other Costa Rican national institutions.

6. That an incentive program to include involvement in and responsibility for certain aspects of planning and execution of research, training, and technical cooperation activities be initiated to retain highly competent national professional staff.
7. That all professional and support staff be assisted with their professional improvement whenever possible. This assistance could take the form of scholarship help for a higher degree or through their inclusion in IPM technical training sessions and workshops.
8. Priority and careful consideration should be given to the definition of the role and activities that the central team has to perform in achieving the objectives of the project.

Research.

1. Some training and technical cooperation resources, particularly professional time of country representatives and the central team should be redirected to research.
2. Steps should be taken to standardize criteria for ranking economic pests and crops, and assessing level of losses.
3. Both the country and central teams need to develop detailed plans for their research activities during the remainder of the project. Research plans which set two goals are needed for each country: a) short-term solutions for immediate problems facing local growers; and b) longer-term development of integrated pest management packages for one or a very limited number of their targeted crops. The goals of central team research should be: a) solutions to one or a very few pest problems which are common to all countries in the region; and b) an application of research methods and techniques which will serve as a practical example for national researchers to develop local IPM schemes.
4. The country coordinators should seek and welcome the assistance from the central team in coordination and guidance relative to the kinds and amounts of research with which they should be involved.

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5. Project research activities should be limited to fewer pest/crops locations.
6. A project goal should be to develop IPM systems for a selected number of crop/pests by the end of the current project that would be validated on-farm during the recommended 5-year project extension.
7. That a standardized system be developed by the central team to accumulate and manage the extensive volume of data generated by the country coordinator and that they, in turn, be provided with sufficient computer facilities to permit a rapid analysis and transfer of research data.

Training

1. That the central staff develop a standard IPM curriculum for short-term training, to be supplemented by local training materials designed to meet unique country needs. This is to insure that all trainees in the region receive the basic knowledge essential to the proper practice of IPM. Standard criteria should also be implemented to measure the impact of each training activity.
2. That the project continue to develop written training materials, but also increase emphasis on developing or adapting audiovisual IPM training materials.

Technical Cooperation

1. That a system be designed to insure that requests for technical cooperation are prioritized and fall within the scope of the project.
2. That the regional diagnostic network with plans to be functional in the third year of the project, provide the mechanism for exchange of technical information between laboratories throughout the region. The evaluation team views this as an invaluable service and therefore recommends that the project personnel exert all efforts possible to facilitate the development of the national laboratories and to become active participants with the central diagnostic facility.

3. Officials in the national institutions in several countries expressed support for the diagnostic laboratory network, but also voiced doubts as to their ability in implementation because of budgetary constraints. The evaluation team recommends that other funding sources be sought, possibly with assistance from project personnel. An example of a possible funding source would be PL480 funds. Where possible, ROCAP should assist in procurement of such funds through their contact with local bilateral, AID missions.

Environmental

1. That ROCAP provide a comprehensive listing of currently permitted pesticide products and use restrictions.

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EVALUATION COST DATA

ROCAP or Bureau/Officer _____

Form completed by Gustavo A. Ruiz PPD 5/15/87
Typed Name Office Date

1. No. and Title of Project/Activity: Regional Integrated Pest Management
(or Title of Evaluation Report) (596-0110)

2. Date of Evaluation Report: December 1, 1986
Date of PES (if different): _____

3. Mission Staff Person Days Involved in this Evaluation (estimated):
- Professional Staff _____ Person Days
- Support Staff _____ Person Days

4. AID/W Direct-Hire or IPA TDY support funded by Mission (or office) for this evaluation: NA

<u>Name</u>	<u>Period of TDY (Person-Days)</u>	<u>Dollar Cost: (Travel, Per Diem, etc)</u>	<u>Source of Funds*</u>
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5. Contractor Support, if any, for this evaluation:**

<u>Name of Contractor</u>	<u>Contract #</u>	<u>Dollar Amount of Contract</u>	<u>Source of Funds*</u>
CHEOCHI & Co.	IQC# PDC-0085-I-00- -6097-00. W.Order #2	\$42,000	PD&S

*Indicate Project Budget, PD&S, Mission O.E. or Central/Regional Bureau funds

**IQC, RSSA, PISA, PSC, Purchase Order, Institutional Contract, Cooperative Agreement, etc.

PROJECT EVALUATION

**REGIONAL INTEGRATED PEST
MANAGEMENT FOR CENTRAL AMERICA
AND PANAMA
(AID/ROCAP Project Number 596-0110)**

FINAL REPORT

CHECCHI AND COMPANY

PROJECT EVALUATION
REGIONAL INTEGRATED PEST
MANAGEMENT FOR CENTRAL AMERICA
AND PANAMA
(AID/ROCAP Project Number 596-0110)
FINAL REPORT

Submitted to:

USAID/ROCAP
San Jose, Costa Rica

Submitted by:

Checchi and Company Consulting, Inc.
1730 Rhode Island Avenue, N.W.
Washington, D.C. 20036

in fulfillment of

IQC # PDC-0085-I-00-6097-00, Work Order # 2

December 1, 1986

PREFACE

This first in a series of planned evaluations of AID/ROCAP Project No. 596-0110, Regional Integrated Pest Management (RIPM), was prepared by a team of consultants to Checchi and Company under the terms of an IQC work order agreement between Checchi and the U.S. Agency for International Development. A copy of the Statement of Work is provided in Appendix I.

The team was made up of the following individuals:

Dr. Theo F. Watson (University of Arizona), Team Leader

Dr. Eddie Echandi (North Carolina State University), Plant Pathologist

Dr. Frank B. Peairs (Colorado State University), Entomologist

Dr. Luis Zavaleta (University of Illinois), Agricultural Economist

Field work in Central America was carried out over a four-week period during September and October, 1986, and a draft report was presented to ROCAP and CATIE prior to the team's departure. This final report on the findings and recommendations of the evaluation team reflects comments received from ROCAP and CATIE on that draft.

REGIONAL INTEGRATED PEST MANAGEMENT PROJECT EVALUATION

AID/ROCAP PROJECT NUMBER: 596-0110

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I. EXECUTIVE SUMMARY

A. Project Overview

The AID/ROCAP Integrated Pest Management Project is one of the most complex and ambitious undertakings known to the evaluation team. Nevertheless, in spite of its complexity (including the integration of scientific disciplines, involvement of different countries and different organizations -- both national and regional-- and multiple crop/pest complexes) this project has made significant accomplishments during the few months of its existence.

The uniqueness and diversity of the project demand a scientific staff equally unique and diverse. The evaluation team believes that this professional staff, dedicated to the IPM concept, is the main reason for the early achievements and high visibility of this project. Obviously, the staff has been carefully selected to cope with both the scientific aspects of the project and the political and socioeconomic relations as well. The personnel on this project realize the magnitude of basic questions requiring answers and that truly integrated pest management will be a slow process. At the same time, they also know that integrated pest management is an evolving concept, continuously improving with the addition of each new piece of research data.

These laudatory comments by the evaluation team are based not only on perceptions derived during this review but by comparison with other less complex IPM projects with which the evaluation team members have been associated. The comments are not to be construed as to imply a perfectly functioning project for there are numerous areas where project improvements can be made; the project staff is well aware of these. It is to say, however, that placement of such a project in the CA/P region by AID/ROCAP, staffed with scientists exhibiting such dedication and commonality-of-purpose will have long-lasting and ever-accruing effects.

The evaluation team commends the vision of AID/ROCAP/CATIE in supporting a project that has the potential for such far-reaching effects on the welfare of a large part of the rural population of CA/P. At the present time the ultimate value of such efforts is inestimable. However, the implementation of this project by CATIE in five CA/P countries enhances the capabilities of CATIE and national institutions in the development of integrated pest management.

B. Purpose

The Regional Integrated Pest Management Project was initiated in July, 1984, and is scheduled to terminate July, 1989. The evaluation plan for this project calls for a total of four formal evaluations--two conducted jointly by ROCAP and CATIE and two by outside consultants. This is the first evaluation conducted by an outside consultant team, at approximately 27 months after project initiation (Appendix A).

The purpose of the initial evaluation is to determine if detailed project plans are adequate to achieve project objectives. This will include a review of specific implementation plans in consultation with the regional IPM staff and country coordinators, and the development of a set of recommendations for possible early changes in project direction.

C. Methodology and Findings

The evaluation team performed the review of the Regional Integrated Pest Management Project by obtaining information on the project from all possible sources. The three major methods utilized by the team were: 1) personal interviews; 2) review of project documents; and 3) in-country, on-site project visits.

The interview process involved a broad array of personnel, both directly and indirectly associated with the project. The first briefing was conducted by ROCAP/Costa Rica with the team leader. This was followed by discussions with the central project team at CATIE. Other key personnel at CATIE not directly involved with the project were also interviewed to provide insight as to the relationship of this project to other elements of CATIE. Specific personnel interviewed are listed in Appendix B. Others with whom various aspects of the project were discussed included the IPM project office and technical staff, country coordinators and their assistants, and institutional representatives in the various countries. Much useful information was gained through this process as many viewpoints were expressed, information which could not have been obtained from any other source.

The second method of project evaluation was the examination of many documents both directly and indirectly related to this project, starting with the project paper itself. Other documents providing a great deal of related information included the final evaluation of the Small Farms Production Systems (SFPS), and Agricultural Research and Information Systems (PIADIC) Projects. A report prepared for CATIE entitled "Farming Systems Research and Extension at CATIE 1975-1985 -Notes and Observations", was also reviewed.

Training materials and other technical bulletins prepared by the IPM project personnel also proved very useful. These included proceedings of seminars, workshops and inventory lists of pests from all countries except Honduras. This one is almost ready for publication.

Individual research projects for the various countries were also reviewed. This provided an insight to the types of research being conducted in the participating countries prior to the on-site visits.

The on-site examination of many of the research projects in all countries except El Salvador provided the evaluation team with a comprehensive picture of exactly what, where, and how the research was being conducted. It also gave us an opportunity to interact with many of the young scientists who were actually conducting the research.

An on-site examination of the research provided the review team with perceptions of the project beyond the methodology and appropriateness of the research. Most of these perceptions were gained from intangibles which would not have surfaced had we not made the in-country visits. Of major interest to the evaluation team was the apparent receptiveness to the IPM team and its outreach programs by national institutional officials and within-country technical personnel involved with the IPM projects. An excellent rapport seemed to exist among the IPM team members and country coordinators, as well as with other personnel associated with the project.

Varying levels of economically-depressed conditions were apparent in the different farming communities visited. The potential impact of the IPM programs on such communities was reflected in the attitudes, enthusiasm, and pride of the young Ingenieros who explained the objectives, design and results of their research plots. In some instances, almost immediate benefits to the grower seemed imminent. With the potential impact expected from these short-term, single component experiments, it becomes increasingly important to look beyond this phase and to intensify efforts to begin integrating multiple components to provide long-term solutions. This will require continuous and closely coordinated research planning between the central IPM team and country coordinators.

D. Conclusions

General

1. The project is a CATIE priority. The mechanism is in place for CATIE to share IPM project costs, although its present financial condition will likely delay this commitment.
2. The project has become highly visible and is a high priority item for CATIE, ROCAP, and National Institution officials.
3. A cohesive, dedicated IPM team was assembled and has quickly become highly productive, often under difficult political, economic, and institutional conditions. With the initial thrust by the central team and county coordinators, as viewed by the evaluation team, the purpose of strengthening national and regional capabilities for development and implementation of effective IPM in the region has been partially accomplished and should continually improve with time.
4. Integrated pest management is so complex and pest-problem solutions so lacking that 5 years will not be sufficient to consolidate the project achievements.
5. Due to delays in starting the project, coupled with the desire to make up for lost time, required coordination and planning of both regional and national project activities have been hasty and at times insufficient.
6. Procurement of goods and services, and financial management have critically delayed the development of all aspects of the project. Country

coordinators have been severely hampered by fund transfers which have been unjustifiably delayed for up to 3 months. The recent hiring of an experienced specialist in finances should go far in alleviating this major problem.

7. It is the conclusion of the evaluation team that the project has had exceptional back-stopping and support from ROCAP in helping to overcome some rather serious obstacles, circumventing long delays by providing for direct procurement of critical equipment.
8. Lack of involvement and responsibility for certain aspects of planning and execution of research, training, and technical cooperation activities, as well as low salaries of National professional project staff in Costa Rica are seriously affecting morale, efficiency, and productivity.
9. The direction and emphasis of the project is very dependent on the crop priorities to be set by CATIE during the next few weeks. If CATIE shifts priorities to perennial crops and the IPM team is requested to conform, the project's annual crop research effort would continue but would be seriously diluted.
10. An extremely important issue is to define the role that the central team, as a whole and individually, has in accomplishing the objectives of the project. Research, training, and technical cooperation activities severely compete for their professional time, and thus emphasis in one of these can only be achieved at the expense of the others. Unless a clear definition of objectives and priorities is made regarding the central team's role accomplishment of several of the project objectives would not be realistic.
11. The impact of this project on officials and scientists in the national institutions and universities is readily apparent. It is obvious that the project is a high-priority item.
12. Impact of the project on the living standards of rural, small-farm families is already easily visualized. This was shown by on-site visits to research plots located on the small farms and through comparisons of common grower-practices with various other pest management treatments. In some instances yield differences were phenomenal.

Research

1. Based on first-hand observation of research activities throughout the region, it is the opinion of the evaluation team that all country coordinators have done a truly remarkable job in moving the research component forward, especially considering the constraints under which they operate. Nonetheless, research has been spread over too broad a geographic area and directed at too many problems. It is understandable that the country coordinators are trying to cover as many crop/pests as

possible, but a real danger is the dilution of their research efforts on any one problem.

2. Research has lagged behind training and technical cooperation during the early phase of the project. Demands on the IPM team for training and technical cooperation are already diluting the research effort, a situation which will worsen as project visibility increases. The research component may also be somewhat weakened by the lack of strong national counterpart research programs.
3. There has been an initial pest inventory in every country, but no standardized system has yet been developed nor implemented to assess levels of losses associated with them. Losses should be quantified.
4. Research activities lack a long-term and regional focus. Most of the research is directed at single pests, which is greatly needed, but the team must soon face the greater challenge of integrating their results into holistic pest management strategies, not only for each country but for the region as well.
5. A demonstration of the impacts of the project is essential. Production and economic indicators should comprise an important part of this evaluation and resources should be redirected immediately to insure that this is accomplished.
6. A strong pesticide management component is definitely needed but is not feasible with the current project resources. Pesticide misuse may quickly nullify benefits derived from many years of concentrated efforts to develop sound integrated pest management programs. The prevalence of the pesticide use in project research activities has led the evaluation team to conclude that many pesticide-related problems exist and should be addressed. Serious thought should be given to incorporating a pesticide management component into the CATIE IPM project. This will have the advantage of contributing to the work already in place, and avoiding duplication of the facilities, infrastructure, institutional contacts, and trained personnel already developed by this project.

Training

1. The project has made excellent progress in meeting its goals for short term training of IPM practitioners in all countries.
2. In-service training has been an active component of the training programs in all countries and is providing national specialists well trained in priority aspects of IPM.
3. All courses taught were developed by the country coordinators to meet local needs. A core short-term IPM curriculum should be developed, with supporting training materials, based on the plan of study developed for the CATIE centers concentration in plant protection. This curriculum should form the majority of the training offered in each country to

insure that national scientists receive the IPM basics. Once developed, this will also result in substantial savings in manpower and travel.

4. Although various excellent written training materials have been prepared, project personnel generally lack expertise in developing training materials. More emphasis should be placed on audiovisual materials, both adapted from existing sources and prepared in-house with support from the CATIE Communications Department.
5. Academic training has lagged behind other training activities. Some country teams have established fruitful relationships with local universities. At the current rate of graduate student recruitment for the CATIE Department of Crop Production MS plant protection concentration, it will be difficult to meet graduate training objectives within the life of the current project.
6. The extensive obligations of all senior project staff has precluded their involvement in up-dated specialized IPM training.
7. The poor plant protection background of country scientists has forced project training activities to be directed to a disciplinary approach as the first step for subsequent IPM training.

Technical Cooperation

1. The project has developed high visibility and a good reputation in all countries which has led to strong demand for technical cooperation in all areas related to pest management.
2. The central diagnostic laboratory at CATIE is operational but not adequately equipped. Nevertheless, it has already made some important contributions to the region.
3. Formation of the pest reference collection has been satisfactory, although more progress would be made if the curator were encouraged to travel specifically to collect in poorly represented groups.
4. Development of the IPM information base, the IPM newsletter, and the photocopy/loan service has been hampered by the delays in the appointment of the documentalist and in procurement of essential equipment.
5. The participation of central team members in technical assistance is a valuable, but time-consuming activity. Project personnel must plan this activity carefully and selectively, to insure that it is maintained without becoming a drain on other components of the project.

training, and technical cooperation activities be initiated to retain highly competent national professional staff.

7. That all professional and support staff be assisted with their professional improvement whenever possible. This assistance could take the form of scholarship help for a higher degree or through their inclusion in IPM technical training sessions and workshops.
8. Priority and careful consideration should be given to the definition of the role and activities that the central team has to perform in achieving the objectives of the project.

Research

1. Some training and technical cooperation resources, particularly professional time of country representatives and the central team should be redirected to research.
2. Steps should be taken to standardize criteria for ranking economic pests and crops, and assessing level of losses.
3. Both the country and central teams need to develop detailed plans for their research activities during the remainder of the project. Research plans which set two goals are needed for each country: a) short-term solutions for immediate problems facing local growers; and b) longer-term development of integrated pest management packages for one or a very limited number of their targeted crops. The goals of central team research should be: a) solutions to one or a very few pest problems which are common to all countries in the region; and b) an application of research methods and techniques which will serve as a practical example for national researchers to develop local IPM schemes.
4. The country coordinators should seek and welcome the assistance from the central team in coordination and guidance relative to the kinds and amounts of research with which they should be involved.
5. Project research activities should be limited to fewer pest/crops/-locations.
6. A project goal should be to develop IPM systems for a selected number of crop/pests by the end of the current project that would be validated on-farm during the recommended 5-year project extension.
7. That a standardized system be developed by the central team to accumulate and manage the extensive volume of data generated by the country coordinators and that they, in turn, be provided with sufficient computer facilities to permit a rapid analysis and transfer of research data.

Training

1. That the central staff develop a standard IPM curriculum for short-term training, to be supplemented by local training materials designed to meet unique country needs. This is to insure that all trainees in the region receive the basic knowledge essential to the proper practice of IPM. Standard criteria should also be implemented to measure the impact of each training activity.
2. That the project continue to develop written training materials, but also increase emphasis on developing or adapting existing audiovisual IPM training materials.

Technical Cooperation

1. That a system be designed to insure that requests for technical cooperation are prioritized and fall within the scope of the project.
2. That the regional diagnostic network with plans to be functional in the third year of the project, provide the mechanism for exchange of technical information between laboratories throughout the region. The evaluation team views this as an invaluable service and therefore recommends that the project personnel exert all efforts possible to facilitate the development of the national laboratories and to become active participants with the central diagnostic facility.
3. Officials in the national institutions in several countries expressed support for the diagnostic laboratory network, but also voiced doubts as to their ability in implementation because of budgetary constraints. The evaluation team recommends that other funding sources be sought, possibly with assistance from project personnel. An example of a possible funding source would be PL480 funds. Where possible, ROCAP should assist in procurement of such funds through their contact with local, bilateral, aid missions.

Environmental

1. That ROCAP provide a comprehensive listing of currently permitted pesticide products and use restrictions.

II. INTRODUCTION

A. Needs for IPM in CA/P

Agriculture has historically been a significant part of the economy of CA/P (Appendix C), with exports of coffee, banana, cotton and beef amounting to about 55% of the region's total export earnings in 1980. With more than half of CA/P labor force directly employed by agriculture and a significant portion of the remainder involved in agriculturally-related businesses, the value of agriculture to this region is obvious.

Because agriculture holds such an important place in the economy of the CA/P region, losses caused by plant pests--diseases, insects, nematodes, weeds, birds, rodents, snails, and slugs--assume a major role in reducing the standard of living for a majority of the population, particularly the small farmer. Losses to crops and harvested products in CA/P have been estimated at 25%-40% of total potential production. Estimates of the economically-quantifiable impacts of these pests and their control have been placed at 650 to 800 million dollars annually. *

Traditional agriculture, still practiced by many of the small farmers in the region, consists of antiquated, unimproved methods whereby poor yields of low quality are produced because of improper cultural practices, poor fertilization, unimproved varieties, and losses to pests such as diseases, insects, and weeds. IPM provides an organized scientific method that almost certainly ensures minimum crop losses with the least cost to the farmer and with less disruption to the environment. Population expansion in the region makes it imperative that a long term sustainable program be developed that will accomplish increased agricultural production with less economic and environmental cost.

B. History of project

While various efforts have been made since the late 1960's to introduce IPM into the region, most of these attempts have been limited in scope and short lived, addressing mostly insect pest problems. These projects generated much useful information on cotton and other non-food crops, but little attention was devoted to pest problems or control alternatives on basic food and grain crops.

Although interest in IPM has been high in the region it has advanced little because of the number of obstacles impeding the development of sound IPM programs. These obstacles include insufficiently trained personnel in the concepts of IPM and inadequate data bases to implement programs. Probably of greatest importance in the failure to develop sustainable IPM programs has been the lack of an organization or mechanism whereby concurrent programs in research, training, and implementation of IPM could be developed and maintained sufficiently long to adequately demonstrate the concept to the farmer and to integrate the multicomponent system of managing crop pests. Bearing this in mind, CATIE was the choice and most appropriate institution to undertake this research.

The Regional Integrated Pest Management project originated in 1984 when ROCAP fielded a multidisciplinary team of specialists to analyze requirements of the proposed project and to assist the MISSION in its design. Between January 22 and March 9 the team consulted representatives of USAID, MISSION, CATIE, National Ministries of Agriculture, National Universities, Agricultural schools, Peace Corps, other regional and international institutions and the private sector in Costa Rica, El Salvador, Guatemala, Honduras, and Panama. Information obtained in field visits and reports, bulletins, project documents, and other

information made available to the team formed the basis for the design of the project.

C. Objectives and Purposes

IPM Project Goals and Purposes

The agricultural sector forms the basis of the economy of the region, generating a major portion of GNP and employing a large percentage of the labor force. The goal of the project is to increase agricultural productivity in CA/P and to enhance the health and living standards of rural families in the region.

A major constraint on meeting future demands for production of basic food, industrial, and export crops are the pests which cause serious crop losses, both in production and storage. Therefore the purpose of the project is to strengthen national and regional capabilities for the development and implementation of effective IPM in the region.

Evaluation of the ROCAP/CATIE IPM Project

The primary purpose of the external review was to provide an in-depth assessment of progress towards achieving project objectives during the scheduled time-frame. Major considerations in the review included not only the main technical components of research, training and technical cooperation, but also ancillary components such as institutional relationships, project management and environmental issues. All of these issues were addressed by utilizing three major methods: 1) personal interviews; 2) project documents; and 3) in-country, on-site project visits.

The criteria utilized by the evaluation team differed with each major component reviewed. However, regardless of the component, the status of progress in relation to the objectives for this point in time was evaluated.

Under the research component, planned objectives and outputs included: a) the identification of the most important pest problems by crop and crop system; b) quantification of crop losses by pests; c) small-scale, on-farm evaluation of IPM; and d) an economic evaluation of IPM. In relation to these objectives, the evaluation team examined the status of progress towards achievement of goals by assessing the appropriateness of the research in each country relative to a number of factors. These included: a) the crops under investigation and their importance to the welfare of the small farmer and to the country as a whole; b) the major pests and the extent to which they had been identified; c) loss assessment studies, if any; d) relevance of the research to IPM; e) the practicality of the research being conducted and/or planned in relation to the needs of extension personnel and farmers; and f) relevance of the research to the perceived needs of the participating countries.

Other considerations in the evaluation included less technical, but nevertheless, important points relative to fulfilling project commitments within the allotted time-frame. These included such things as present status of the project relative to research progress and implementation, and whether the purpose of the project could realistically be accomplished within the allotted time-frame.

To the extent possible, these criteria were utilized in addressing the research being conducted in every country. Results of these findings are presented separately for each country with a general assessment from the regional standpoint in a subsequent section of the report.

The training component, by nature, differed from the research component and, thus, had entirely different objectives and outputs. These in turn, required different methodology by the team to assess status of and progress in this

component. The objectives were: a) to give project personnel specialty training; b) to enhance public awareness and technical training of nonproject personnel--this included a broad array of people including administrators, teachers, researchers, agribusiness personnel, etc; c) to provide academic and in-service training; and d) to generate training materials necessary to meet these objectives.

The evaluation team, although attempting to assess the status of this component by asking the same general questions as with the research component, had to utilize documented accomplishments almost entirely rather than personal observations to assess the status of this component. This was easily done relative to certain objectives such as development of training materials, involvement in graduate and short-term training programs and state of progress at this point in time relative to that planned for the life of the project. Other aspects of the evaluation were less tangible and required a considerable amount of inference on the part of the evaluators. These included such things as quality of instruction, curriculum, laboratory and field training, and results of various types of training activities. This was necessary as the team had no opportunity to observe first hand any of these activities. Again, assessment of this component is given for each country.

The third, and last, technical component of the project involved Technical Cooperation which had objectives of providing assistance in 3 major areas: a) establishment of a pest diagnostic network; b) development of a regional IPM information service center; and c) provide for technical assistance in IPM.

Again, the main evaluation method included numerical data relative to project outreach on these activities. However additional insight into the status of this component was possible by viewing critical facilities necessary to

accomplish stated objectives. These included the regional diagnostic and information service centers. This component is discussed separately by country in a subsequent section (Appendix H).

Institutional strengthening was another major area requiring a significant amount of the evaluation team's efforts. Because of the complexity of an IPM project and further, because of its regionality, unique problems pertain to the project as a whole rather than to individual components. The ultimate success of the project depends to a great extent on the interrelations of project personnel and national and regional institutions.

Because of the constraints mentioned above, a sense of project progress in this area was only possible by in-depth discussions with all institutional organizations related to the project. In the process of determining institutional relationships, partial evaluations of other aspects of the project were possible, for example, effectiveness of Country Coordinators and, visibility of and receptiveness to the project IPM philosophy by regional institutions. Potential success of the major components, particularly research, as related to apparent level of institutional cooperation were all evaluated, at least partially, through these meetings.

Project management was evaluated by a number of means. Periodic discussions were held with central team members, both in groups and individually. It was also possible to evaluate management by travelling with project personnel to various countries and to focus on the in-country activities in relation to the project as a whole. Of particular interest in the in-country visits was the chance to observe project management relative to the relationship between central team members and country coordinators. And further, within-country project management involving the country coordinator and his assistant

and personnel in the various institutions provided valuable insight as to obstacles to and potential success in project implementation.

Since IPM Project personnel are deeply involved in various activities at CATIE, appropriate officials at this institution were interviewed to determine the effects of these activities and/or higher administrative handling of project affairs on their ability to function in the project. These interviews provided further insight into the internal management of the project.

Environmental issues were only addressed in a cursory manner. The appropriate data were simply unavailable to provide an in-depth picture of this issue. Most of the 'feel' obtained on environmental issues came from discussions with in-country personnel relative to their thoughts and knowledge on pesticide use. Little concrete information was available.

III. THE INTEGRATED PEST MANAGEMENT PROJECT (REGIONAL)

A. Central Team - Turrialba

The uniqueness and diversity of this project calls for a scientific staff equally unique and diverse. First and foremost is the necessity for all members to be true believers in and practitioners of the integrated control concept, albeit from different scientific disciplinary viewpoints. Additionally, the team not only needs to be internally compatible, but also must be compatible with the country coordinators and their assistants. Team members are also responsible for serving in an additional capacity outside their narrow scientific discipline, e.g., in charge of project training, research, etc.

The evaluation team had the opportunity to interact with all team members on numerous occasions and under different circumstances. It is the opinion of the evaluation team that a superb job has been done in selecting the scientists

that comprise the central team. It is obvious that a high degree of rapport and cooperation exist among the team members as well as between the central team and country coordinators.

This project has rapidly gained visibility in the participating countries as well as at CATIE. Because of this, demands placed on the central team are becoming so great that careful project management is going to be essential. If this is not done the dilution factor will likely impair the effectiveness of each team member in fulfilling his broad range of responsibilities.

Training and technical assistance have demanded a great deal of the time of the team members during the early phases of this project. It is the opinion of the review team that this cannot continue without adversely affecting the project as a whole, particularly the research component.

The participation of central team members in the graduate teaching program is another dilution factor in meeting the demands of the IPM project. With the new IPM concentration in the Crop Production Department, this problem will likely be exacerbated.

The evaluation team suggests that the project director make every effort to meet regularly with the team for the express purpose of addressing and managing these excessive demands. Such meetings could result in better coordinated training and technical assistance programs, resulting in reduced central-team time-expenditure and in better coordinated research among countries.

Although the central team exhibited a high degree of enthusiasm for and dedication to the project, frustrations did surface relative to the many demands placed on them. One concern was the lack of time to generate original research in their respective fields and thus, the chance to maintain their professional

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Although the central team exhibited a high degree of enthusiasm for and dedication to the project, frustrations did surface relative to the many demands placed on them. One concern was the lack of time to generate original research in their respective fields and thus, the chance to maintain their professional

integrity.

B. Country Coordinators and Assistants

The key element in regionalizing this project is the cohesiveness and cooperation of the country coordinators with the central team. In addition, the country coordinator is the key to the IPM Project outreach in the various countries through the relationship he is capable of establishing with national institutions. Again, members of this part of the team seemed, for the most part, to possess the unique qualities essential to establishing productive relations with such institutions in their respective countries. It was obvious that the project director devoted much attention and care to the selection of the country coordinators.

Relative to the activities of the country coordinators, a point of major concern to the review team involved the magnitude of research with which they are cooperating. In their efforts to cover many diverse habitats and crops, several research locations were involved, requiring much travel time. The review team cautions against overextending in this respect and suggests input from the central team in deciding on a manageable research program.

The assistants to the country coordinators also appeared to be well suited to their jobs. Obviously, their selection resulted from a stringent selection policy as they were well qualified to serve in that capacity. They appeared to have a good rapport with their national institutional counterparts.

C. Monitoring and Evaluation Plan:

The project has a "Project Design Summary - Logical Framework" which provides a time-scale/project output yardstick. This seems to be a practical way of assessing the status of the project throughout its duration in terms of planned commitments. This, however, is more of a monitoring system to

determine the status of progress and does not address the evaluation of the activities.

Each major component--research, training and technical cooperation--should have an evaluation plan, developed by the central team in collaboration with the country coordinators. This group should meet once each year to evaluate the results of all activities of the preceding year and to discuss plans for the forthcoming year.

The review team feels that relatively few key indicators should be established and standardized for each component for the entire region. Overall progress of the project, as well as that in individual countries, could be assessed periodically, probably annually.

Because of the limited number of professionals available to actually conduct research this component should receive special attention relative to establishing a division of labor. For example, with the many crops and pests involved, different countries/groups should concentrate in different areas.

The areas of economic thresholds and damage should be investigated for the key pests (insects, weeds and pathogens) in the various crops. Three main criteria should be used to establish recommendations for management of any pest. These are damage level, economic feasibility, and practicality.

An evaluation of the training component would be a much easier matter than that of the research component. Tests should be designed to be administered before and after a training session is held. This would show the effectiveness of the session. The type of testing would need to be adapted to the type of training, eg., workshop, seminar, etc, and to the clientele. In the academic area, eg. in the CATIE M.S. program, evaluation is less of a problem as it is an inherent part of the system.

Evaluation of the technical cooperation component should also be somewhat simpler than with research. In some instances, good record-keeping would be the method of obtaining the data necessary for evaluating the activity. For example, a system could be devised for cataloging all diagnostic services, with subsequent follow-up to determine action taken after the diagnosis was made. These data could easily be assembled for the project as a whole as well as for individual countries.

The documentalist could easily set up a similar system to meet the needs for information, documents, newsletters, etc. The use and value of this information could be determined by follow-up research by the documentalist.

D. Development Impact of the Project

It is the opinion of the review team that this project will have a significant impact on all levels of the agricultural sector of Central America and Panama. First, our perception of project acceptance by officials in the national institutions and universities was that of highest priority. There was a very positive attitude shown by these officials. A continual association with these institutions should add to the present strong relationship and, when economic conditions permit, provide for greater IPM support by the national institutions. This understanding and support of IPM by the national institutions should ultimately be beneficial to the CA/P small rural farmer.

Second, the involvement of national institution technicians with CATIE project personnel will provide a cadre of better-trained scientists. As their understanding of the IPM concept and methodologies increases, they in turn, should have a greater impact in their locale even in the absence of CATIE-IPM project personnel. This will allow implementation of IPM programs in other locations and/or on other crops and pests.

And third, results from research in the early phase of this project are already showing tremendous potential for increasing productivity through better pest management practices. Due to the small size of most of the farms, even a small increase in productivity of the farmers' basic food and grain crops would result in a sharp rise in the health and living standards of rural farm families. This potential is already evident even though relatively little has been accomplished on project research to date. Given more time, the potential for increasing living standards of rural families over the entire CA/P region is most feasible.

IV. INSTITUTIONAL STRENGTHENING

The project has made remarkable progress in its outreach efforts, especially considering that the project is still relatively new and participating countries became functional parts of the project at varying times. It was readily evident from the in-country visits with all levels of participants that much interest has been generated in IPM from this project. The IPM central staff is already much in demand to provide technical assistance, as well as for most of the other activities of the project. This is indicative of the progress already made on this project but also portends of future problems relative to demand on the central staff. Accomplishments to date on all major components of the project are summarized in Appendix D.

The problem alluded to above is testimony of the project staff performance. It is obvious from the relationships shown between project personnel and in-country coordinators and associated personnel that the interaction is definitely team oriented and that a high degree of mutual respect exists.

In some instance, the degree of cooperation between country coordinators and the central team needs to be improved. This is in reference to close coordination of local IPM project development, especially with regard to sound experimental design. Additionally, local projects are designed to attack one pest problem at a time. With a chance to interact in the design of the project by the central team, two potential benefits might ensue: 1) to correct basic flaws in experimental design and 2) the integration of another pest problem research effort into the same experiment with little extra output.

The main strategy of the central project to identify collaborating institutions and groups is one whereby major responsibility is placed upon the country coordinator. This appears to be a very sound procedure as it provides a certain amount of autonomy for and focus on the in-country coordinators who should be in the best position to align with the most productive collaborators.

The central team has been focusing on considerable short-term training and assistance (Appendix D). The problem here is that the central team is already stretched too thin and as time goes on and their efforts become increasingly visible, even more demands will be placed on their time.

The project has only recently been staffed with a documentalist. In the short time of his tenure he has developed an initial set of plans to implement publication and training material development and dissemination. Other publications have already been issued by the project (Appendix G).

A discussion was held with the Director of CATIE relative to his perception of the future of the IPM project. It became obvious very quickly that the project is high on his priority list. Relative to potential funding sources for the project when the ROCAP funding ends, he has obviously given considerable thought to how to pick up project funding in its entirety. Three

possible sources of funding were given: 1) redirection of core budget; 2) the sale of technical assistance; and 3) other fund-raising activities.

A major question with which the director is wrestling concerns the scope of the project, i.e., how broad or how narrow it should focus. He personally feels that it may be too broadly oriented at present and should concentrate on fewer crops than at present. He would also like to see more involvement with perennial crops rather than almost completely with annuals as is currently being done.

The project has made remarkable progress during its first two years. Should this progress continue at its present pace, the furtherance of IPM in the CA/P region will have been greatly advanced. However, this does not mean that it will have advanced equally in all countries nor have achieved a self-sustaining status by that time. Many variables will influence end-of-project conditions from country to country.

CATIE will have the technical capability of providing effective training and technical assistance in IPM. However, the permanent capacity to do so will depend on CATIE solving some of its budgetary problems in order to financially support this effort. As mentioned above, the director is considering various funding sources to permit continuation of the activities.

It was obvious in our interactions with officials in the national institutions and private-sector groups that the IPM project personnel have made tremendous in-roads with these groups in promoting the merits of IPM, and much greater progress should be made by the end of the project. Relative to the promotion of the IPM concept, continuity is of critical importance. This poses an additional problem in the various countries where personnel are frequently changing. Hopefully, the outreach efforts will involve a sufficiently large

number of nationals that even with personnel changes a trained cadre will remain in place.

By the end of the project, technician capability for implementation of IPM in CA/P should be greatly improved. Already many technicians have received training in various aspects of IPM and should continue to get additional training as the project progresses. Equally important, however, is the actual experience the technicians are getting in field research. With the proper guidance by project personnel this experience should vastly improve their technical capabilities.

Because of the lateness in the hiring of a documentalist, the preparation and dissemination of crop protection information has lagged behind other aspects of the project. However, with the start made by the documentalist this phase of the project should rapidly catch up and be fulfilling a very definite need in the near future.

V. ENVIRONMENTAL ISSUES

In general, the evaluation team found that this project has done well in conforming to USAID pesticide policy. This was in spite of the fact that they have very limited information on the specifics of this policy. ROCAP needs to provide project personnel with a comprehensive listing of allowable pesticide products and uses.

A serious concern is that the El Salvador group has initiated experiments on the use of aldicarb (Temik) for control of slugs and other early-season bean pests. Although aldicarb is registered in the US for planting-time applications to dry beans, the evaluation team takes the position that the risks associated with aldicarb use far outweigh any benefits which might result from this research.

Aldicarb is extremely hazardous to handle, even given the relatively safe formulation being tested in El Salvador. It is doubtful that any feasible amount of educational effort could eliminate the risks to human health posed by this compound. An additional consideration is the possible movement of aldicarb in ground water. Several experiences in the US indicate that we do not have sufficient knowledge to predict groundwater hazard if this product is used in the project area.

In one instance, USAID pesticide policy is preventing the project from conducting weed control research which responds to farmer needs. The current restriction of paraquat is a significant problem since it is the herbicide of choice for Central American small and medium scale farmers because of low price and good efficacy. Chemical weed management practices developed without paraquat stand little chance of wide adoption in the region.

VI. EVALUATION TEAM COMPOSITION

Theo F. Watson, University of Arizona, Team Leader
Entomologist: Insect Pest Management
reviewed programs in Guatemala, Honduras and Turrialba

Eddie Echandi, North Carolina State University
Plant Pathologist: Integrated Pest Management
reviewed programs in Costa Rica and Panama

Frank B. Peairs, Colorado State University
Extension Entomologist: Insect Pest Management
reviewed programs in Guatemala and Turrialba

Luis R. Zavaleta, University of Illinois
Agricultural Economist: Integrated Pest Management
reviewed programs in Guatemala, Honduras and Turrialba

VII. SUMMARY AND CONCLUSIONS

A. Research

The project is oriented towards the basic food and grain crops, grown to a large extent by the small farmer. The crops are grown on diverse soil types under many climatic conditions in CA/P and are subject to attacks by a number of important pests. These pests routinely cost the farmer significant yield and quality losses. Research designed to solve these pest problems is one of the major components of the project (Appendix E).

The research component stands at varying levels of development in the different countries, mainly because of differing dates on which the country coordinators were hired and in place. And, when in place, the development of good research programs was not instantaneous as the proper national institutions had to be identified and working relations with them established. In some instances this process has had to be repeated due to continuously changing government officials.

Unlike the training and technical cooperation components of the project, the research component has no highly trained cadre of scientists to perform the actual work. This places a tremendous burden on the country coordinator and his assistant, as these scientists are also involved in the training and technical cooperation programs. Therefore the amount and quality of research is dependent upon their ability to solicit cooperation with competent young scientists in the national institutions and universities.

The evaluation team was able to visit and observe first-hand some of the research that was being conducted in every country except El Salvador. This provided the team with a fairly good insight as to types, amount and quality of

research that is being conducted. It is the opinion of the evaluation team that the country coordinators have done a truly remarkable job in moving the component forward, especially considering the constraints under which they were operating.

Since the project is limited mainly to the country coordinator and his assistant within most countries, management of the diverse research activities is a difficult task. In the view of the evaluation team, the coordinators, in their desire to gain much-needed information as quickly as possible, have over-extended themselves in their abilities to provide quality assistance on the many crops and especially the many and widespread research locations.

The central team is in a position to provide coordination and guidance to the country coordinators relative to the kinds and amounts of research with which they should be involved. The country coordinators should seek and welcome this assistance.

Present research efforts are mostly aimed at short-term, single-pest problem-solving. This is the necessary first step. However, as these data begin to accumulate, planning sessions should be held between the central team and country coordinators to begin putting together integrated management systems that can then be validated.

Recommendations:

1. That the country coordinators carefully review their research programs in an effort to reduce quantity for the sake of improving quality.
2. That better communications be established between central team members and country coordinators relative to more careful planning of research experiments.
3. That the central team restrict their outreach involvement to provide

some individual research time of their own. This could be in collaboration with the country coordinators to answer specific questions that they may be unable to answer under their structural setup.

4. That greater effort be made by both the central team and country coordinators to expand research productivity by reducing duplication between countries.

B. Training

The project has made excellent progress in meeting its goals for short term training of IPM practitioners in all countries. The evaluation team has noted, however, that training subject-matter has been at the discretion of the country coordinator and that there is little consistency when the training offered in one country is compared to that offered in another.

A certain body of knowledge is necessary to practice IPM regardless of location. To insure that IPM scientists in each country are uniformly exposed to this knowledge, a core short-term IPM curriculum should be developed, with supporting training materials, based on the plan of study developed for the CATIE masters program in plant protection. This curriculum should form the majority of the training offered in each country to insure that national scientists receive the IPM basics. This curriculum should, of course, be complemented by additional materials to meet specific local training needs. Once a standard curriculum and training materials are developed, the savings in manpower and time will be substantial as staff will not have to develop new materials every time a course is proposed nor will all staff have to participate in every course.

Various written training materials have been prepared. The project should consider more emphasis on audiovisual materials, based both on videotapes and

on slide-tape sets. This phase of the project has been seriously delayed by administrative problems in equipment procurement, which should be corrected shortly. Many IPM audiovisual training materials already exist, and can be obtained from such sources as IRRI, CIAT, Entomological Society of America, Escuela Agricola Panamericana in Honduras, and many of state Cooperative Extension programs in the US. Some materials may be utilized immediately, while others will require translation or some other adaptation.

In-service training has been an active component of the training programs in all countries and has provided a good source of national scientists specialized in priority aspects of IPM.

Academic training has lagged behind. Some country teams have established fruitful relationships with local universities. This has led to cooperation with faculty on research projects and to guidance of students on their undergraduate (ingeniero) thesis projects. Additionally, the CATIE Crop Production Department has included plant protection as one of its Master of Science concentrations. At the current rate of graduate student recruitment for this concentration, it will be difficult to meet graduate training objectives within the life of the current project.

The CATIE graduate program in crop production, with a concentration in plant protection, is shown in Appendix F. This is a rather extensive and appropriate curriculum for an IPM major. However, because of the number of supporting courses, the student is limited in the number of directly-related, plant protection courses that can be taken. This provides broadly-based training but one lacking in depth in the crop protection disciplines. It may not be a serious problem if the student's undergraduate training included a sufficient number of courses in these areas.

It is the opinion of the evaluation group that the impact of training activities should be quantified. Short exams, covering the planned course content, administered prior to and repeated at the end of an event will provide a quantitative measure of the knowledge gained by the trainees and therefore of the impact of the activity.

Recommendations:

1. That the central staff develop a standard IPM curriculum for short-term training, to be supplemented by local training materials designed to meet unique country needs. This is to insure that all trainees in the region receive the basic knowledge essential to the proper practice of IPM. Standard criteria should also be implemented to measure the impact of each training activity.
2. That the project continue to develop written training materials, but also increase emphasis on developing or acquiring audiovisual IPM training materials.
3. That the emphasis on in-service training be maintained in order to provide a continuous supply of specialized IPM practitioners to national plant protection programs.
4. That rate of recruitment of graduate students for the CATIE Master of Science concentration in plant protection be increased to insure that project goals for graduate training are met within the duration of the project.

C. Technical Cooperation

One of the objectives of this project is to establish the capacity, at CATIE, to provide services in IPM to public and private-sector institutions and individuals in CA/P. The provision for accomplishing this was provided for in

Technical Cooperation, one of the major components of the project.

The Technical Cooperation component is designed to provide assistance in three distinct ways: 1) pest diagnostic services; 2) regional IPM information services; and 3) technical assistance. With the recent addition of the documentalist to the central team, all three areas are now functional.

The central diagnostic laboratory at CATIE is functional but not fully equipped due to long delays in processing purchase orders in the CATIE purchasing department. Nevertheless, it has already made major contributions to the region as a whole by identification of numerous pest organisms and/or damage symptoms.

Another function of the central laboratory is to establish a reference collection of the many pest organisms which occur in the region. Considerable progress has already been made on this objective, but, as with IPM itself, it will never be completed as it is an evolving area, with new specimens continually being added.

This is an important service to the region and an accelerated approach should be taken to make the diagnostic center more complete. It is the opinion of the evaluation team that the central IPM team should provide greater technical and administrative assistance in this area. A coordinated effort should be made to have specimens transported by team members traveling between countries. Also, the central diagnostic laboratory curator should assume the lead role in developing not only the central laboratory but in assisting the national laboratories to become established and functional. A well-planned trip into each country would provide technical help to the national laboratories and provide the specialist the opportunity of adding specimens from the various countries to the CATIE center.

A diagnostic center is not only difficult to establish, including reference collections, but difficult to remain functional in terms of always being up-to-date. Therefore, a concern of the review team is the plan in Guatemala to have not only a central diagnostic laboratory, but a series of regional ones, as well. The IPM Project has an opportunity to influence this decision as the country coordinator has been requested by DIGESA to assist in its reorganization of their diagnostic network.

The regional IPM information service center is just getting underway with the recent hiring of the documentalist. In the short time that he has been at CATIE he has developed a list of activities and the time frame in which they will be accomplished. This center should serve as an important outreach function of the project and country coordinators should be briefed on the scope of the center and avail themselves of all of its services.

The technical assistance mission is a very important and active part of this component. Its outreach has extended to all participating countries.

The project appears to be much in demand to provide technical assistance and according to a list of technical assistance activities, each central team member and country coordinator has participated in many of these activities. This is an important function that continually improves the visibility of IPM and enhances the concept. However it is also a time-consuming activity and one which project personnel must plan carefully and selectively or an inordinate amount of their time will go into this activity.

Recommendations:

1. That the IPM Project make every effort to expand the central diagnostic laboratory and to encourage its use by the other countries. This includes assistance to the diagnostic laboratory specialist in building a

strong reference collection.

2. That the documentalists seek input from the country coordinators in ways that the IPM information center can best serve the individual countries and the region as a whole, and ways to encourage its use.
3. That the central team carefully analyze its role in the technical assistance mission with the express purpose of maintaining its visibility and effectiveness while at the same time reducing their individual input.

D. Environmental Issues

In general, the evaluation team found that this project has done well in conforming to USAID pesticide policy. This was in spite of the fact that they have very limited information on the specifics of this policy. ROCAP needs to provide project personnel with a comprehensive listing of allowable pesticide products and uses.

Recommendations:

1. That ROCAP provide a comprehensive listing of currently permitted pesticide products and use restrictions.

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VIII. APPENDICES

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Appendix A. Itinerary For Review Team

DATE	ACTIVITY/PLACE
September 23	Arrival in San Jose, Costa Rica
24	Briefing at ROCAP/Costa Rica Arrival in Turrialba
25	Orientation session with CATIE officials Discussion with IPM Central Team:
26	Review of Project Documents
27	Review of Project Documents Departure of Echandi for Panama (September 29-30 and Costa Rica (October 1-2) Review of Research at Turrialba
28-29	Document Review and Initiation of Evaluation Report
30	Departure for Honduras Meeting with Honduras project staff Meeting with SRN officials
October 1-2	Visit research sites in Region II, Honduras
3	Return to Turrialba
4	Departure of Echandi for U.S.
4-9	Writing of Evaluation Report Individual meetings with CATIE officials
9	Arrival of Peairs
10	Departure for Guatemala Meetings with ROCAP/Guatemala and AID/Guatemala Meetings with project coordinator - El Salvador
11	Continued discussions with El Salvador coordinator
13	Meeting with local CATIE Representative Meeting with Guatemala project staff Meeting with USAC faculty Meeting with ICTA and DTSV officials Meeting with Universidad del Valle faculty
14	Visit project activities in San Jeronimo, Baja Verapaz
15	Return to Turrialba
16-22	Preparation of Report
20	Debriefing with project Central Team
21	Debriefing with CATIE Officials
22	Departure for San Jose
23	Departure from Costa Rica
24	Debriefing with ROCAP/Guatemala (Watson)
25	Departure of Watson to US

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Appendix B. Official and Technical Personnel Visited

CATIE

Dr. Rodrigo Tarte, Director of CATIE
Dr. Romeo Martinez Rodas, Department Head, Crop Production
Dr. Carlos Burgos, Cropping Systems and Soils
Dr. Gustavo Enriquez, Cocoa Specialist
Ing. Jorge H. Echeverri, Coffee Specialist

IPM PROJECT

INTERNATIONAL STAFF

Dr. Joseph L. Saunders, Coordinator
Dr. Ramiro De la Cruz, Weeds/Training
Dr. Jose Rutilio Quezada, Entomology/Pesticides
Dr. James B. French, Agricultural Economist/Research, Computers
Ing. Philip Shannon, Entomologist
Dr. Elkin Bustamante, Plant Pathology/Diagnostic Lab
Lic. Orlando Arboleda, M.Sc., Information Specialist

NATIONAL TECHNICAL STAFF

Lic. Tulio Ramirez, Administrative Assistant
Ing. Daniel Coto, Entomology Assistant
Ing. Manuel Carballo, Entomology Assistant
Ing. Carlos Enrique Rojas, Weed Science Assistant
Ing. Jose Martin Jimenez, Plant Pathology Assistant
Ing. Margarita Meseguer, Agricultural Economics Assistant

SUPPORT STAFF

Carlos Vargas, Assistant
Herman Zuniga, Assistant
Adriano Rodriguez, Assistant
Tomas Rojas, Assistant
Walter Bermudez, Assistant
Miguel Sanabria, Assistant
Rigoberto Solano, Assistant
Floribeth Salguero, Bilingual Secretary
Yorlene Perez, Bilingual Secretary
Isabel Royo, Executive Bilingual Secretary

COSTA RICA

Dr. Ramon Lastra, Country Coordinator/Plant Pathology
Roger Meneses, M.Sc. Assistant Country Coordinator
Ing. Antonio Zumbado, Coordinator, Potato Program, MAG
Francisco Alvarez, M.Sc., Head, Dept. of Entomology, MAG
Gregorio Leandro, M.Sc., Head, Dept. of Plant Pathology, MAG
Ing. Rodrigo Alfaro, Director of Research and Extension, MAG
Willie Loria, M.Sc., Director, Experiment Station Fabio Baudrit, UCR
Dr. Rodrigo Gámez, Director, Molecular Biology Laboratory, UCR

EL SALVADOR

Dr. Freddy Alonzo, Country Coordinator/Entomology
Ing. Ricardo Sandoval, Country Coordinator Assistant

GUATEMALA

ROCAP

Dr. Gordon Straub, Regional Agricultural Development Officer
Ms. Nancy Fong, Agricultural Specialist
Dr. Harry Wing, Chief, Office of Rural Development, USAID-Guatemala
Dr. Angel Chiri, CIRP/ROCAP

CATIE

Ing. Bladimiro Villeda, CATIE Representative
Dr. Mario Pareja, Country Coordinator/Weed Scientist
Ing. Edgar Alvarado, M.Sc. Country Coordinator Assistant

FACULTY OF AGRONOMY, USAC

Ing. Cesar Castaneda, Dean
Ing. Luis A. Castaneda, Secretary
Ing. Amilcar Gutierrez, Plant Pathology
Ing. Edil Rodriguez, Plant Pathology
Ing. Rolando Aguilera, Plant Pathology/Weed Science
Ing. Manuel Martinez, Weed Science
Ing. Samuel Cordova, Entomology
Ing. Alvaro Hernandez, Entomology

ICTA

Ing. Oscar Leiva, Manager
Ing. Rolando Lara, Assistant Manager
Ing. Horacio Juarez, Technical Director

Ing. Alfredo Trejo, General Director, DIGESA
Ing. Mario Gaitan, Technical Director, DTSV/DIGESA

UNIVERSIDAD DEL VALLE DE GUATEMALA

Ing. Miguel A. Canga-Arguellas, Rector
Dr. Jack Schuster, Entomology
Ing. Marco Arevalo, Plant Pathology

ICTA Research Center, San Jeronimo

Ing. Vinicio Barrondo, Chief
Ing. Jose L. Queme
Ing. Ramiro Asaba
Ing. Carlos Cajas

HONDURAS

Dr. David Monterroso, Country Coordinator
Ing. Mario Bustamante, Assistant Country Coordinator
Dr. Leopoldo Alvarado, Director of Research, SRN
Eliseo Navarro, M.Sc. Head, Dept. of Plant Health, SRN
Miguel Angel Solera, Director of Research, SRN Region 2
Ing. Hector Rodriguez, Head, Rice Program, SRN
Ing. Roberto Moreno, Research, SRN

PANAMA

Dr. Jorge Pinochet, Country Coordinator
Gabriel von Lindeman, M.Sc., Assistant Country Coordinator
Dr. Gaspar Silvera, Director of Agricultural Research, IDIAP
Dr. Alberto Taylor, Botanist, University of Panama
Dr. Omar Quintero, Entomologist University of Panama
Mr. Donald Orga, Project Officer, AID
Dr. Orencio Fernandez, Virologist, IDIAP
Lic. Moises Darwish, CATIE Representative in Panama

Appendix C. List of Acronyms

INTERNATIONAL INSTITUTIONS

CATIE - Tropical Agricultural Research and Training Center
CIDIA - Inter-American Center for Documentation, Implementation of
Agricultural Information
EAP - Panamerican Agricultural School (Zamorano)
IDRC - International Development Research Centre, Canada
IICA - Inter-American Institute for Agricultural Cooperation, OAS
USAID/ROCAP - U.S. Agency for International Development/Regional
Office for Central America and Panama

NATIONAL INSTITUTIONS

AGMIP - Guatemalan IPM Association
CENTA - El Salvador, National Agricultural Technology Center
DDV - El Salvador, Department of Plant Protection
DIGESA - Guatemala, Directorate of Crop Extension
DTSV - Guatemala, Directorate of Plant Health
ICTA - Guatemala, Agricultural Science and Technology Institute
IDIAP - Panama, Agricultural Research Institute
MAG - Costa Rica, Ministry of Agriculture and Livestock
MAG - El Salvador, Ministry of Agriculture and Livestock
MIDA - Panama, Ministry of Agricultural Development
SRN - Honduras, Natural Resources Secretariat.
UASC - Guatemala, Autonomous University of San Carlos
UCR - University of Costa Rica
UP - University of Panama
UV - Guatemala, Valle University

OTHER

CA/P - Central America and Panama
DPV - CATIE, Department of Crop Production
MIP - Integrated Pest Management

Appendix D. Status Report on IPM Project Output

MAJOR OUTPUTS	INDICATORS	NUMBER OF ACTIVITIES	
		LENGTH OF PROJECT	TO DATE
A. RESEARCH			
1. Initial country pest diagnosis	a. Initial country pest diagnosis	5	4
2. Experiments	a. Studies initiated	N/A	41
	b. Studies completed	N/A	7
B. TRAINING			
1. Academic training	a. MS Program Estab. at CATIE	1	1
	b. MS students	15	3
	c. Academic courses	15	2
2. Technical training	a. Workshops	29	13
	b. Seminars	13	8
	c. Diagnostic assistance to national instit.	N/A	268
	d. Technical assistance missions	N/A	123
3. In-service training	a. Persons	11	6

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C. TECHNICAL COOPERATION

1. Diagnostic services	a. New species collected	N/A	360
	b. Principal pest slides prepared	N/A	271
2. Regional IPM Information Service Center		1	1
3. Technical assistance missions	a. Consultancies (1-4 weeks)	25	3
	b. Periodic short-term assistance to national inst.	N/A	20

Appendix E. Summary of IPM Research Projects

Country	Project Title
Guatemala	Pepper weevil population level related to control action.
Guatemala	Evaluation of <u>Melia azederach</u> extracts as a botanical insecticide.
Guatemala	Determination of <u>Epilachna varivestis</u> population levels for determining control action thresholds in beans.
Guatemala	Evaluation of six chemicals and three application frequencies for slug control.
Guatemala	Evaluation of nematicides and fungicides for control of Pepper wilt causal organisms in the soil.
Guatemala	Influence of application of insecticides to cotton on populations of citrus black fly and its natural enemies.
Guatemala	Evaluation of chemicals and botanical extracts for sorghum midge (<u>Contarinia sorghicola</u>) oviposition inhibition.
Guatemala	Distribution, damage levels and identification of the principal slug genera in Guatemala.
Honduras	Critical epochs of Caminadora (<u>Rottboellia exaltata</u> L. Lf) competition with maize. (Four locations).
Honduras	Critical epochs of Caminadora (<u>Rottboellia exaltata</u> L. Lf) competition with rice. (Four locations).
Honduras	Relation of <u>Cyperus rotundus</u> populations and maize yields.
Honduras	<u>Cyperus rotundus</u> management in maize (two locations).
Honduras	Relation of <u>Cyperus rotundus</u> populations and rice yields.
Honduras	<u>Cyperus rotundus</u> management in rice. (Three locations).
Honduras	Evaluation of fungicides and doses for <u>Pyricularia orizae</u> management in rice. (Three locations).
Honduras	Evaluation of cultural practices for maize ear rot control.

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Honduras	Evaluation of importance and control of bacterial leaf spot of cabbage.
Honduras	Evaluation of damage and control of <u>Plutella xylostella</u> in cabbage.
Honduras	Evaluation of damage and control of the pepper weevil (<u>Anthonomus eugenii</u>). (Two locations).
Honduras	Evaluation of damage and control of the cabbage butterfly in cabbage.
Honduras	Management of <u>Phytophthora infestans</u> in potato.
Honduras	Evaluation of resistance to <u>Phytophthora infestans</u> and crop management.
Honduras	Management of <u>Rottboellia exaltata</u> L. Lf. in a maize-sorghum production system.
Panama	Nematodes associated with fruit species in commercial nurseries in Panama.
Panama	<u>Cyperus rotundus</u> control in tomato.
Panama	Diagnosis of gemini virus and curly top in tomato.
Panama	Evaluation of tomato genetic materials to economically important pathogens.
Panama	Evaluation of pepper genetic materials to economically important pathogens.
Panama	Integrated management of Pentatomidae in rice.
Panama	Biology of the weed <u>Saccharum spontaneum</u> .
Panama	Biological control of <u>Cyperus rotundus</u> with the fungus <u>Puccinia canaliculata</u> .
Panama	Weed population vs maize yield.
Panama	Weed population vs sorghum yield.
Panama	<u>Puccinia canaliculata</u> development on <u>Cyperus rotundus</u> .
El Salvador	Nematodes associated with vegetables and fruits and their possible importance in El Salvador.
El Salvador	Farm level parasitological survey in Regions I and II.

El Salvador	Characterization of parasitological problems and beneficial organisms in maize.
El Salvador	Formulation and evaluation of IPM alternatives for major maize pests.
El Salvador	Survey of pesticides used in maize in El Salvador and the ecological implications.
Costa Rica	Virological analysis of <u>Xanthosoma saggitifolium</u> meristem cultures.
Costa Rica	Virus reinfection dynamics in virus free <u>Xanthosoma</u> .
Costa Rica	Vector population, rate of viral infection and production of virus free <u>Xanthosoma</u> .
Costa Rica	Evaluation of maize genetic tolerance to viral diseases.
Costa Rica	Principal viruses of tomato in Panama.
Costa Rica	Diagnostic studies of tomato curly top in Central America.
Costa Rica	Implementation of the ELISA technique and evaluation of the citrus "Tristeza" virus in Central America.
Costa Rica	Aphid population variation and its influence on potato virus incidence.
Costa Rica	Identification of the causal agent of a disease of <u>Secchium edule</u> disease in Guatemala.
Costa Rica	Integrated pest management in irrigated maize and sorghum.
Costa Rica	Identification of scales and their natural enemies in citrus in Costa Rica.
Costa Rica	Ecology and control of slugs (<u>Diplosolenodes</u> sp. and <u>Sarasinula</u> sp.) on beans in Costa Rica.
Turrialba	Pepper resistance to basal rot and bacteria.
Turrialba	Tomato and pepper resistance to Phytophthora, anthracnosis and virus.
Turrialba	Reaction of three commercial tomato cultivars to traditional and integrated pest management.
Turrialba	Effect of organic fertilizer, calcium, and spacing on "mal seco" of <u>Xanthosoma</u> .

- Turrialba Evaluation of "currare" (Musa AAB) plantain tolerant to black sigatoka.
- Turrialba Evaluation of maize stalk, foliage and ear pathogens.
- Turrialba Efficiency of pesticide use on potatoes.
- Turrialba Linear modeling for four methods of slug control in beans.
- Turrialba Dynamics of decision making for pesticide application to potatoes.
- Turrialba Socio-economic filter development for use in developing alternate integrated pest management.
- Turrialba Population dynamics of Plutella xylostella and its parasite Diadegma sp. under three treatments.
- Turrialba Evaluation of resistance-tolerance of clones/varieties of coffee, cocoa, and plantain to plant parasitic nematodes.
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Appendix F. CATIE MSc. Curriculum in IPM

General (5-6 credits)

Use of scientific literature (1)
Seminar (1)
Independent Study (1-2)
Technical Writing (2)

Statistics (8 credits)

Statistical analysis (3)
Experimental design (3)
Data processing (1)
Sampling methods (1)

Basic (10 credits)

Biochemistry (3)
Ecology (2)
Ecophysiology (3)
Plant Climatology (2)

Integrated Pest Management (18 credits)

Diseases (3)
Pest diagnosis methods (3)
Weeds (3)
Entomology (3)
Integrated pest management (3)
Production Economics (3)

Thesis Project

**Appendix G. Technical Literature from the IPM Project, and Seminar --
Workshops Presented by Project, University and National Institutional
Personnel (In Spanish).**

I. LITERATURA TECNICA PRODUCIDA POR EL PROYECTO MIP

A. Elkin Bustamante

1. Metodologías para identificación, estudio y cuantificación del daño causado por hongos fitopatógenos. Curso corto MIP - El Salvador. Mayo 1986. 26 p.
2. Patología de semillas. Curso corto MIP - El Salvador. Mayo 1986. 27 p.
3. Guía para la elaboración de informes trimestrales. Documento Técnico 004. 1986. 25 p.
4. Resistencia de las plantas a patógenos. Curso Corto MIP - El Salvador. Febrero 1986. 10 p.
5. Conceptos sobre manejo integrado de enfermedades. Curso Corto MIP - El Salvador, Febrero 1986. 20 p.
6. Problemas en maíz almacenado en Colombia. II Seminario Nacional sobre pérdidas post-cosechas de granos básicos. Antigua Guatemala. Noviembre 18-22 1985. 13 p.

B. James French

1. French, James B. "La Importación de la Socioeconomía en el Manejo Integrado de Plagas". Presentado en Curso Corto Intensivo Filosofía y Componentes del Manejo Integrado de Plagas, San Andrés, El Salvador, 22-28 de febrero.
2. French, James B. y Margarita Meseguer. Presupuesto Parcial y Umbrales Económicos. Presentado en Curso Corto de Estrategias Potenciales para el Manejo Integrado de Plagas.
3. French, James B., William González y Franklin Rosales. "Estado de Riesgo de Cinco Variedades de Yuca Sembrado

en Monocultivo y Asocio con Maíz". Presentado en XXXII Reunión Anual de PCCMCA, San Salvador, El Salvador, 17-21 de marzo, 1986.

4. French, James B. "Risk Evaluation of Threshhold Based Management Strategies of Paratuberculosis: An Infections Animal Disease". Selected Paper Presented at the American Agricultural Economics Association Annual Meeting, Reno, Nevada, 27-30 July, 1986.

C. José Rutillo Quezada

1. Parasitoides y depredadores, un recurso para el manejo integrado de plagas. Febrero 1986. 24 p.
2. El uso de entomopatógenos en el manejo integrado de plagas. Marzo 1986. 12 p.
3. Principios, fundamentos y tácticas de manejo integrado de plagas. Marzo, 1986. 23 p.
4. El papel de los enemigos naturales en el manejo integrado de plagas. Marzo 1989. 2 p.
5. El impacto ecológico de los plaguicidas en la fitoprotección. Marzo 1986. 7 p.
6. Políticas en relación con la identificación de avispas parasíticas. Marzo 1986. 13 p.
7. Algunas líneas de investigación sobre plaguicidas. Abril 1986. 6 p.
8. Control biológico de plagas de cítricos en la región centroamericana. Abril 1986. 15 p.
9. Principales aspectos a cubrir en el estudio biosistémico de enemigos naturales. Mayo 1986. 12 p.
10. Evaluación del impacto de los enemigos naturales en las poblaciones de plagas. Mayo 1986. 11 p.

D. Otras Publicaciones y Documentos de Trabajo

1. Inventario de los problemas fitosanitarios de los principales cultivos de la República de Guatemala. D. Monterroso y M. Pareja. Octubre 1985. 54 p.

2. Diagnóstico parasitológico preliminar de los principales cultivos de El Salvador. F. Alonzo Padilla y M. Palma Rosales. Octubre 1985. 23 p.
3. Inventario de plagas y enfermedades de las plantas en Costa Rica. R. Lastra. 1985. 25 p.
4. Inventario de plagas y enfermedades de Panamá. J. Pinochet. 1985. 25 p.
5. Informe anual Proyecto MIP El Salvador 1985. F. Alonzo P. Enero 1986.

**II. SEMINAR-WORKSHOPS PRESENTED BY IPM-PROJECT,
UNIVERSITY AND NATIONAL INSTITUTIONAL PERSONNEL.**

A. <u>Seminario-Taller de Entomología (Panamá, 2 al 5 Dic. 1985)</u>	Pág.
1. Registro, comercialización y papel de las casas comerciales en el uso de pesticidas. Adames, Jaime, Servicios Agroquímicos.	9
2. Insectos plagas de las hortalizas. Alonzo P., Freddy, CATIE	13
3. Mejoramiento de programas de enseñanzas de fitoprotección a nivel de agrónomo: logros de proyecto MIPH 1983-1985. Keith, Andrews, E.A.P.	20
4. Proceso del proyecto MIPH en la validación y transferencia de tecnologías para productores de maíz y frijol en Honduras. Keith, Andrews, E.A.P.	26
5. Problemas entomológicos actuales en la Península de Azuero, Dominguez, Darys, MIDA.	32
6. Fundamentos toxicológicos de los insecticidas de uso en las zonas altas de Chiriqui. Espinoza, Jaime, IDIAP.	36
7. Determinación de periodos críticos de ataques de plagas en arroz. Estrada, Felix, IDIAP.	43
8. Control y fluctuaciones de insectos enrolladores de la hoja del tomate. <u>Keiferia lycopersicella</u> y <u>Scrobipalpula</u> sp. Gordón, Román, IDIAP.	47
9. Las plagas forestales en Costa Rica. Hilge, Luko, Universidad de Heredia.	51

10.	Situación actual de la mosca del mediterráneo (<u>Ceratitis capitata</u> Wied) en la provincia de Chiriquí. Republica de Panamá. Jimenez, Ricardo, MIDA.	55
11.	Alternativas para el establecimiento de un programa de manejo integrado de plagas en tomate en Panamá. Korytkowski, Cheslavo, UNIPAN.	59
12.	Transmisión de virus por insectos. Lastra, Ramón, CATIE	65
13.	Resultados agro-industriales y económicos de siete años del programa de control biológico de Diatraea spp. en caña de azúcar. Narvaes, Luis, Azucarera Nacional.	72
14.	El control biológico como táctica del manejo integrado de plagas. Quezada, José Rutilio, CATIE.	80
15.	Insectos plagas de los frutales y medidas para su control. Quezada, José Rutilio, CATIE.	87
16.	Pisibilidades de manejar el cultivo de frijol soya con un mínimo de plaguicidas. Quezada, José Rutilio, CATIE.	98
17.	Introducción de la mosca del mediterráneo (<u>Ceratitis capitata</u> Wied) y evolución del program moscamed en Panamá. Rojas, Melquiades, MIDA.	107
18.	La importancia de la sistemática en el manejo de plagas. Schuster, Jack, Universidad del Valle.	111
19.	Monitoreo y Control de plagas en la industria citrica de Chiriquí. Serrud, Humberto, Citricos de Chiriquí.	114
20.	Programa de investigación entomológica en arroz en Chiriquí, Panamá, 1981-1983. Shannon, Phillip, CATIE.	118
21.	Situación actual de la abeja africanizada en Panamá. Vanegas, Ramón, MIDA.	120
22.	Insectos de las selvas tropicales. Wolda, Henk, STRI.	123
B.	<u>Seminario-Taller de Malezas (Panamá, 14 al 27 Oct. 1985)</u>	<u>Pág.</u>
1.	Experiencias con Siembra Mecanizada y Manual bajo el Sistema de "O" Labranza. a. Alvarado, IDIAP.	1
2.	El Concepta del Manejo de Plagas en Malezas. R. De la Cruz, CATIE.	5

3.	Técnicas de Investigación en Malezas. R. de la Cruz, CATIE.	12
4.	Análisis de los Plaguicidas en Malezas. B. La Moth, IDIAP.	21
5.	Químico Dinámica de los Herbicidas. B. La Moth, IDIAP.	29
6.	Origen, Establecimiento y Problemas Potenciales de la Maleza <u>Saccharum spontaneum</u> en Panamá. G. von Lindeman, CATIE.	33
7.	Características de la Maleza <u>Rottboellia exaltata</u> , su Distribución, Competencia y Medidas de Control. G. von Lindeman, CATIE.	38
8.	Proyecto de Investigación complementario IDIAP-UNAP sobre "Control de Malezas en Areas Agrícolas. L. López, FAUP.	41
9.	Evaluación Preliminar de los Herbicidas en el Control de Malezas en el Cultivo de la Papaya. M. Moreno, MIDA.	45
10.	Metodología Descriptible de Estudio de Competencia en Malezas. M. Navarro, IDIAP.	48
11.	Biología y Ecología de Malezas como base para el Desarrollo de Programas de Manejo Integrado de Malezas (MIM). M. Pareja, CATIE.	54
12.	Principales Problemas de Malezas en Panamá. J. Pinochet, CATIE.	61
13.	Problemas de Malezas en Barú, Chiriquí, Panamá. R. Rodríguez, IDIAP.	64
14.	Malezas de Importancia Económica en Arrozales de la Provincia de Chiriquí. L. C. Salazar, FAUP.	66
15.	Control de Malezas en la Producción de Semillas. J. B. Torres, FERTICA.	72
C.	<u>Seminario-Taller de Fitopatología (Panamá, 22 al 24 abril, 1986)</u>	<u>Pág.</u>
1.	Levantamiento y control químico de hongos asociados a semillas de arroz. Barraza, Eddy E., FAUP	9
2.	Evaluación de progenies de catimores de la serie T 8600 resistente a la roya del café (<u>Hemileia vastatrix</u> Berk y Ber) en Boquete, Panamá. Bermúdez R., Humberto, MIDA.	14

3.	Incidencia de dos enfermedades fungosas en café en la Provincia de Veraguas, Panamá. Berrocal, Alfonso, MIDA.	20
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Appendix H. Country Reports

1. Costa Rica

The project was initiated in February, 1985, with the Ministry of Agriculture and Animal Husbandry (MAG) as the local counterpart institution. Work started by evaluating human and physical resources, as well as the projects of institutions engaged in phytosanitary activities. Simultaneously with the evaluation, an inventory of the most important pests of Costa Rica was conducted. Once these two activities were completed a strategy for IPM involving research, training, and technical cooperation was developed in conjunction with MAG.

A new project coordinator is now being recruited for Costa Rica.

Research

Since the beginning of the project, 12 research projects have been initiated (Appendix E). There are 9 projects directly or indirectly dealing with virus or virus-like diseases and 3 dealing with insects.

The project has developed well in this country. This is probably due to the good relations and strong cooperation maintained with the counterpart organization MAG and other institutions engaged in pest management such as the University of Costa Rica (UCR). These relations and strong cooperation between the project and MAG should be maintained and strengthened if possible.

The project has emphasized research on virus and virus-like diseases. In general, the research projects have been of short duration and of the problem-solving type. Examples are projects such as virological analysis of Xanthosoma sagittifolium from meristem culture, and Implementation of

ELISA technique and evaluation of citrus "Tristeza" virus in Central America (Appendix E). Results from these two projects have been well received by MAG and the corresponding sectors of Costa Rican growers.

Housing the project in MAG with the Departments of Plant Pathology and Entomology has been highly beneficial to the project as well as to these departments.

Training

From 1985 to October 1986, 3 workshops were conducted by the project (Appendix D). The project has offered intensive training to four Costa Rican scientists from MAG and Centro de Investigacion en Granos y Semillas (CIGRAS).

The project has done a good job in training. It organized 2 workshops: one on diagnosis of virus diseases and the other on virus inclusions. The papers given at the workshops should have been assembled and published for the benefit of the plant pathologists of the region.

The project has also been successful in in-service training. However, plant pathologists and entomologists from MAG have indicated that there are not enough fellowships in the project to satisfy their needs.

Technical Cooperation

Several activities in the area of technical cooperation have been accomplished by the project in Costa Rica. These activities are primarily in the area of diagnosis of virus diseases. Also, the project coordinator participated in four scientific meetings.

The project has also cooperated effectively with several local institutions, particularly in the area of diagnosis of virus and other plant diseases.

Conclusions and Recommendations

This project has made significant accomplishments during the time of its existence. However, because of various circumstances, immediate action must be taken to keep the project moving forward and to expand it. The review team recommends:

1. That in order to provide continuity to the program, the new project coordinator should be hired as soon as possible. Since so much of the ongoing research is in the area of plant pathology, particularly virology, it might be appropriate to consider hiring a scientist with a background similar to that of the previous coordinator. However, of foremost importance is finding the right scientist who understands the integrated pest management concept and who can work with an IPM team.
2. That in the future, members of the project should meet once every six months with the Heads of Plant Pathology, Entomology and the Director of Research of Mag to review the progress of the project and to make the necessary changes to reach the project's goals for Costa Rica.
3. That the new country coordinator attempt to institute greater balance among projects in the different disciplinary areas. For example, a preponderance of the research projects involved pathogens, a few involve insects and none involve weeds.

2. El Salvador

Due to the political environment existing at the time of the scheduled trip, and the subsequent events that resulted from the strong earthquake

that shook this country, the review team was unable to visit the sites where research related to this project is taking place. Instead, the project leader and the country coordinator went through long efforts to set up and conduct a meeting in Guatemala.

Research

It is commendable the extensive efforts made by the country coordinator to identify the pest problems that exist in this country. The surveys conducted at the institutional and farmers' level should provide an approximation of the needs in IPM and thus to orient the research that is required to fill this void. However, a word of caution should be placed in using these techniques. Straight farmer surveys are not the most accurate ways to identify pest problems. An appropriate procedure would be to set up tests to try to identify and prioritize pest problems.

There has been so far no quantitative measurement of the extent of the damages and losses due to pests. Although this is a difficult task, we consider it necessary to take the appropriate steps to obtain this type of information. Once obtained, this information should be of extreme help in identifying key crops and pests on which to work.

An extensive amount of data is being gathered with the objective of being able to quantify and qualify the benefits that will be derived after switching from the standard farmer's practices to practices that are compatible with the IPM philosophy.

The pests in the country have been identified by major crops. Based on this diagnostic survey, there are 29 crops of major economic importance. Up to now, pests have not been ranked according to their damage or their presence in crops and most are controlled by prophylactic applications of

chemical pesticides.

A good deal of the research is centered on beans, and we found out about it through the presentation of the country coordinator. However, there are no records of this research in Turrialba. We encourage the country coordinator to remedy this situation in the near future.

Part of the research done in beans, especially the work on slugs should be complemented with the work in other countries like Honduras and Guatemala. For this purpose we strongly suggest that better communication be established among country coordinators and the central team. Also, the same kind of interaction is suggested in the case of corn.

In this case the question is not so much of whether the purpose will be accomplished, but more along the lines of what will be accomplished with the projects. It seems that there is a large number of projects in terms of crops, pests, and locations that may dilute the efforts of the team, thus reducing the quality of the research involved.

Another case is where data are being collected to characterize the situation before and after the participation of the project. This is a very important activity in terms of measuring the impact of the project.

A second issue about which the review team was concerned relates to the insect collections being obtained. For what we could infer in our exchange of information with the country coordinator, there seems to be a large amount of insects being sampled, with no specific objective in mind. Although collection of specimens is necessary, we think that a restricted and theme-oriented version would be more beneficial and economical than collecting all the insects that occur in fields in Salvador.

Under normal circumstances the progress made by the IPM project in

Salvador would have been adequate. However, considering the environment in which the project had to take place, the team feels very strongly that the progress has been very commendable.

Training

Several training activities have already been conducted in El Salvador. Six seminars and two congresses were held in 1985, in conjunction with several members of the central team. In 1986, two workshops have been held on IPM strategies with 42 and 43 participants, respectively.

Training appears to be a high priority component with the country coordinator as well it should be. With the extensive number of research personnel under his direction it is of utmost importance that they be well trained in the IPM concept and tactics. Although progress is quite adequate at this time, a continuation of training activities of the technical research personnel, should result in the improvement of the quality of the research.

Technical Cooperation

The outreach effort by the IPM project in Salvador has been up to now excellent. Under adverse circumstances the project has developed remarkable institutional connections with its counterpart institution CENTA. In a first instance, both the IPM project and CENTA have worked together in determining an inventory of pests that affect farmers. Among some of the activities developed during the inventory were the establishment of six different areas of work in the country, the permanent presence of the project in these areas, and the identification of farmers that will help in their research work.

In the area of interacting with other organizations, the country coordinator has excelled. Also, he should be given recognition for his

efforts in obtaining and securing funds from other projects and institutions. Particularly, we are referring to the case of obtaining funds to complement their objectives through PL480 funds. Thanks to his efforts, the project now has another 21 professionals to carry out its research, technical assistance, and training activities. This country component of the IPM project is now the strongest in terms of personnel directly working in it.

We believe that there is room for improvement in the area of interaction with the central team. The country coordinator should communicate more to the central team about his plans and ask for an in-house review of project proposals to improve the quality of the research and to improve regional coordination of activities.

Procurement of goods and services and financial management have critically delayed development of all aspects of the project in Salvador. Routine delays in materializing commitments by CATIE have created a stressful situation on the project. ROCAP has attempted to alleviate this problem by providing funds to CATIE up to 3 months in advance. This, however, has not solved the problem.

The issue of pesticides used, the health and environmental impact, and the compliance with AID procedures has come across as a potential source for controversy in the development of this project. Presently, the IPM team is experimenting with Temik for control of slugs. This is a restricted-use pesticide in the U.S.A. and allowed on beans only at planting time. Although, its use can be properly demonstrated to farmers, there is a high possibility for mismanagement by the latter. This possibility should not be overlooked and further uses of this pesticide should not take place in farmers fields.

Conclusions and Recommendations

In the past, there have been serious setbacks in the implementation of this project due to administrative delays in CATIE. Under normal circumstances the progress obtained by the IPM project in Salvador would have been appropriate. However, considering the environment in which the project had to take place, the team feels very strongly that the progress of the work has been excellent. Some changes would be needed to continue excelling in the future and several recommendations are offered to achieve this end:

1. That the country coordinator communicate more with the central team about his plans and ask for an in-house review of project proposals to improve the quality of the research and to improve regional coordination of activities.
2. That the country representative reduce the scope of his research program by establishing, together with the central team, priorities in crops, pests, and locations. There is a large number of projects in terms of crops, pests, and locations that may dilute the efforts of the team, thus reducing the quality of the research involved.
3. That a restricted and theme-oriented version of insect collecting be instituted which would be more beneficial, feasible, and economical. It appears that excessive amounts of insect pests that occur in crops in El Salvador are being collected.
4. That the indicators to measure the impact of the project be carefully chosen. Measuring the impact is an excellent idea and should be encouraged in other countries as well. However, the number of indicators should be reduced since it appears they are excessive in

some cases.

5. That experiments be conducted to identify and prioritize pest problems. Straight farmer and extension personnel surveys are not the most accurate ways to identify pest problems. Also, we consider it necessary to obtain a quantitative measurement of damages and losses due to pests. Once obtained, this information should be of extreme help in identifying key crops and pests on which to work.
6. That the country coordinator be given recognition for his efforts in obtaining and securing funds from other projects and institutions. In the area of interacting with other organizations he has excelled.
7. That procurement of goods and services and financial management have been critical in the development of the project in Salvador, and every effort should be made to improve it. The recent hiring of an experienced specialist in finances should go far in alleviating this major problem.

3. Guatemala

In Guatemala, the project was initiated in June, 1985 with ICTA (Instituto de Ciencia y Tecnologia Agropecuaria) as the counterpart research institution and DTSV (Direccion Tecnica de Sanidad Vegetal) as the counterpart extension institution. As in other countries, the project was initiated with an evaluation of human and physical IPM resources, as well as of ongoing plant protection research. This was completed within 3 months of the project start. Research activities, however, were not initiated until mid- 1986 due to replacement of most high-ranking officials as a result of the new Guatemalan government installed in late January,

1986.

Research

Substantial effort has been made to insure that research problems are of perceived importance to local research and extension personnel. Major pest problems in Guatemala have been identified through a review of available literature and through interviews with ICTA and DTSV personnel. Also, assisting with this effort were AGMIP personnel, extension workers, and some scientists in the private sector. A 'first approximation' of this pest inventory has been published. This publication places pests in 1 of 3 groups in terms of perceived importance and 1 of 3 groups in terms of research needs. Crops and crop-systems choices as research targets should be appropriate since they were selected in conjunction with ICTA/DTSV staff and therefore reflect perceived local needs and priorities. The selected problems appear to be important and solutions should have a favorable impact on Guatemalan pest management practices.

Although selected major pest problems reflect the perceptions of ICTA/DTSV staff as to economic impact and research needs, the status of these pests should be verified through an assessment of both crop loss and farmer perceptions. To some extent, preliminary farmer-perception surveys have been conducted by ICTA through its socioeconomic unit.

Some verification of pest importance through crop-loss research has been done or is planned for pests targeted by the group. Yield-loss data have been collected for pepper weevil in chile and for Mexican bean beetle in beans. Experiments on critical weeding periods in several crops should provide data on losses due to competition with local weed complexes. Similar data should be collected for the remaining crop/pest combinations

targeted by the CATIE/Guatemala team. Other economic aspects of IPM, apart from production losses, such as farmer pest-control practices or pest perceptions are not being investigated at this time. However, some information has been generated in Guatemala on grower practices in tomato and pepper.

Although some on-farm experiments and farm-level surveys are being conducted, no IPM 'packages' are presently ready to be evaluated at this level. Tomato seems to be the crop most likely to have a package available within the duration of the project. It is not yet possible to judge whether the required number of control guidelines will be developed and delivered during the life of the project, although it is obvious that this will not occur if these guidelines are to be based on project-generated research results.

Research is being conducted or planned on more crop/pest combinations than project resources can support. The overwhelming needs and demands for IPM research in Guatemala has led the CATIE group into several questionable areas. Citrus blackfly problems, for example, are apparently directly related to pesticide use patterns in cotton, a commodity expressly outside the scope of this project. This poses a complex issue as the citrus problem and the small citrus farmer may fall within the scope of this project but the problem itself is apparently generated from a non-target crop (cotton). This is truly a regional research project, coordinated by the central team, and conducted in both Costa Rica and Guatemala but the fruitfulness of these efforts should be carefully evaluated unless changes are forthcoming in pest control practices in cotton. The CATIE group in Guatemala should be careful that research projects be limited

enough in size and number to fall within available project resources. The chances of meeting project objectives within the allotted time are also diminished as the research effort becomes diluted. Consideration should be given to reallocating some research effort towards the socioeconomic aspects of IPM in Guatemala, in accordance with project guidelines. The best use of this effort would be to monitor certain indicators designed to measure the impact or progress of IPM research activities.

Research generally involves a comparison of various treatments, some of which may cause yield losses. If such research is conducted in cooperation with limited-resource farmers, some mechanism should be established to compensate them for crop loss.

Being inherently more complicated, research progress is understandably lagging behind the technical cooperation and training components of the project. Nonetheless, the Guatemalan team has done a superior job of establishing linkages with local research, extension and teaching institutions, thus laying the groundwork for performing relevant local IPM research and delivering the results to the appropriate entities. Especially notable is the fact that ICTA did not have a plant protection department when the CATIE IPM group arrived, while now an ICTA scientist has been given plant protection responsibilities in each of the regions where CATIE works and there are plans to establish a plant protection department. Research on economically important pests and pest groups will eventually have a favorable impact on local IPM practices, but it is doubtful that this will occur during the present life of the project. There is barely time to finish the needed research, let alone combine the results into acceptable IPM packages.

There was no indication of any conventional pesticide use that would conflict with USAID policy. The group is placing some emphasis on using plant extracts of Melia azederach, with much encouragement from ICTA. The project should perhaps consider contracting a short term consultant in this area. One source would be IRRI which is currently conducting a neem research project. Additionally, the use of plant extracts should be examined for any possible conflict with USAID's pesticide policy. The likely active ingredient in the extracts being tested by CATIE is azadirachtin which has no US EPA food crop registrations.

Training

The Guatemalan team has made an impressive start in meeting their short-term training goals. Seventy-five nationals have received training from in-country courses in IPM, Weed Science, and Study of Immature Insects. Twenty-two others have attended regional courses. Two Guatemalans are receiving in-service training in Weed Science and Entomology. The CATIE group will also be participating in 1987 as formal instructors in the ICTA in-service training program for new scientists.

Although formal academic training has understandably lagged behind, the country coordinator has established good relations with both the Universidad Autonoma de San Carlos and the Universidad del Valle, to the point that CATIE staff members are having significant input into several undergraduate theses. There is one Guatemalan (from ICTA) who will be completing his M.Sc. in IPM (with specialization in plant pathology) at CATIE by mid- 1987. Two students are receiving valuable assistance from the country coordinator in their applications for Fulbright scholarships and US graduate school admissions. Unless project graduate scholarships are

awarded within the next year, it will be difficult for those receiving scholarships to finish their course of study during the life of the project.

The Guatemalan group is preparing several sorts of training materials, mostly in the form of workshop proceedings and short course references. Many training materials were still in preparation. An excellent manual for the identification of immature insects, based primarily on Peterson, has been prepared. The distribution of this has been limited because of worries about copyright infringement. ROCAP should do whatever is possible to alleviate this concern and to facilitate duplication and distribution of this reference throughout the region.

Technical Cooperation

The CATIE team in Guatemala has done its job in technical cooperation so well that they have reached the limit of their ability to provide technical assistance without competing with other components of the project. They have already assisted a variety of Guatemalan institutions. As the presence of the group becomes more widely known and their reputation grows, it will become increasingly difficult to meet all of the requests without detracting from the other project components. A method of prioritizing these requests as well as a method of insuring that the requests fall within the scope of the project will have to be developed and implemented.

A good example of this activity is assistance in pest diagnosis. Guatemala (DTSV) has a central pest-diagnosis laboratory and 2 regional labs, and has received an AID loan to develop several more regional labs. The CATIE team in Guatemala has been asked to advise DTSV on the further development of this pest-diagnosis network.

Conclusions and Recommendations

The CATIE IPM team in Guatemala has done an excellent job to date. They have formed strong relationships with a variety of relevant Guatemalan institutions, thus laying the groundwork for effectively delivering IPM research, training, and technical cooperation. Several recommendations are suggested to insure continued superior performance.

1. That the number of research activities be limited so as to remain within project resources and so as to insure that research quality is not affected by diluted efforts.
2. That some research effort be redirected towards designing economic criteria that will measure impact of project research activities and towards monitoring these criteria.
3. That steps are taken to insure that sufficient Guatemalan scientists are recruited within the next year for graduate study so as to meet that objective during the life of the project.
4. That a system be designed to insure that requests for technical cooperation fall within the scope of the project.

4. Honduras

In this country the projects with the Secretaria de Recursos Naturales, Ministerio de Agricultura, were initiated in January of 1986. Previous to this date, delays in the starting date were due first, to the hiring of the appropriate scientist to lead the different activities to be performed within this project which did not occur until January of that year, and second, to the political environment resulting from recent elections, and the commonly known institutional shuffle of personnel that takes place as the result of

newly- appointed authorities.

Research

The group of scientists and their assistants working in this project have compiled an inventory of the major pest problems identified in this country. Such a list was prepared in conjunction with the personnel from the Secretaria de Recursos Naturales from those pests that were explicitly identified by farmers as most injurious. Although the list has not been published yet, as required by one of the goals in this project, it is in the final stages of preparation and is expected to be completed in the near future. A subgroup of these pests was chosen to be the research subjects in this project.

In formulating this list of pests, by crops, losses due to yield reduction or damage have not been quantified or valued in economic terms. This is not an unusual result when dealing with pest management due to (1) the complexity of the problems involved in assessing these losses, and (2) because of the lack of appropriate and valid information. The review team did not observe any serious attempt to reach this goal established for the first two years. Thus, it is our recommendation that steps toward achievement of this goal should be taken in the near future.

Research experiments (Appendix E) that are being conducted in this country (28) were started during the second half of 1986 and are expected to terminate at the end of this year (19), in 1987 (6), in 1988 (2), and in 1989 (1). These studies include 6 crops (cabbage, pepper, maize, potatoes, rice, and sorghum) and one production system (maize-sorghum). There are 3 pests being analyzed in maize (Rottboellia exaltata, Cyperus rotundus, and Diplodia maydis), 3 in rice (Rottboellia exaltata, Cyperus rotundus, and

Pyricularia oryzae). 1 in soybeans (Rottboellia exaltata), 2 in cabbage (Plutella xylostella) and bacterial blight, Xanthomonas campestris, 1 in pepper (Anthonomus eugenii), 1 in potatoes (Phytophthora infestans), and 1 in the maize-sorghum crop system (Rottboellia exaltata). The selection of these pests and crops to work on was developed from educated perceptions and information held by extension personnel on which were the most important ones, indicating that the studies selected are valid issues and to a certain extent they are consistent with the objectives of this project.

Overall, the studies taking place are very interesting, quite appropriate, scientifically sound, and relevant to the needs and priorities of the farmers of the region; indications are that they will have a short-term payoff. Although these research efforts will contribute to some aspects of IPM, they should not be expected to provide the information required for an integrated pest management package.

Although IPM places a serious emphasis on the development of pest management strategies that are economically and environmentally sound, the projects reviewed indicated that a limited exchange of information, if any at all in some cases, has taken place that will insure an appropriate economic analysis of the results.

The results to be obtained will in the future contribute to the knowledge to be disseminated by extension personnel, and for a more rational use of inputs by farmers.

Since the experiments conducted in the country were selected, designed, and are taking place under the auspices of the agricultural institution from the host country, there is no doubt that as a first approximation they are filling the needs and priorities of this country.

The review team would like to make an observation in the particular study of Pyricularia oryzae in rice. The research taking place is geared to the collection and measurement of yield losses, and control practices that can be used against this pest. We felt that there were some basic flaws in the design of the experiment that need to be corrected before useful information can be obtained. For example, the test, designed to study the effects of varying levels of weeds as competitors with rice, simply looked at two levels--all or nothing. The number of weed-free plots within a larger plot merely increased the number of replications rather than changed the percentage of competition. To correctly assess weed competition, weed density per unit area should have been altered.

Training

CATIE/IPM has offered 12 workshops so far this year. Almost 100 percent of the staff from Sanidad Vegetal/SRN has participated in these courses. SRN regards highly the training assembled and offered by the IPM project. They consider that the training has been very successful, and that it should continue to be offered in years to come. They pointed out, however, that one of the most important limitations in the training of their professionals is the availability of technical materials and manuals that will help them in identifying key issues in crops and pests.

This institution hopes that in the near future IPM-CATIE would be able to offer training for their quarantine inspectors.

Technical Cooperation

It should be stressed that in the brief time that this project has been in effect, the project coordinator in this country has done a superb job in

reaching out and securing the participation of national institutions. The project has the enthusiasm and high motivation and support of professionals and technicians from the Secretaria de Recursos Naturales (SRN). In all instances, the review team was assured of the beneficial nature and influence of the IPM participants in the development of the research, training, and technical assistance components. Also, working relations have been established with the Escuela Nacional de Agricultura and the Instituto John F. Kennedy. With both of these institutions, the IPM team has established joint research projects that at the same time will serve as in-the-field learning and preparation for the students involved.

The review team observed that the IPM project participants did play a leading role in the development of the different projects in IPM, and that as a result from this leadership and assistance to the national institution a strong partnership has developed between these two entities. This should prove to be a very important factor in determining future cooperation and in increasing the integration efforts for a better use of the resources that each institution has.

The review team also found the national institution to be overly dependent on the participation of the IPM/CATIE-Honduras. Most, if not all, of the projects visited depended heavily on IPM funds to carry on the research. There are no indications of a serious commitment on the part of the SRN to provide adequately and timely needed operating costs. This is not the result of lack of interest on the part of the national institution, but the result of a very limited amount of resources available for its research activities. Thus, the IPM project has been playing a critical role by stepping in and solving some of these short term constraints that could

at any time jeopardize the results of the experiments.

Support of the IPM/CATIE-Honduras project is being constantly requested for the training of personnel at the national institutions. So far the work in this area has been excellent and extensive to many participants, and demands are being placed by the national counterparts for these services to continue in the future.

The SRN has demonstrated and expressed their need for assistance and support in the area of biological control. In this regard, they have acknowledged their need to send two experts to Mexico so they can learn and develop the appropriate technology to rear parasites that are needed in the control of citrus blackfly.

Similarly, they have placed the request for support in the implementation of a laboratory that is needed for the pest diagnostic network (as established in the objectives of the project), and also have requested the presence and help of a phytopathologist.

Both members that the team had the chance to meet were able to effectively communicate with their national counterparts. Similarly, among themselves they did work in a highly professional manner and interacted in almost an ideal way.

Although there exists communication between the members of the Hondurian and central team, it is possible and necessary to increase this cooperation and exchange of information. We feel that important improvements can be made in the area of research by truly integrating disciplines. This is an important issue and therefore extensive thought should be given to it. In our talks with the country coordinator we were assured that at the end of the 5th year a truly integrated approach to pest

management for the different crops studied could be achieved. This may be the case, however there exists the need to express so and to describe the process that will take place through time. Therefore, our encouragement to the country coordinator to rewrite the proposals for the studies that will take place and to describe when and how the integration of sciences, if any, will take place.

A second issue that we feel is lacking in the studies is the short vs. long-term view of the projects. In most of the projects reviewed we could not see a programming of activities that would take place in the long run. Projects are written as one-time or single-year projects, rather than the multiyear type of studies that they really are. It is not enough for the country coordinator to know what is going on, and what will be the future actions that he will take regarding the direction of the research to be performed. It is imperative that this issue be looked at carefully and expressed in writing so that the whole project can be reviewed and analyzed by in-house members of the team, and at the same time, so that comments and suggestions can be made towards the improvement of the overall project.

The previous issue brings up a third point that we feel needs to be addressed as well. Projects are being written with very little information and literature research. In many cases, exactly the same study was done in several locations and presented as separate projects. This has several disadvantages with regard to the alternative formulation of writing it as a single project that is replicated in several locations. For one, it has to be written as many times as locations are chosen, with no new information, and second, it does not show nor address the statistical value and insight

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information regarding the treatments and their limitations, that having the same experiment in different locations can provide.

Finally, we recommend that in the future, projects should have an in-house review by the central staff, and a discussion of their methods, materials, and objectives before they take place in the field. This will not only improve the quality of the research but will also tend to encourage the exchange of information with scientists from other disciplines.

The counterpart institution (SRN) has expressed their need for more materials with technical information, and manuals. Also, they have requested support for the development of posters and pamphlets that could be used in disseminating information already obtained on some pests. They observed that, albeit information is available in pest management, the available technology is not being transferred to farmers.

A complementary pest management project, funded by USAID/Honduras, operates out of Zamorano (EAP). Relations with this project have been strong. The CATIE team has provided technical assistance to the EAP project in areas in which they are lacking, particularly economics. The two groups cooperate in short courses, which are often held in EAP facilities. Scientists from the two projects have co-edited a Central American IPM text soon to be published by IICA. In summary there has been nothing but strong mutually beneficial interactions between the two projects.

The ineffectiveness of CATIE administrative back-stopping relative to procurement of goods and services, and financial management--as in other countries-- has been a critical issue in the development of the project. Every effort should be made to eliminate these administrative constraints on the functional operations of the project.

Conclusions and Recommendations

Although present research efforts will contribute to some aspects of IPM, they should not be expected to provide all the information required for an integrated pest management package. IPM places a serious emphasis on the development of pest management strategies that are economically and environmentally sound, and the projects reviewed indicated that a limited exchange of information, if any at all in some cases, has taken place that will insure an appropriate economic analysis of the results. Therefore, due to the complexity of the problems involved in assessing losses, and because of the lack of appropriate and valid information on yield reduction or quality damages several recommendations are offered to help alleviate these and other problems. These are:

1. That immediate steps be taken to assess the damage of major pests and to determine their economic impact.
2. That the country coordinator reduce the scope of his research program by establishing, together with the central team, priorities in crops, pests and locations. Because of the large number of projects in terms of crops, pests and locations, the review team feels that efforts on the projects may be so diluted that quality of the research will suffer.
3. That basic experimental designs be carefully reviewed, perhaps in consultation with the central team, to insure accomplishment of objectives. The review team would like to make an observation in the particular study of Pyricularia orizae in rice. The research taking place is geared to the collection of measurement of yield losses, and

control practices that can be used against this pest. We felt that there were some basic flaws in the design of the experiment that need to be corrected before useful information can be obtained.

4. That the IPM/CATIE-Honduras team should be commended for its performance in the areas of training and technical assistance. The project coordinator in this country has done a superb job in reaching out and securing the participation of national institutions. The review team observed that the IPM project participants played a leading role in the development of the different projects in IPM, and that as a result from this leadership and assistance to the national institution a strong partnership has developed between these two entities.

5. That increased communication take place between the members of IPM/CATIE-Honduras and the central team. We feel that important improvements can be made in the area of research by truly integrating the disciplines represented by the central team.

6. That the studies be viewed on more of a long-term basis. Projects are written as one-time or single-year projects, rather than the multiyear type of studies that they really are.

7. That in the future, projects should have an in-house review by the central staff, and a discussion of their methods, materials, and objectives before they take place in the field.

5. Panama

In Panama, the project was initiated in February, 1985 with IDIAP (Instituto de Investigaciones Agropecuarias de Panama) as the counterpart research institution and MIDA (Ministerio de Desarrollo Agropecuaria) as

the counterpart extension institution. As in other countries, the project was initiated with an evaluation of human and physical IPM resources, as well as of ongoing plant protection research. This was completed within 6 months of the project start.

Research

The CATIE team has established a vigorous research program in Panama and is actively trying to solve a number of pest problems in several crops. Results should have a favorable impact on pest management practices in Panama.

The important pests of Panama have been inventoried by reviewing pertinent literature and by surveying Panamanian scientists for their perceptions as to key pest problems in the country. The inventory has been published.

Selection of crops and crop systems seemed to be appropriate when the research projects were started as it was made on the basis of the pest inventory and the analysis of national plant protection resources and activities.

There is some indication that some Panamanian scientists feel that national IPM research needs and priorities are not now being met by the CATIE group. This is likely due in part to rapid personnel turnover within the cooperating national agricultural institutions, which may have resulted in unclear or inconsistent ordering of national priorities. The evaluation team recommends that the CATIE group periodically review their activities with IDIAP and MIDA to insure that these needs and priorities have been communicated correctly. Some research should be directed towards problems which require immediate attention and which will complement efforts to

increase Panamanian agricultural production. If this is not the case, then CATIE research activities may have to be modified accordingly, although every effort should be made to maintain continuity. Communications would also be improved if the CATIE project were housed in IDIAP, allowing for daily contact and interaction.

Losses to weed complexes in corn and sorghum are currently being evaluated, but loss assessments should also be made for other crop/pest combinations chosen by the CATIE team.

No on-farm experiments or farm-level surveys are being conducted and no IPM 'packages' are presently ready to be evaluated at this level. Tomato seems to be the crop most likely to have a package available within the duration of the project. It is not yet possible to judge whether the required number of control guidelines will be developed and delivered during the life of the project, although it is obvious that this will not occur if these guidelines are to be based on project-generated research results.

No research efforts are being directed towards socioeconomic aspects of IPM in Panama. Efforts should also be made to validate the importance of selected pests through assessment of farmer perceptions. Additionally some effort should be made to assess the impact of the team's research activity through carefully designed and monitored socioeconomic criteria.

The Panamanian team has established linkages with local research and extension institutions, and should be able to perform relevant local IPM research and deliver results to the appropriate entities. Strong relations have not, however, been established with the Faculty of Agronomy, University of Panama. University contacts in other countries have led to fruitful interactions both with faculty and student research projects, and to

the identification of students highly qualified for graduate training.

Research should eventually have a favorable impact on local IPM practices, but it is doubtful that this will occur during the life of the project. There is barely time to finish the needed research, let alone combine the results into acceptable IPM packages. It is not yet possible to judge whether the required number of control guidelines will be developed and delivered during the life of the project, although it is obvious that this will not occur if these guidelines are to be based on project-generated research results.

Training

Short term training has been excellent. The team seems to be well on its way to meeting its objectives in this area. Workshops in entomology, plant pathology and weed science have been well received and attendance has been good. Although the content of the training courses has been generally well received the evaluation team questions whether there was sufficient coverage of economic aspects of IPM. Four nationals have received in-service training in areas relative to local IPM needs.

Academic training has been weaker. No Panamanians have received scholarships for graduate training in IPM disciplines. The evaluation team encourages the CATTE team to continue efforts to establish ongoing contacts with University of Panama students and faculty similar to those that have been made with other national universities in other countries.

The proceedings of the workshops held in Panama have been published and distributed throughout the region. As these are valuable resources for all IPM scientists, every effort should be made to insure that similar documents are produced and distributed after all training events.

Technical Cooperation

Since objectives in technical cooperation have not been quantified, this is difficult to assess. The project team has made the appropriate contacts with local research and extension entities, thus laying the groundwork for such cooperation. The technical expertise of project personnel seems to have been accepted. It seems likely that the level of activity in this area will continue to increase and remain a significant component of the project. For example, to date, the country coordinator has performed several consultations in nematology. Project personnel have presented 18 technical papers at 12 scientific meetings.

Conclusions and Recommendations

The project had an excellent start in Panama, with initial institutional and pest inventories being performed rapidly and satisfactorily. Rapid turnover of national counterpart personnel has led to communication difficulties. The evaluation team recommends several steps to insure continued superior performance of the CATIE IPM team in Panama.

1. Project members meet with IDIAP and MIDA authorities to reevaluate, and if necessary, modify CATIE IPM activities. These parties should continue to meet periodically.
2. That efforts be made to expand work with personnel and students of the Faculty of Agronomy, University of Panama.

Appendix I. STATEMENT OF WORK

ARTICLE I - Title

Regional Integrated Pest Management (596-0110) Interim Evaluation

ARTICLE II - OBJECTIVE

The objective of this assignment is to have contractor carry out an initial interim (21 months) evaluation of AID/ROCAP Project No. 596-0110, Regional Integrated Pest Management (RIPM). The evaluation team will be expected to evaluate progress toward achievement of the project purpose and contribution to the project goal, to determine if the project purpose will be accomplished in the time frame established in the Project Paper, whether implementation plans are adequate to achieve the project purpose and outputs, and if the work in progress accurately reflects the implementation plan. The evaluation team will review the project Logical Framework document in detail, general implementation plan, and the current year's work plan in close consultation with the IMP project team, CATIE administrative staff, and ROCAP staff. The evaluation will also focus on project coordination, staff performance, and overall understanding of project purpose, goal, and outputs. The evaluation team will be expected to produce a final report presenting its findings and recommendations for possible changes in project design and direction.

ARTICLE III STATEMENT OF WORK

I. Project Purpose, Goal, and Outputs

A.I.D.'s Regional Office for Central America and Panama (ROCAP) is working with the Centro Agronomico Tropical de Investigacion Y Ensenanza (CATIE) to implement an Integrated Pest Management (IPM) project. The purpose of the project is to strengthen regional and national institutional capability to develop and implement effective integrated pest management in Central America and Panama (CA/P). The project will help to establish sound IPM programs aimed at reducing the deleterious effects caused by pest organisms to selected crop production systems in the region. The goal of the project is to help increase agricultural productivity in the Central American region and thereby enhance the living standards of rural families.

As noted above, the evaluation will assess progress toward achievement of the project purpose and contribution of the project to the program goal. In addition, the evaluation team will develop a monitoring and evaluation plan, using the model annexed to this Statement of Work, in order to develop specific information and data on an ongoing basis regarding project purpose achievement and goal contribution.

End-of-project conditions are as follows:

1. Permanent capacity at CATIE to provide appropriate and cost effective training and technical assistance in IPM.
2. National institutions and appropriate private sector groups in CA/P sensitized to the merits of IPM.
3. Improved technician capability for implementation of IPM in CA/P.
4. Better crop protection information made available to farmers in CA/P, including quarterly newsletter.

The project comprises three principal components: research, training, and technical cooperation. The research component focuses on selected pest-crop systems and the identification of appropriate IPM practices and promotion of the IPM approach to pest control. Training is being directed at public and private sector groups and individuals involved in crop protection research, extension and decision-making activities. The final component involves the provision of pest related information and diagnostic services to national institutions, private sector groups, and farmers. The creation of a regional information management center at CATIE is planned to organize and distribute technical information.

The project, which began in July 1984, has all its key personnel, except the documentalist, on board and has initiated activities in all participating countries (Costa Rica, Guatemala, Panama, Honduras and El Salvador). In November 1985, the project paper logical framework was amended by CATIE and ROCAP to better reflect desired outputs. The revised logical framework is attached as Annex A to this scope of work.

II. Additional Issues

The evaluation report should provide recommendations related to each of the subject areas outlined below in order to improve overall project performance, attainment of the project purpose, and sustainability/institutionalization at CATIE and among CA/P institutions. The evaluation team will work closely with the Directorate of CATIE, the head of the Crop Production Department, the RIPM project.

A. Project Outputs

1. Review the overall IPM project implementation strategy within the context of the revised project paper logical framework, implementation plans as outlined in the project paper, and the work plans for

the current year. Determine if the on-going and planned project outputs, as a whole, are realistically geared to achieve the project purpose in the prescribed timeframe and make a contribution to the project goal.

2. Assess the appropriateness of the planned research activities in achieving the project purpose, in terms of crops/cropping systems selected, major pest problems identified and targeted, relevance of research to the IPM approach, practicality of planned work in terms of relevance to extensionist/farmer's use of research findings, and relevance to participating countries' needs and priorities.

3. Evaluate the appropriateness of the project's graduate and short-term training programs, in terms of quality, content and overall relevance to IPM and crop protection needs in the CA/P region.

B. Institutional Strengthening

1. Assess the degree of the project's outreach efforts; its ability to generate interest and cooperation in national institutions; the extent of the demand for project services; its ability to provide technical assistance, transfer available pertinent information, and strengthen national counterpart organizations. Assess the degree of actual and planned project interactions with other programs at CATIE, regional and international crop protection organizations, and other IPM projects in the region.

2. Evaluate project staff performance and their ability to work and interact as an IPM team, in terms of their ability to understand project philosophy and objectives, and work as an inter-disciplinary team in attacking collectively perceived and targeted problems. Evaluate the degree of integration and cooperation between the country coordinators and the central team.

3. Examine the strategy of the project for identifying collaborating institutions/groups in the various countries and focusing short-term training and technical assistance on these groups/institutions, to the extent possible.

4. Examine the project's strategy for the development and dissemination of publications and training materials to meet the needs of educators, extensionists and other target groups.

5. Assess CATIE's strategy to develop a sustainable IPM program beyond the ROCAP IPM project completion date. Key questions to be analyzed include: is CATIE picking up key costs as per agreement; to what extent is CATIE obtaining, at an increasing rate, other resources to fund IPM activities; to what degree has CATIE defined the nature/level of its program in IPM beyond the PACD, does CATIE have a plan for charging for some of its services in IPM and is this feasible?

6. Make recommendations for improving the end-of-project conditions. Specifically, the team should define what level of institutional capability should be attained by the end of project by CATIE and national institutions (in terms of quality and quantity of human resources and any other relevant criteria and also identify the specific national institutions to be strengthened.

C. Project Management

1. Evaluate project management and coordination performance and its ability to keep the project purpose, goal and outputs in focus.

2. Assess the appropriateness of the current allocation of time of the project's human resources to the various project activities in accordance with the project purpose and outputs.

3. Review the nature and extent of involvement of non-project CATIE technical and administrative officials (i.e., Crops Department, Education Department, Directorate). Recommend areas of greater collaboration.

4. Assess the effectiveness of both CATIE and ROCAP administrative backstopping to the project as they relate to procurement of goods and services, financial management, progress reporting, approvals, etc.

III. Environmental Issues

A. Assess pesticide use to date under the project, its health and environmental impact (whether positive or negative), and compliance with A.I.D. procedures.

B. Recommend changes if necessary in product use and application procedures in order to improve health and environmental impact of pesticide usage.