



INTER-AMERICAN INSTITUTE FOR COOPERATION ON AGRICULTURE
PROMECAFE-ROCAP PROJECT



MID-TERM EVALUATION OF THE "REGIONAL PROJECT ON COFFEE PEST CONTROL"
(IICA/PROMECAFE-AID/ROCAP 596-0090)

SAN JOSÉ, COSTA RICA
SEPTEMBER, 1984

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INSTITUTO INTERAMERICANO DE COOPERACION PARA LA AGRICULTURA
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Estimado Ing. Palencia:

En cumplimiento del contrato de Consultoría celebrado entre la Dirección del Area Central del IICA y los suscritos Consultores, el día 27 de agosto del año en curso, con el objeto de prestar sus servicios profesionales conducentes a realizar una evaluación sobre la marcha del Proyecto Regional de Control de Pestes del Cafeto que desarrolla el IICA/PROMECAFE con financiamiento de AID/ROCAP (Proyecto N° 596-0090), los Consultores hacen entrega formal del Informe de la Evaluación mencionada en dos Volúmenes: Volumen I: Informe de la Evaluación, Volumen II: Anexos.

Los Consultores prestaron sus servicios profesionales materia de esta Consultoría entre el 26 de agosto y el 22 de setiembre de 1984, inclusive, en la Ciudad de San José, República de Costa Rica, de donde viajaron a los países de la región (Guatemala, El Salvador, Honduras, Nicaragua y Panamá) para completar los requerimientos del proceso de evaluación.

Los Consultores dejan constancia de su reconocimiento por el apoyo logístico y facilidades brindadas para realizar su trabajo a la Dirección General del IICA y a todo el personal de PROMECAFE.

Merecen especial muestra de aprecio y agradecimiento el Dr. Carlos Enrique Fernández, Director del Area Central y de la Oficina del IICA en Costa Rica; el Dr. Rufo Bazán de la División de Evaluación del IICA; el Ing. Rodolfo Martínez Ferraté de la Dirección de Análisis y Evaluación/IICA, quien acompañó a la Comisión en su gira por la Región y la asistió con sus

./.

INSTITUTO INTERAMERICANO DE COOPERACION PARA LA AGRICULTURA

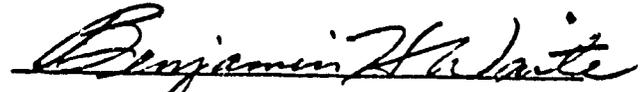
DESTINATARIO Ing. Aníbal Palencia O. HOJA No. -2- CODIGO

valiosos conceptos y sugerencias; al Ing. Aníbal Palencia O., Jefe de PROMECAFE quien asistió y acompañó a la Misión durante todo el tiempo, tanto en su gira por la región como en Costa Rica y sin cuyo apoyo hubiese sido muy difícil realizar el trabajo; a las señoras Flory Jiménez y Millsen Chaverri R., secretarias de PROMECAFE por su calidad humana, capacidad profesional y espíritu de colaboración.

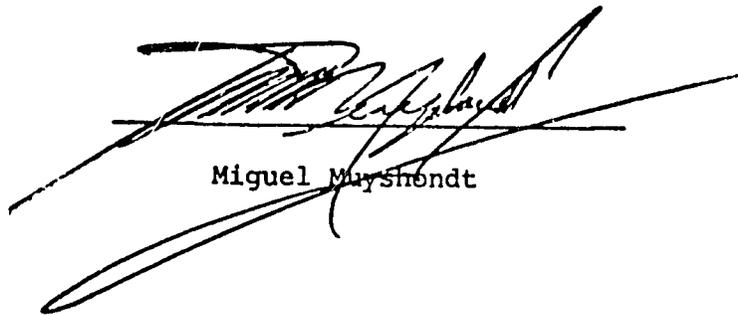
En fé de lo anterior, los Consultores firmamos la presente en la Oficina Central del IICA/PROMECAFE, ubicada en Coronado, San José de Costa Rica, a los veintiún días del mes de setiembre de mil novecientos ochenta y cuatro.



Richard A. Hamilton



Benjamín H. Waite



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PROJECT NO. 596-0090

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PROMECAFE AND ROCAP PROJECT PERSONNEL

- CARLOS ENRIQUE FERNANDEZ, Head of PROMECAFE until March 31, 1983. Presently Director of the Central Area and the IICA Office in Costa Rica.
- ANIBAL PALENCIA O., Head of PROMECAFE as of April 01, 1983, headquartered in Costa Rica.
- EDUARDO ANURADE M., Specialist in Agricultural Communication, responsible for training activities, headquartered in Costa Rica.
- JORGE HERNAN ECHEVERRI, Phytopathologist, responsible for plant breeding activities, headquartered in CATIE, Turrialba, Costa Rica.
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- ZIA U. JAVED, Phytopathologist, responsible for coffee rust activities, headquartered in El Salvador, as of January 29, 1983.
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- LUDWIG MULLER, Physiologist in CATIE, responsible for tissue cultivation activities, headquartered in Turrialba, Costa Rica.
- HUMBERTO GOMEZ P., Assistant researcher in plant breeding activities, headquartered in CATIE, Turrialba, Costa Rica, as of April 15, 1983.
- RAUL PINEDA, Coordinator of PROMECAFE in the Dominican Republic.

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COSTA RICA

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Ministerio de Agricultura y Ganadería
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Manuel Flores Berrios, Director General
Cecilia Gálvez, Departamento Fitopatología
Nelson Henríquez Chacón, Departamento Comunicaciones
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Zía Javed, Experto Fitopatólogo del Proyecto PROMECAFE/ROCAP

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HONDURAS

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AID/IHCAFE

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OFICINA IICA

Alberto Franco, Director
Edgar L. Ibarra, Especialista en Investigación Agrícola
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PROMECAFE/ROCAP

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César Estrada Riso, Secretario Técnico Dirección General

OFICINA IICA

Michel Montoya, Director

PANAMA

Ministerio de Desarrollo Agropecuario (MIDA)
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Alexis Bonilla, Jefe Departamento de Café

OFICINA IICA

Guillermo Guerra E., Director

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ACRONYMS

AID	Agency for International Development
ANACAFE	Asociación Nacional del Café, Guatemala
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza, Turrialba, Costa Rica
CEPI	Centro de Elaboración de Proyectos de Inversión, IICA
CICAFE	Centro de Investigaciones en Café, OFICAFE, Costa Rica
CIDIA	Centro Interamericano de Información y Documentación Agrícola, IICA
CIFC	Centro Internacional de Royas del Café, Oeiras, Portugal
CORECA	Consejo Regional de Cooperación Agrícola para Centro América, Panamá y República Dominicana.
GERDAT	Grupo de Estudios e Investigaciones para el Desarrollo de la Agricultura Tropical, Francia
IAC	Instituto Agronómico de Campinas, Brasil
ICAITI	Instituto Centroamericano de Investigación y Tecnología Industrial, Guatemala
IHCAFE	Instituto Hondureño del Café
IICA	Instituto Interamericano de Cooperación para la Agricultura
INMECAFE	Instituto Mexicano del Café
IRCC	Instituto de Investigaciones en Café y Cacao, Francia
ISIAP	Instituto Salvadoreño de Investigación Agraria y Pesquera
ISIC	Instituto Salvadoreño de Investigaciones del Café
MAG	Ministerio de Agricultura y Ganadería
MIDA	Ministerio de Desarrollo Agropecuario, Panamá
MIDINRA	Ministerio de Desarrollo Agropecuario y Reforma Agraria, Nicaragua

MRN Ministerio de Recursos Naturales, Honduras

OFICAFE Oficina del Café, Costa Rica

OIRSA Organismo Internacional Regional de Sanidad Agropecuaria

PROMECAFE Programa Cooperativo para la Protección y Modernización de
la Caficultura en México, Centro América, Panamá y El Cari-
be.

ROCAP Regional Office for Central America and Panamá, AID.

SEA Secretaría de Estado de Agricultura, República Dominicana

UFV Universidad Federal de Vicosa, Brasil

USDA Departamento de Agricultura de los Estados Unidos de América

PRESENTATION

In compliance with the terms of the Agreement between IICA/PROMECAFE and AID/ROCAP regarding the evaluation of the Regional Project on Coffee Pest Control (Project No. 596-0090), the Directors of the Central Area and of the IICA Office in Costa Rica engaged the professional services of three consultants to form an Ad-Hoc Committee for the mid-term external evaluation of the Project.

According to the Agreement, the Ad-Hoc Committee would evaluate Project 596-0090 in accordance with the following guidelines:

- a. To evaluate progress made towards the achievement of Project objectives.
- b. To identify and evaluate problem areas or restrictions hindering this achievement.
- c. To consider how such information could be used to overcome the problems or restrictions identified.
- d. To evaluate, insofar as possible, the Project impact on general development.

To carry out this evaluation, the Committee adopted a work plan including the following steps:

- a. Analysis of the frame of reference of the IICA/PROMECAFE-AID/ROCAP Project.
- b. Study and analysis of the "Documento Base Informativo y Analítico" relative to the design, objectives, and progress of Project 596-0090, which was prepared to assist and guide the Ad-Hoc Committee in the evaluation of the Project.
- c. Assembly and analysis of verbal and written information provided by national and international institutions and persons connected with the Project.
- d. Preparation of the final report of the Ad-Hoc Committee relative to the results obtained in the evaluation of IICA/PROMECAFE-AID/ROCAP Project No. 596-0090.

To implement the work mechanisms adopted, the Ad-Hoc Committee limited itself to the following terms of reference:

- a. Assemble and analyze verbal and written information required to develop the evaluation process.
- b. Travel to the different countries in the region to interview officials and technicians of institutions participating in the Project.
- c. Prepare and present the final report of the Ad-Hoc Committee in accordance with the plan adopted.

The Consultants composing the Committee rendered their professional consultancy services, subject of this document, to IICA/PROMECAFE between August 26 and September 22, 1984 in San José, Costa Rica, which was assigned as headquarters for these services.

The members of the Committee wish to express their deep appreciation to the executive, technical and secretarial personnel of IICA and PROMECAFE as well as to the Ministers, Vice-Ministers, national and international experts, Directors of IICA, AID and ROCAP Offices in the countries visited and Directors and technicians of CATIE and OIRSA for their cooperation and suggestions which made possible the preparation of this document within the period agreed upon.

1. INTRODUCTION

The January 1978 creation of the "Programa Cooperativo para la Protección y Modernización de la Caficultura en México, Centroamérica y Panamá (PROMECAFE)" is the expression of regional solidarity to strengthen the effort made by each country, by way of its national and regional institutions, to find the answer to social, economic and technical problems affecting coffee cultivation in the region.

All the countries involved in PROMECAFE aim to produce their own technology or try to adapt technology existing in other countries, carry out their own technological training and transfer programs and make enormous financial efforts to support their national coffee programs.

Coffee research, however, is not easy; it is expensive and requires continuity and follow-up, conditions which frequently fail in the countries included in PROMECAFE. The transfer of modern coffee technology is not easy because it requires special methodology due to the type of cultural practices and the type of producer dedicated to growing coffee.

Furthermore, there is a lack of technical and auxiliary personnel able to meet the needs of research and transfer of technology.

The fall in coffee prices in the international market has decreased the income of governments and increased the internal and external debt of the countries. Public expenditure has increased due to the sociopolitical problems affecting the region and the reduction in purchasing power of their currencies. In the face of this serious economic and financial crisis, national budgets for the strengthening of organizations and coffee programs have been affected, both in the countries themselves as well as in the region.

The Grant Agreement to donate US\$3.5 million dollars, signed by IICA/PROMECAFE and AID/ROCAP in June 1981 and which set up the Regional Project for Coffee Pest Control is being carried out within the context of cooperation and reciprocal assistance between the countries of Central America and Panama, taking advantage of the

Institutional capacity existing in the area to assist national institutions and to improve extension services so that research results can preferably be applied mainly by small coffee growers to improve their present social condition and to increase their income.

All the activities of the IICA/PROMECAFE-AID/ROCAP Project are aimed at obtaining an efficient and economic control of coffee pests especially rust and coffee bean borer, and to augment the productivity of small coffee farms with the purpose of increasing the income of this large social group.

The Evaluation Commission of the IICA/PROMECAFE-AID/ROCAP Project presents this evaluation document to comply with Section 5.1 of Article 5 in the IICA/AID Grant Agreement which states that an external evaluation of the Project must be carried out half way in its period of duration.

The Evaluation Commission hopes that this document will provide the countries, IICA/PROMECAFE and AID/ROCAP with guidelines to:

- a. Re-orient Project activities, if necessary, for the achievement of the desired product at the end of the Project.
- b. Validate the joint efforts of countries within the region to reinforce and consolidate research, training and transference of coffee technology.
- c. Decide if regional international cooperation must continue in order to follow up on activities initiated under the present Project, with the purpose of attaining the integral development of small coffee growers of Central America and Panama.

The experience, achievement, acceptance and credibility obtained by the IICA/PROMECAFE-AID/ROCAP Project in participating countries, up to the time of this report, allow us to foresee that its future activities will serve the purpose of strengthening what has already been done, broadening and deepening the objectives to achieve integral and integrated development of the countries of the region in general and of small coffee growers in particular.

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2. THE REGIONAL PROBLEM

2.1 Importance of coffee in the region

The countries participating in the IICA/PROMECAFE-AID/ROCAP Project (Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama) are eminently agricultural and in the majority of them coffee growing is the most important component of national revenue, and of income and employment in rural areas. It is estimated that coffee growing provides work to over 35 per cent of the total labor force in rural areas.

Characteristics of regional coffee growing are illustrated in the following tables.

Table 1. Extension, production and productivity

COUNTRIES	Area planted to coffee Ha		Average Annual Production Millions of 60 kg bags		National Productivity <u>2/</u> Kg/Ha
	Total	% of TLA 1/	Total	Exportable	
Costa Rica	114.264	22.4	2.1	1.9	1.102.7
El Salvador	188.492	10.5	2.8	2.5	891.3
Guatemala	255.500	9.0	2.7	2.3	634.1
Honduras	122.500	15.0	1.6	1.4	783.7
Nicaragua	103.949	9.5	1.0	0.9	577.2
Panamá	22.000	5.6	0.2	0.1	545.5
TOTALS	806.705	-	10.4	9.1	773.5

Source: Information provided by countries to Evaluation Commission.

1/ TLA= Total Land Area dedicated to Agriculture

2/ Productivity= $\frac{\text{Total Production}}{\text{Total Area}}$

Table 2 emphasizes the economic importance of coffee in the region by indicating the average annual volume of coffee exports by country, its average total value and its percentage relationship with the value of total exports, as well as revenue received by governments through taxes generated by coffee exportation.

Table 2. Economic importance of coffee in the region

COUNTRIES	Average annual volume of coffee exports (Thousands of (60 kg bags)	Value of Coffee Exports		Average revenue from coffee (US\$ mil-lions)
		Average Annual total (US\$ mil.)	Percentage of total exports	
Costa Rica	1.610.5	240.0	37.0%	32.0
El Salvador	2.746.4	513.2	71.2%	111.0
Guatemala	2.272.7	320.0	30.0%	30.0
Honduras	987.6	148.9	23.1%	20.0
Nicaragua	650.5	150.0	-	-
Panamá	66.9	11.8	5.0%	-
TOTALES	8.334.6	1.383.9	-	193.0

Source: Information provided by countries to the Evaluation Commission.

The general belief is that coffee production in the countries participating in the IICA/PROMECAFE-AID/ROCAP Project is in the hands of a few large growers. However, in reality there exist over 200,000 small coffee growers who are economically dependent on coffee growing. Nevertheless, the majority are low producers due to the absence of modern and adequate technology for the crop and the lack of economic and efficient control of pests and diseases that threaten coffee.

Table 3 shows that, at the regional level, 84.5 per cent of the coffee growers are small farmers, with farms measuring between 1 and 4 hectares; but their contribution to the total coffee production in the region only represents 23.4 per cent.

Table 3. Social importance of coffee in the region

COUNTRIES	Number of coffee growers			Average size of small farms (Has)	Ave. total production by small coffee growers (60 kg bags)
	Total	Small Coffee growers	Percentage of small coffee growers		
Costa Rica	48.534	39.278	80.9%	1.4 - 1.9	701.224
El Salvador	37.500	34.569	92.2%	1.0	341.250
Guatemala	44.500	42.000	94.4%	0.4 - 4.0	421.667
Honduras	40.000	36.173	90.4%	2.5	970.642
Nicaragua	60.000	40.000	66.7%	-	-
Panamá	18.000	17.949	99.7%	1.2	-
TOTALS	248.534	209.969	84.5%	-	2.434.783

Source: Information provided the Evaluation Commission by countries.

2.2 Dissemination of rust and broca in the region

Coffee rust (*Hemileia vastatrix*) first appeared in Central America in 1976, in the Republic of Nicaragua. Since then its presence has been reported in coffee areas of all the countries in the region with the exception of Panama.

The coffee bean borer (*Hypothenemus hampei*) was first detected in the Central American region in 1971, in coffee producing areas of the Republic of Guatemala. Subsequently and to date, the insect has been reported in coffee plantations of El Salvador and Honduras and there are no geographic or technical reasons to assure that it will not spread to plantations in Nicaragua, Costa Rica and Panama.

The extent to which coffee plantations are affected by rust and the coffee bean borer and the degree of distribution in the different countries included in the ROCAP Project vary greatly. However, if regional and national efforts are not made to control these pests adequately and economically and if an increase in production by small coffee growers is not achieved, their economic survival will be in serious danger.

There exist possible solutions to the problem, as has been mentioned in the "Documento Base Informativo y Analítico" prepared for the Evaluation Commission; also limitations existing in the countries of the region to meet the problem have been indicated in that document.

2.3 Main activities of the ROCAP Project (596-0090)

Taking these limitations into account, the ROCAP Project supports seven main activities that should contribute to minimize such limiting factors when the Project terminates in 1986. These activities are:

- a. Introduction of high yielding rust resistant coffee plants to enable the different countries to select two or three varieties for distribution to small coffee growers.
- b. Study of the biology, epidemiology and control of coffee rust with the purpose of determining the use of more appropriate fungicides, their dosage, time and number of applications and equipment to attain a more adequate and economic control of the disease.
- c. Study of the biology, epidemiology and control of the coffee bean borer to determine the best practices in order to combine, if possible, cultural practices with biological and chemical control.
- d. Analysis of residues for the recording and control of pesticides used in coffee with the purpose of developing uniform regional methods for this activity.
- e. Training of technical and auxiliary personnel from national coffee organizations with the purpose of overcoming the present shortage.

- f. Generation, development, adaptation and transfer of appropriate technology for the rapid and practical incorporation by small producers to increase their income through modernization of coffee growing.
- g. Development of a regional information system and a data bank that will serve as a technical reference source for personnel from countries participating in the PROMECAFE/ROCAP Project.

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3. INTRODUCTION OF HIGH YIELDING COFFEE PLANTS RESISTANT TO RUST

3.1 Objectives

Objectives of the PROMECAFE/IICA Project at CATIE, briefly stated, are:

- a. To develop rust resistant strains of coffee which can be substituted for susceptible cultivars now grown without sacrificing yield, quality or uniformity.
- b. To develop methodology and techniques to multiply and distribute rust resistant planting material as rapidly as possible to coffee producers of member countries.

3.2 Breeding and selection

Breeding and selection activities of PROMECAFE/IICA at Turrialba are being carried out competently under the leadership of Jorge Hernán Echeverri. Ludwig Muller is in charge of tissue culture research and development activities which include coffee. These activities are expected to play an increasingly important role in rapid propagation and dissemination of newly selected rust resistant phenotypes.

There are 150 + 10 accessions of *Coffea arabica* and related species at Turrialba which have been introduced by CATIE for use in the coffee breeding and selection program for development of rust resistant cultivars. These accessions consist of the following:

- a. Commercial cultivars with acceptable horticultural characteristics but little or no rust resistance.
- b. Rust resistant breeding lines and cultivars which are mostly natural or controlled crosses of *C. arabica* x *C. canephora* parentage.

These have been introduced from India, Brasil, Portugal and France in recent years.

- c. Advanced generation hybrids (CATIMOR x *C. arabica* cultivar), mostly in the F₃, F₄ and F₅ generations. Selections from this group which have good resistance to Race II of *Hemileia vastatrix* are being selected and tested for possible use as rust resistant cultivars. It is expected that from 2 to 5 of the best quality, highest yielding, most uniform of these advanced generation hybrid progenies can be released as new cultivars prior to the termination of the PROMECAFE Project in 1986.

It is considered that very selective, rather than a continuous introduction of germplasm resistant to rust is advisable, since most of the basic germplasm needed is probably already present in the coffee cultivar and germplasm collection of CATIE. If virulent new races of rust appear, or if outstanding new rust resistant cultivars are developed elsewhere, their introduction and testing by PROMECAFE would certainly be advisable. This is important because there is no guarantee that races of coffee rust, other than Race II, might not become a serious factor in the future.

3.3 Tissue culture and micro-cuttings

Vegatative propagation of new rust resistant coffee selections by tissue culture and micro-cuttings has certain advantages as well as limitations. Serious logistic and cultural problems may be encountered in transferring and establishing tissue cultured plants from the laboratories of CATIE to remote coffee growing areas in other countries. Careful studies are needed to determine how long this might take and the estimated cost per plant.

For small coffee producers in remote areas who have little training, capital, and transportation facilities, the cost of tissue cultured plants could become prohibitive. It could take considerably longer and cost several times more to produce tissue cultured coffee plants for transplanting in other countries compared to planting them in areas near the tissue culture laboratory where they were produced. The time needed to produce tissue cultured coffee plants, transfer them to another country, establish them in a nursery, and grow them to acceptable size for transplanting in the field during a

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rainy season, would take about 18 months. This is a logical estimate because it takes about the same time to grow comparable "concha" seedlings to the standard size for transplanting in the field. Massive asexual multiplication of selected coffee phenotypes by tissue culture to be planted on a commercial scale is not expected to have any appreciable impact on coffee production in the ROCAP area before the 1986 deadline of the present PROMECAFE/ROCAP Project. The mechanical support, or lack of it, from the adventitious root systems of tissue cultured coffee plants and micro-cuttings is also suspect, compared to the mechanically stronger root systems of seedlings. (Papaya and macadamia trees produced from cuttings and pine trees by tissue culture for commercial plantings have usually been unsuccessful because the poor anchorage and inadequate support resulting from a structurally weak root system causes the trees to lean over badly or fall). This problem needs to be critically evaluated in test plantings of asexually propagated coffee plants grown from micro-cuttings and by tissue culture.

3.4 Summary of the Turrialba breeding and selection program

The breeding program for resistance to Race II of *Hemileia vastatrix* has made good progress during the time the program has been in progress. It is presently anticipated that from 2 to 5 different Catimor rust resistant hybrid selections will be released in the 6 member countries by 1986. This will be done after in-country testing prior to release. They should be considered uniform enough to be released as cultivars in areas where rust is severe enough to warrant their substitution to replace the present rust susceptible varieties.

Further selection and testing can be expected to further improve quality, uniformity, and yield of these selected breeding lines now in the F_4 to F_6 generations.

Continuing objectives of the breeding program for rust resistance are to bring the newly selected rust resistant selections and/or cultivars up to yield, quality, and uniformity standards of *C. arabica* varieties presently used in Central America and Panama.

3.5 Future activity at IICA/CATIE

Variety development

Future activities at Turrialba beyond the 1986 termination of the present PROMECAFE Project should logically continue the selection, progeny testing, and inbreeding programs with the best preliminary rust resistant selections. Such continuing activity would be aimed at improving quality, yield, and uniformity of the new rust resistant strains and progenies which have only been under development and testing for 5 years or less.

Tissue culture

Tissue culture and micro-cutting work for rapid multiplication of rust resistant strains and progenies is in a preliminary stage. It needs to be continued well beyond the present project deadline to expect an impact on future production of coffee in the member countries of Central America and Panama.

Up to now the stated objective and proposed program of reproducing large numbers of promising selected rust resistant phenotypes from *arabica* and *robusta* hybrids by tissue culture and micro-cuttings has not been fully activated. If activated, it is not expected to have an impact on the operations of coffee farmers with small acreages until after 1986.

The laboratories, technicians and Director of the CATIE tissue culture facility are, however, adequately trained, competent, and able to produce tissue cultured plants in quantity when required and the program is put into action under the PROMECAFE/IICA Project.

4. BIOLOGY, EPIDEMIOLOGY AND CONTROL OF COFFEE RUST

This phase of the project was designed to accomplish two general objectives:

a) a basic understanding of the epidemiology of coffee rust disease, including obtaining information on rust races and b) the selection of appropriate fungicides, their dosage, frequency and time of application.

As with other components of the ROCAP/PROMECAFE agreement, the responsibilities for implementing these objectives was largely assigned to OIRSA. However, because of this organization's incapacity to carry out these studies, it was deemed necessary to assign the Senior Plant Pathologist to IICA, El Salvador where he was to work closely with ISIC, using the field, greenhouse and laboratory facilities of that institution.

Personal interviews and technical reports from the IICA Senior Plant Pathologist, Zía Javed, and the ISIC Plant Pathologist, Cecilia Galvez, form the basis of the evaluation of the plant pathology effort at this point in the Project. It should be pointed out that from 1980 until the end of 1982, ISIC developed a series of sub-projects to obtain information on rust races, epidemiology of the fungus, and fungicidal control.

With the arrival of the IICA/PROMECAFE Senior Plant Pathologist early in 1983, four new sub-projects were initiated. The IICA Senior Plant Pathologist was almost entirely responsible for the development and implementation of these sub-projects which were incorporated into the goals of the Department of Plant Pathology, ISIC.

At the present time, the sub-projects underway at ISIC, El Salvador under the direct monitoring of PROMECAFE, are as follows:

- 1) Evaluations of fungicides and their dosification under laboratory conditions.
- 2) Field evaluation of fungicides of various formulations with 50% copper as the active ingredient.
- 3) Frequency of applications of copper fungicides.

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- 4) Epidemiological studies of rust under conditions of low altitude in El Salvador.
- 5) Determination of the optimum dosage of three sources of copper for the control of rust.
- 6) Evaluation of three systemic fungicides sprayed alone and alternatively with 50% copper oxychloride.

The preceding studies, initiated in 1983 or 1984, are planned for a minimum period of two to four years, depending on particular objectives. Also planned for 1984 are epidemiological studies under highland conditions in El Salvador.

Dr. Javed has recently reported in detail on research programs planned or underway in the study of rust epidemiology and control (See Annex No.4: "Study of Epidemiology and Control of Coffee Rust in Central America").

In addition to work carried out in El Salvador, comments are made concerning on going studies in Guatemala, Nicaragua, and Honduras. Procedures are given for studying biology and epidemiology of the rust fungus, recording disease incidence and progress, and obtaining meteorological data. The methodology for field evaluation of fungicides for rust control in these four countries is also given as well as that for evaluation of new fungicides in the ISIC laboratory.

Current on-going PROMECAFE Projects under supervision of the Senior Plant Pathologist are summarized as follows:

4.1 Epidemiological Studies

1. El Salvador (low altitude)
Initiated Oct. 1983
2. Guatemala
Initiated June 1984
3. Nicaragua
Meteorological equipment not yet received
4. Honduras
Initiated 1982 by IHCAFE

4.2 Chemical Control Studies

1. El Salvador

- a. Field evaluation of seven 50% copper formulations initiated June 1983.
- b. Development of different spray programs
Initiated June 1983
- c. Evaluation of different dosage of three commercial copper fungicides.
Initiated May 1984
- d. Evaluation of three different systemic fungicides
Initiated May 1984
- e. Laboratory evaluation of different fungicides
Initiated July 1983
(Note: of the above five programs, the last three are scheduled to be terminated by 1986).

2. Guatemala

- a. Field evaluation of 50% copper formulations
Initiated May 1984
- b. Development of different spray programs
Initiated May 1984
(Note: Both of these programs are scheduled to be terminated by 1986).

3. Nicaragua

- a. Field evaluation of 50% copper formulations
Initiated June 1984
- b. Development of different spray programs
Initiated June 1984
(Note: both of these programs are scheduled to be terminated by 1986).

4. Honduras

- a. Field evaluation of three 50% copper base commercial fungicides
Initiated in May 1984.

(Note: This program is scheduled to be terminated in 1986).

4.3 Comments and recommendations

The assignment of the Project Senior Plant Pathologist to IICA, San Salvador with most of his time spent at ISIC where he has been able to work in close cooperation with the pathology effort of that institution has resulted in a well organized and effective plan for epidemiological studies and rust control trials. The facilities and personnel available at ISIC have resulted in basic biological studies being carried out at that center.

Dr. Javed has logically contributed more time to El Salvador than to the other countries in the Project. However, for the remainder of the project, it seems advisable that more time be devoted to the other countries in the capacity of advisor and to monitor the field trials, especially in Honduras. Regret was expressed in Honduras that Dr. Javed has not been able to spend sufficient time with IHCAFE personnel. Because of lack of sufficiently trained pathologists in Guatemala and Nicaragua, it is important that Dr. Javed continue to maintain closer relations with these countries. It was the impression of the evaluation team that Nicaragua has good relations with the Senior Plant Pathologist. However, because of delays in establishing the rust epidemiology and control studies there it is imperative that future contacts be even closer in order to effectively terminate Project activities by 1986.

Although the Senior Plant Pathologist has visited Costa Rica since the discovery of rust there in December 1983 and has maintained contact with the Ministry of Agriculture Office of Coffee (MAG-OFICAFE), no coordinated program between Costa Rica and the ROCAP/PROHECAFE Project has been established to date.

(Reasons for this are discussed elsewhere in this evaluation). With the apparent increased interest by OFICAFE in cooperating with the Project, however, it is imperative that Dr. Javed maintain closer personal relationships.

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Assuming that the Project continues to proceed and develop at its present scheduled pace, we must consider the anticipated results at Project termination in 1986. The ISIC Plant Pathologist estimates that about 80% of the six sub-projects will be successfully completed by that date. Although field experiments may be terminated by 1986, the analyses of data is not expected to be finished until later.

ISIC delays have been due largely to restructuring of the Ministry of Agriculture and Livestock, which resulted in 1982 in reduction of human and material resources in PROMECAFE, delays in receiving laboratory and field equipment, lack of technical and auxiliary personnel, and changes in the sociopolitical situation in the country which has impeded the general implementation of research plans. The lack of a greenhouse, principally for epidemiology and rust control studies, has resulted in delays in the preliminary evaluation of fungicides which permits the more rapid selection of products without having to go into field trials. Fortunately, a contract for greenhouse construction has been signed and it is hoped that facility will be operative by 1985.

Delays in field evaluations in all countries have also undoubtedly been due to lack of proper spray equipment and spare-parts, a situation which can only be partially improved over extended periods. The entire spray technology program, however well planned, is difficult to carry out within a specific time schedule due to numerous delays over which the Project may have little or no control.

Based on meteorological data obtained in the various countries the Senior Plant Pathologist believes it should be relatively easy to classify all coffee growing areas in Central America into three categories of rust incidence:

- a. Minor incidence, not effecting coffee production
- b. Moderate incidence in most years, occasionally serious
- c. Severe incidence in all years

In areas of the first category no chemical control may be necessary. However, modifications in cultural practices, including shade, spacing, and pruning of

coffee plants may be important in reducing rust incidence and should be incorporated into field studies in appropriate areas for the remainder of the project. Dr. Javed believes the second category is likely to include the major part of the coffee growing areas of each country. In these zones use of fungicides is probably the major means of control, but modifications of existing farm management practices may also be important.

The third category will depend more on fungicide applications but cultural modifications should still be considered.

5. STUDIES ON THE BIOLOGY, EPIDEMIOLOGY AND CONTROL OF COFFEE BEAN BORER (BROCA)

Research activities, control methods, and life cycle studies of the broca beetle, *Hypothenemus hampei*, have not yet received adequate attention and thus have not progressed to the point of widespread control efforts.

Coffee bean borer infestations have been found in El Salvador, Guatemala and Honduras, but not in Panama, Costa Rica or Nicaragua.

A critical deficiency in broca control efforts and activities of the PROMECAFE/ROCAP project is the lack of a trained entomologist to fill the vacant position of Coffee Entomologist, authorised for the project. Qualifications required for the position have made recruitment difficult, especially as regards experience with coffee and coffee pests. Because of this, broca research has not received attention due and efforts needed in detection and control of broca. As a consequence many, or most of the objectives and research activities have not been carried out or continued.

5.1 Broca control efforts

Zifa Javed, Senior Pathologist of the Project, has had considerable experience with coffee bean borer in Kenya and is now in charge of broca control in the Project area. He has recommended field control of broca through shade reduction, clean culture practices, and field sanitation measures. This program is designed to keep broca populations at an acceptable level of control.

Experiments in the use of spray materials for field control of broca were carried out in Guatemala and Honduras by Freddy Alonzo Padilla, PROMECAFE/ROCAP Entomologist from 1981 to 1983, using a variety of spray materials including Thiodan (endosulfan). His experiments with Thiodan demonstrated that thorough and timely applications of these materials can provide good field control by reducing populations of broca by more than 90 percent. He advocated use of these materials, together with shade clean culture and harvesting, and disposal of off-season and fallen coffee cherries infested with

broca. His experimental work has provided a background for future broca control studies. Although residue tolerance levels have not yet been established for Thiodan in green coffee beans, this product is being used for broca control.

The possibility of biological control of broca by the fungus *Beauveria bassiana* has also been explored in El Salvador and Guatemala. Importations of this fungus have been made but control efforts have not progressed much beyond the laboratory stage.

OIRSA was expected to furnish much of the basic research studies on the biology, life cycle and field control of broca. To date, however, OIRSA has been unable to accomplish stated objectives because of limited staff, budget limitations and lack of laboratory facilities. This has slowed progress in broca detection and control in most member countries.

5.2 Impact of PROMECAFE/ROCAP project on broca control

The principal impact of the PROMECAFE/ROCAP project on broca control has been in the introduction, testing and promotion of clean culture, field sanitation, shade management and use of effective chemical spray materials such as Thiodan (endosulfan). Judicious and thorough use of these materials and methods can appreciably reduce breeding populations and limit the spread of coffee bean borer. The former Project Entomologist and the Project Plant Pathologist have both been active in introducing testing and promoting control measures.

Prospects for eradicating this pest are remote but widespread use of sanitation and clean culture techniques, plus the development, testing, and clearance of cheaper, more effective insecticides, could enable coffee growers to limit the size of breeding populations of broca more effectively in the future. Because of the seriousness of the broca problem in Central America, control work should undoubtedly be continued beyond the time limitation of the present PROMECAFE/ROCAP project.

5.3 Summary

The most practical control of coffee bean borer is presently through clean culture, and field sanitation methods and practices. These measures should consist of collecting and disposing of over-ripe and off-season crop as well as cherry coffee which has fallen to the ground. Pruned branches and other plant residue should also be removed from the field and disposed of. These clean culture methods, disposal of infested cherry coffee, and reduction of shade, presently appear to be the most practical method of controlling broca by reducing population levels in infested areas of Guatemala, El Salvador and Honduras.

6. RESIDUE ANALYSIS FOR CONTROL AND REGISTRATION OF PESTICIDES USED IN COFFEE

As defined in the ROCAP Project Paper "This component will seek to develop a system, acceptable to the regional and national entities, for the analysis of pesticide residues and establishment of standards for use and registration of pesticides in coffee production".

Under the terms of the Project Grant Agreement between USAID and IICA, OIRSA was identified as the principal institution responsible for this component of the Regional Coffee Pest Control Project. Because of internal problems explained elsewhere in this project evaluation OIRSA has been unable to comply with any aspect of these responsibilities. Accordingly, the services of a consultant-expert in pesticide chemistry and residue regulations were requested by PROMECAFE in February, 1984. Mr. J. C. Cummings, retired chemist specialist in this field of activity was contacted through AID/Bureau of Science and Technology to evaluate this component of the Project June 17-30. His report with recommendations was submitted to IICA, Washington, D.C. upon completion of the evaluation.

6.1 The J. C. Cummings report

A summary of the Cummings report is as follows:

Findings and recommendations

a. Laboratory capabilities

Four laboratories were identified in the Project area with the capability for residue analyses.

These are:

- a) The University of Costa Rica
 - b) The Central American Institute for Research and Industrial Technology (ICAITI), Guatemala.
 - c) The National Center of Agricultural Technology (CENTA), El Salvador.
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d) The Salvadoran Coffee Research Institute (ISIC), El Salvador.

The profiles of these laboratories with comments on their capabilities were summarized in the Cummings report and are presented in Annex No.2.

b. Present regulatory status of fungicides of interest

Copper oxychloride has a general exemption from the requirement of a residue tolerance on all agricultural commodities in the USA. With the exception of one product none of the systemic fungicides presently under research use or consideration for possible future experimentation in the control of rust or other coffee diseases have US tolerance or Codex Alimentarius MRLA (maximum residue limits) for coffee. These are Sicarol, Tilt, Vitavax, and Calirus. Bayleton, the most promising systemic fungicide for use on coffee, has a temporary Codex Alimentarius limit of 0.1 m.q./kg. A petition is also pending in the Environmental Protection Agency (EPA) of the US for a tolerance of 0.05 ppm of Bayleton (triadimefon) in coffee beans.

c. Present regulation status of insecticides of interest

There is no official US tolerance or Codex Alimentarius MRL for endosulfan, the insecticide of most interest in the control of coffee broca in coffee beans. However, other insecticides do have US and/or Codex tolerances for coffee beans. These are carbofuran (0.1 ppm), diazinon, (0.2 ppm) and aldicarb (0.1 ppm).

d. Surveillance in the US for residues on imported coffee beans.

The number of coffee bean shipments sampled annually at ports of entry in the US, between the years 1977-1983, varied between 30 to 40. Residues found were mostly the common chlorinated insecticides and malathion. No shipments in this period were rejected due to pesticide residues.

e. Cooperation of manufacturers in the petitions for US tolerances on coffee beans.

Establishment of residue tolerances for coffee beans will require the active participation of the manufacturers. Data supplied by the latter

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would include information on chronic toxicity, oncogenicity, mutagenicity, teratogenicity and acute toxicity; all are data required by EPA for the establishment of tolerances.

f. Protocol for residue trials.

A protocol is offered for residue trials in the field based on the understanding that agricultural practices are fairly uniform in the countries involved in the ROCAP-PRÓMECAFE project. These take into consideration differences between highland and lowland coffee with respect to harvest seasons, methods of spray applications, spray dosages, and interplanting with other possible food crops which may be sprayed (e.g., bananas).

A program is presented for the implementation of the residue trials under the supervision of the Project Plant Pathologist as well as the Entomologist, in the event that such a person will be contracted. Three representative countries should be selected in which trials are to be carried out. It is suggested that two test sites in each country representing lowland and highland conditions be selected. These should be near the laboratories where the residue analyses are to be performed. Plot designs are proposed, appropriate dosage rates recommended, sampling procedures elucidated, and analytical methodology references are given. In this regard, it is strongly advised that analytical methods should be fully evaluated in each participating laboratory before analyses of test samples.

Furthermore, the laboratories should be part of the quality assurance programs supervised by the USAID contract laboratory at the University of Miami, Perrine, Florida.

Since paraquat is widely used in coffee plantations in the project area, it is suggested that coffee bean samples be obtained from plantations with a known history of paraquat use and that contact be made with the University of Florida facility for sample analyses. Also, the earlier reports of lead residues, as a result of contamination of that element in copper fungicides, should be further investigated. Although elimination or restriction of the use of lead arsenate to control rooster eye

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disease ("ojo de gallo") has in general been affected in Central America, some lead residues in coffee beans may occur as a result of past or continued use of this fungicide.

g. USAID assistance in residue analyses and training of chemists

Through AID/Bureau of Science and Technology support, assistance in residue analyses should be sought from the University of Miami, Perrine Training Center where ROCAP/PROMECAFE chemists can receive additional training.

6.2 Acceptance of the Cummings report and recommendations

The findings and recommendations of this report were turned over to the Plant Pathologist of the ROCAP/PROMECAFE project and were received without reservation. Dr. Javed and Gloria Cecilia Galvez, Senior Plant Pathologist at ISIC, El Salvador have greatly appreciated the assistance of Mr. Cummings and are prepared to follow his recommendations as stated in the consultancy report. They are currently in process of choosing residue evaluation sites and intend to maintain future contacts with Mr. Cummings through ROCAP and AID/Science and Technology, Washington, D.C.

6.3 Recommendations

It is recommended that the Project Plant Pathologist and Entomologist (as soon as he is active in the Project) accept the report of Mr. Cummings in full, and proceed as soon as possible with the residue analyses. Based on the Laboratory Profiles described in the report (Annex No.2), as well as the personal knowledge of the facilities on the part of several members of the evaluation team, it is recommended that the facilities at ICAITI, Guatemala and CENTA, El Salvador be selected as the two laboratories in Central America where all residue analyses should be carried out. This would insure the quality of the assessments through the exchange of samples as well as back-up support capability.

If residue analyses are initiated at an early date (late 1984) the objectives of developing residue and tolerance data for the uniform registration of pesticides should be attained by the termination date of the present ROCAP/PROMECAFE project. It is also recommended that cooperation of the manufacturers

of the pesticides to be used in the project be requested as soon as possible through AID/ROCAP and AID/Science and Technology. If it is impossible for AID to obtain cooperation from a manufacturer in obtaining specific information data on a product it is recommended that the product it is recommended that the product be eliminated from residue field trials and its use in the control of coffee diseases be discouraged in Central America and Panama.

When residue analyses have been obtained from the three countries involved in this activity, PROMECAFE/OIRSA, in cooperation with ICAITI and other national groups should proceed with the planning of seminars and short courses on the needs and procedures for standardization of regulations and registration of pesticides. Manuals on pesticide use should also be developed.

Since the future participation of OIRSA in residue analysis and establishment of standards for use and registration of pesticides in coffee production remains uncertain, it is recommended that the Project Plant Pathologist and Entomologist, in close cooperation with ISIC, continue to take responsibility for this phase of the project. If OIRSA is in the position to assume some of the responsibilities, its participation should be agreed upon only after consultation with the Project Plant Pathologist and Entomologist.

7. TRAINING OF TECHNICAL AND AUXILIARY PERSONNEL

7.1 Basic concepts

There are two basic training concepts upon which the Project takes action:

- a. The concept that problems of rust and coffee bean borer can only be successfully overcome by means of integrated technology for coffee growing; and
- b. the concept that such technology in the countries participating in the Project is a process that can only be completed if national coffee organizations have personnel trained to overcome these problems. This means that training must not be considered as an isolated and occasional action but should be seen as a dynamic and permanent process.

7.2 Actions performed

In its first stage, the Project has tried, together with the participating countries, to solve the most urgent and immediate training needs of their technical personnel, on the following subjects:

- Modern coffee growing
- Communication and transfer of technology
- Coffee rust control
- Handling of equipment used in rust control
- Rural administration and micro-economics with emphasis on production costs.
- Technical writing
- Research methodology
- Coffee bean borer and its control
- Coffee processing
- Coffee grading
- Sampling, statistical design and handling of research data

- Educational support materials in coffee growing
- Coffee plant physiology
- Area profiles

Training activities for technical and auxiliary personnel from the countries have included:

- 1) National and regional courses, of six, two and one-week duration;
- 2) Symposia on coffee growing to allow the exchange of research findings and experiences in the area;
- 3) In-service training, short courses, field trips and lectures;
- 4) Special studies on rust at CIFC, Oeiras, Portugal and at UFV in Brazil

7.3 Proposed actions

Although the training carried out has been successful within the Project, the Coordinator for the activity feels that the following areas should be strengthened:

- a. Improve the continuation of training offered in the countries.
- b. Encourage the countries to prepare training plans for their technical personnel, with short, medium and long-term objectives and goals.
- c. Appoint national training teams in each country in order to achieve a multiplying effect of Project actions and which, at the end of the Project, will continue training national personnel.
- d. To encourage national coffee organizations and programs to support post-graduate training for their most outstanding technicians.

In addition to the above, it is necessary that personnel be trained in technology validation and transference methods, thus reinforcing the human, social and economic concept in the modernization of coffee growing. Also, formal training of technicians should be reinforced in the areas of biology, epidemiology and control of the coffee bean borer.

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It is expected that at the termination of the Project, the principle of training as dynamic and permanent process will have been fully accepted and integrated into the action concept in all the countries of Central America and Panama.

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8. DEVELOPMENT, ADAPTATION AND TRANSFER OF APPROPRIATE TECHNOLOGY FOR COFFEE GROWING

8.1 Objectives

The objectives of this activity are:

- a. To develop technology appropriate to the conditions and characteristics of small and medium-sized producers, which will permit the transfer and adoption of the better options, including recommendations from other project activities.
- b. To train technicians from coffee institutions in the design and execution of these methods.

8.2 Actions performed

To date, actions carried out may be summarized as follows:

- a. Analysis of systems of technical assistance in coffee, in Panama and Guatemala.
- b. Specific advisory services were rendered to ISIC in El Salvador on publications, to ANACAFE in Guatemala on courses for overseers, to IHCAFE in Honduras on training, extension, publications and radio broadcasting.
- c. In the matter of training, between 1981 and 1982 two courses were offered to all technical personnel of ANACAFE in Guatemala and an International Workshop on Methodology for the Transfer of Technology was held.

In May 1983, a Regional Meeting to review educational aids for coffee growing took place in El Salvador.

- d. During the last quarter of 1983, action was initiated to characterize coffee growing production systems in Honduras and El Salvador by means of a regional workshop on the subject.
- e. Some results obtained from the description of production systems are:

- Listing of determinants and variables to be considered in the characterization of the coffee production systems.
- Organization, analysis and preparation of output charts with respective information from secondary sources.
- Structure of output charts to include information from primary sources (field survey).
- Definition of criteria for the selection of the Pilot Areas and their location: southwest of the Department of La Libertad (El Salvador) and Comayagua (Honduras).
- Design and selection of the sample: 176 growers (small and medium-sized) in El Salvador.
- Design and structuring of the questionnaire for field work.
- Preparation of instruments to manage the questionnaire and conduct the survey in each country.
- Design the answer sheet used in Honduras
- Prepare work routes in the areas to be surveyed.
- Organization and training of technicians in the management of the survey and field work and a document to support and direct this work.
- Re-structuring of output charts for information from primary sources.
- Carrying out 176 interviews in El Salvador and 379 in Honduras.
- Sixteen preliminary documents in El Salvador.
- First draft of five documents for Honduras.

8.3 Future action

Phase III To arrange problems encountered in the diagnosis according to priorities for solution by means of research and/ or validation and their combination with the coffee technology that is to be made public and transferred to producers.

Phase IV To design and execute plans to transfer appropriate coffee technology to growers.

Phase V To evaluate the methodology

These actions would allow, at the end of Phase V, the combination of a plan to produce, adapt and transfer technology with the "Technological Model" that institutions in each country could include in their work systems with groups of producers. This model is directed toward the integration of researchers and extensionists, with the participation of farmers; in the process of modernizing coffee growing.

8.4 Comments and recommendations

The methodology to describe the coffee growing system (area profile) for the transfer and validation of technology to small coffee planters seems to be a positive step and should be made available to the remaining countries.

Initial objectives and the original model for transfer must be revised in view of the crisis affecting the countries, which has forced a personnel reduction in counterpart institutions, has enforced a reorganization of these institutions, and changed conditions of the producers themselves.

The "friendship and study groups" method that is being developed in Guatemala also seems promising and the possibility of introducing this method in other countries should be considered, since the work group approach is essential for a massive transfer of modern technology in coffee. A meeting of multidisciplinary technicians in the region to discuss this matter would be feasible.

9. DEVELOPMENT OF A REGIONAL INFORMATION SYSTEM AND DATA BANK

The IICA/PROMECAFE-AID/ROCAP Project considers the creation of a documentation and information service as one of its activities to promote and strengthen the exchange of experiences between coffee research technicians and institutions from countries participating in the Project and other similar personnel and organizations not included in the region.

At present, progress of this activity has been very slow and it has not brought about significant achievements to benefit the countries.

Nonetheless, IICA/PROMECAFE engaged the services of a Consultant to define a strategy that will allow the implementation of this activity within the time left until the termination of the Project. The Consultancy report was submitted to PROMECAFE and is included in this report as Annex No. 3.

It is essential that PROMECAFE, to the extent with the cooperation of IICA/CIDIA, study and decide upon the implementation of a plan of action to carry out this activity before the Project terminates.

10. INSTITUTIONS COOPERATING WITH THE PROJECT

For the execution of the IICA/PROMECAFL-AID/ROCAP Project it was considered best to work within the institutional framework existing in the Region and not to create a new structure for the development of the activities.

Since CATIE and OIRSA are signers of the "Agreement to Create PROMECAFE" and some aspects of the ROCAP Project fall within the areas of interest covered by these organizations, they were considered competent to cooperate in the execution of parts of the ROCAP Project and, consequently, specific "Operational Agreements" were signed with each institution.

10.1 OIRSA

In the Operational Agreement between IICA and OIRSA, this organization is in charge of activities related to rust, coffee bean borer and pesticide residues. In reviewing the terms of the Agreement and analyzing the results obtained from the exchange of impressions held by the Evaluation Commission with the Executive Director and technical personnel of OIRSA, it became clear that the terms of cooperation do not conform to the real situation of OIRSA and, therefore, its participation in the ROCAP Project can not be expected to be outstanding.

During the interview it was clearly established that OIRSA should review the terms of the Operational Agreement with IICA and should present, as soon as possible, a new proposal that would permit its real and effective cooperation for the remainder of the ROCAP Project.

The Evaluation Commission believes that the areas of cooperation in which OIRSA could be involved are the coordination and supervision of the pesticide residue analyses and the preparation of uniform local regulations for the registration and control of pesticides used in coffee at the regional level, cooperation in the training of technical and auxiliary personnel in the region and in the development of a regional information system and data bank.

10.2 CATIE

The Operational Agreement signed by IICA and CATIE considers the execution of activities relevant to the development and reproduction of coffee varieties resistant to rust and training of technicians in coffee.

In reviewing the terms of the Agreement and the action performed by CATIE, it may be said they have been effective in terms of logistic support and only partly so in aspects of technical personnel.

With the purpose of securing a more active participation, it is considered timely and necessary that CATIE:

- a. Clearly define the future of tissue cultured coffee plant production and the functioning of the currently operating laboratory designed for this purpose.
- b. Express its view on the future of the Coffee Germplasm Bank with respect to its adequate maintenance and use. The Bank has been enriched by new cultivars introduced by PROHECAFE, as well as from experimental field projects that are being carried out to evaluate introduced coffee genetic material.
- c. Reinforce its training activity by re-initiating actions that previously permitted CATIE to grant a Master's degree with specialization in coffee.

11. DURATION, RESOURCES AND FUTURE NEEDS OF THE PROJECT

11.1 Duration

The contract between the United States and IICA was signed on June 5, 1981 for a five-year period, until May 31, 1986. However, IICA/PROMECAFE-AID/ROCAP Project activities were only initiated during the first months in 1982 since the first financial disbursement was received on December 31, 1981.

11.2 Resources

Resources for Five Years of the Project (in 000 dollars)

Source	1981	1982	1983	1984	1985-86	TOTAL
-AID/ROCAP	350	939	820	881	510	3.500
-Countries						
a. In cash	120	240	120	120	180	780
b. In kind	-	499	682	705	187	2.073
-IICA						
a. In cash	30	60	60	60	90	300
b. In kind	3	9	44	69	97	222
-CATIE						
a. In kind	22	50	54	57	20	203
-IRCC						
In kind	-	24	24	24	24	96
TOTALS	525	1821	1804	1916	1108	7.174

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The contribution of IICA/PROMECAFE is the sum total of cash contribution and contribution in kind from IICA, plus cash contributions from the countries, plus the IRCC contribution, and according to the previous table totals US\$1.398.000.00, an amount surpassing by US\$519.000 the original commitment of IICA/PROMECAFE that, according to the Agreement with AID/ROCAP, was to be US\$879.000.00.

It is appropriate to point out that the country contributions, those of IICA/PROMECAFE and CATIE are larger than the amount contemplated in the Agreement with AID/ROCAP, although the previous Table does not include OIRSA's participation because up to now it is not considered significant.

It must be recognized that the Project is being carried out with less financial resources than foreseen in the AID/ROCAP grant.

11.3 Survey of future needs

If Project activities continue at the rate they have been taking place, funds allocated will be sufficient until the termination of the Project in 1986.

It is worth mentioning that at the end of the Project there will be an unspent balance of a little over US\$656.000.00. These funds could be used to extend the duration of the Project and to finance some priority activities that would strengthen general actions developed within the period of the Agreement, which would benefit national coffee institutions.

Priorities for the use of unspent funds should be defined by means of joint meetings between the countries, PROMECAFE and AID/ROCAP. These meetings would also serve to determine the feasibility of structuring a new IICA/PROMECAFE-AID/ROCAP Regional Project, and for re-orienting and broadening the goals and objectives of the present Project. The Evaluation Commission is aware of the interest of the countries to participate in regional projects of cooperation and reciprocal assistance to attain the solution of problems common to Central America and Panama.

12. CONCLUSIONS AND RECOMMENDATIONS

1. The introduction of rust resistant and high yielding coffee plants at CATIE has been extensive, to the degree that it is considered that the Project has at present one of the most complete germplasm banks in the world.

R: From now to the end of the Project, new introductions to CATIE should be made wisely and more emphasis should be placed on making preliminary selections of rust resistant material available to the countries so that they, in turn, speed-up their efforts to adapt the material to local conditions. It is also necessary to determine which varieties are best suited for distribution to small farmers within a reasonable period of time (although it is unlikely that this can be done during the life of the Project).
2. Because of the anticipated high cost of producing large numbers of tissue cultured coffee trees, the difficult logistics of moving them from CATIE to PROMECAFE member countries, and other problems involved, it is not expected that tissue cultured coffee plants would be available for field planting within the time limits of the PROMECAFE/ICCAF project.

R.: A more logical and practical use of tissue cultured coffee plants would be as a means of reproducing outstanding progeny-tested individual plants in sufficient numbers for establishing seed gardens in the member countries. These progeny-tested trees, established in sufficient numbers for seed gardens, would have previously been tested for rust resistance, productivity, uniformity and quality of their seedling progeny. Seed from these seed gardens would then furnish rust resistant seedlings of sufficient quality for commercial planting in rust infected areas where it is no longer feasible to plant susceptible varieties.

These improved seedlings could be grown in conventional nurseries by coffee growers in the traditional manner. This would eliminate the need for large numbers of expensive tissue cultured clonal progenies, which may or may not perform satisfactorily in the field because of weak root systems.

These progeny-tested seedlings would also be much cheaper to produce, grow in the nursery, and establish in the field than tissue cultured plants.

Cost factors would become a major deterrent to propagation of large numbers of tissue cultured plants required for field planting. On the other hand, production of progeny-tested seedlings would be in the same cost range as traditionally grown rust susceptible seedlings.

3. The Evaluation Commission has been made aware of problems concerning certain aspects of the administration and coordination of activities in the plant tissue culture program.

R.: IICA/PROMECAFE and CATIE should:

- a. Clearly define the lines of coffee research to be carried out in order to meet the specific goals of the PROMECAFE/ROCAP project.
- b. Resolve the problem of administrative authority which at the present time is not properly defined and has resulted in personal disagreements among the technical staff.
- c. Define the extent to which non-PROMECAFE activities are to be carried out in the laboratory and establish norms and procedures for the proper use of laboratory facilities.

In addition, it is essential that CATIE take immediate action to rectify the problems of laboratory design and equipment which have resulted in problems of contamination and inefficiency.

The Commission feels that the July 30, 1984 memorandum of Jose Galindo and Franklin Rosales, addressed to the CATIE Director (See Annex 12) on the subject of the function of the tissue culture laboratory, be accepted and implemented to the extent possible and at early date.

The participation and assistance of the Head of PROMECAFE and the senior administrative Officials of CATIE, actively cooperating together, is essential to resolve these issues.

4. Studies on rust biology and epidemiology are well advanced in El Salvador but should be intensified in the rest of the countries.

R.: The Project Plant Pathologist should maintain more frequent and close contact with national counterparts in the other countries in addition to where he is stationed. In certain selected areas, research on chemical control combined with cultural control levels should be considered.

5. Due to the lack of an Entomologist with special training in the coffee bean borer, studies on this insect are much delayed.

R.: The services of a Project Entomologist with sufficient knowledge and experience in coffee and the coffee bean borer to up-date these activities, are urgent. Besides chemical control, cultural control of this pest must be considered of great importance and it is advisable that contact with other countries having experience on cultural control of the coffee bean borer be established. In regard to chemical control, other insecticides besides endosulfan should be tried out.

6. A uniform methodology for the gathering of samples and pesticide residue analyses in chemical control of rust and the coffee bean borer has not been defined. In connection with this activity, only some preliminary results have been obtained which are the product of initiative taken by national technicians in charge of this research at ISIC, El Salvador, but in general this action has not been undertaken in a systematic manner due to the fact that neither PROMECAFE nor OIRSA have personnel specially trained to design the execution of this work. Nonetheless, PROMECAFE/ROCAP engaged the professional services of Mr. Joseph G. Cummings as Consultant, to study, analyze and suggest a line of work for the residue action. The Consultant has already submitted a final report.

R.: As soon as possible, make a decision relative to the observations included in the Cummings Report and, if necessary, proceed to discuss and sign work agreements with OIRSA, ISIC, CENTA and ICAIL to begin this activity early in 1985.

7. All the countries expressed an interest in training since they intent to have, before the termination of the PROMECAFE/ROCAP Project, a sufficient number of national technicians trained in specific fields.

The training of national technicians and auxiliary personnel in the subject of rust has been satisfactory to date. However, it seems that training on "broca" has not deserved the same attention.

- R.: a. Perfect training in rust and intensify this activity as it pertains to the coffee bean borer, in countries away from the region.
- b. Increase training in transference and validation of technology.

8. To date, more technicians than small coffee growers have been benefited by the Project. This is logical and normal. But to achieve tangible results at the end of the Project, it is necessary to initiate actions aiming at the involvement of the small coffee growers in the Project.

The diagnosis of the present situation in certain geographical areas is an important instrument for this purpose.

- R.: Intensify in all the countries "area profile" studies in order to develop and validate a methodology for the production, adaptation and transfer of coffee technology to small farmers. This methodology should be suited to:

- a. Accomplish the integration of researchers, extensionists and small coffee growers.
- b. Contribute to the proposed model for the transfer of technology.
- c. Work with organized groups of small coffee growers.
- d. Allow for less general and more specific recommendations.
- e. Achieve a greater integration of the activities of PROMECAFE
- f. Cooperate in the preparation of plans for Integrated Agricultural and Rural Development.

9. The activity calling for a regional information system and data bank has been timidly initiated. The PROMECAFE/ROCAP Project hired a Consultant to cover this matter and recommend the action to be taken. A final report has been submitted to PROMECAFE.

R.: In concurrence with the countries, PROMECAFE must proceed to make a decision on the recommendations offered by the Consultant so that, at the end of the Project, at least a basic methodology to strengthen this activity is available.

10. In Section 10 of this report, the Evaluation Commission has expressed its comments and suggestions relative to the cooperating organizations, CATIE and OIRSA.

R.: The Administration of PROMECAFE should exchange with CATIE and OIRSA more information relative to the areas of common interest and jointly discuss and prepare a document, which in a more realistic manner, updates Operational Agreements in force and more effective participation and coordination achieves in the PROMECAFE/ROCAP Project.

11. At the end of the ROCAP Project in May 1986, there will be an unspent balance of a little over US\$656.000.00.

R.: In concurrence with the countries, PROMECAFE should negotiate with AID/ROCAP an extension of the present Project in order to continue financing some activities considered of first priority and necessary to raise the social and economic level of small coffee growers. PROMECAFE/ROCAP should promote, within a reasonable period of time, multi-disciplinary meetings with national technicians in order to determine the priority of activities to be financed, if an extension of the AID/ROCAP Agreement is granted.

The Evaluation Commission feels that the following priority activities should be presented to the countries for consideration.

- a. Research and training in the coffee bean borer.
- b. Training on transfer and validation of technology.

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c. Preparation of area profiles and establishment of pilot areas similar to those in El Salvador and Honduras, in other countries participating in the Project.

12. In considering the different aspects of the Project within the context of activities in research, training and transfer of technology, they seem to be isolated actions in specific fields and not activities designed to integrate a project with common goals and objectives.

In general, the researcher is isolated from the extensionist and the coffee producer. In many cases, research is carried out without keeping in mind the real and urgent needs of the producer, the social importance, and the economic importance of the crop. Plant breeders are interested in the resistance of plants to rust but do not take into account the commercial qualities of the bean to be produced.

R.: The Project must take national technicians more conscious of the close relationship and communication that must exist between the researcher, the communicator/extensionist and the farmer.

Crop technology and control of its pests should be viewed as the solution to the social and economic problems, small coffee growing farmers and therefore all Project activities should be focused towards the promotion of integrated development in the coffee growing areas of the region.

The Head of the Project should be responsible for this orientation.

13. The Evaluation Commission is under the impression that, because rust was detected in Costa Rica only in late 1983 and the coffee bean borer has not appeared yet, little interest to participate in Project activities has been shown. Now, however, a favorable change in attitude is reflected in the activities of both the Ministry of Agriculture as well as OFICAFE, to the extent that funds have been allocated in the 1985 budget to pay PROMECAFE quotas.

R.: The Head and technicians of the ROCAP Project should strengthen cooperation and reciprocal assistance of the Project with the respective national authorities and OFICAFE officials should transact the signing of the PROMECAFE Agreement.

14. The Evaluation Commission is aware that coffee production is not high priority in the development of agriculture in Panama; nevertheless, both the IICA representative and the representative from the Department of Coffee Research of MIDA expressed their appreciation of the PROMECAFE/ROCAP Project. Training of Technical Personnel is considered as the most important contribution the Project can make in Panama, according to these representatives. They do not believe that research in Panama should be emphasized for the remainder of the life of the Project.

R.: The Project Specialist in Agricultural Communication should maintain close contact with the IICA and MIDA representatives to develop a program to meet the Project needs in Panama.

Communications between PROMECAFE and IICA-Panama should be improved to obtain these objectives.

15. The Evaluation Commission has learned that headquarters for the Administration of the Central Area will be transferred to Guatemala and is aware of the possibility of transferring the headquarters of other regional projects.

R.: The Commission considers that in view of the degree of progress of the Project, logistical support received from IICA, the presence of the ROCAP Office in San Jose, and the research work being done at CATIE, headquarters for the PROMECAFE/ROCAP Project should not be changed.

16. All the countries expressed their satisfaction with the effort and activities of the IICA/PROMECAFE-AID/ROCAP Regional Project in benefitting coffee growing in the region and recognized that some of these activities, such as the introduction of rust resistant coffee plants and training of national technicians away from the region, would not have been achieved by only individual effort on the part of each country.

They expressed their interest in participating and supporting this and other similar projects of a regional nature.

R.: Regional activities of the PROMECAFE/ROCAP Project should be continued and broadened and with this satisfactory experience, support should be given to other similar projects that allow better reciprocal cooperation among countries, institutions and technicians through the exchange of knowledge and experience in areas of common interest.

17. All the countries expressed to the Evaluation Commission their concern and interest relative to diversification in coffee growing regions.

R.: The following actions could be undertaken:

- a. Competent national authorities should look for support for specific projects in this area of interest by contacting local AID offices.
- b. PROMECAFE should make an inventory of projects and studies on the subject that have been carried out in the area, identify alternatives that the farmers themselves have developed and, on this basis hold a seminar to discuss the approach to diversification.
- c. A IICA/PROMECAFE-AID/ROCAP regional project should be negotiated through IICA-PROMECAFE to initiate or reinforce national and regional diversification programs.

18. There is concern in the countries about the adequate coordination between national institutions and projects related to coffee.

R.: The Head of PROMECAFE must maintain close contacts and exchange information with all national institutions and projects connected with coffee growing and promote coordination between and within them.

19. In some countries the responsibility for research and transfer of coffee technology is not directly that of the Ministries of Agriculture or their equivalent institution in the region. Thus, the Ministers are not always aware of the activities, progress and achievements of the PROMECAFE/ROCAP Project and hence the Project does not receive the necessary political support.

R.: The Head of PROMECAFE should advise CORECA that the subject of coffee growing and a report of the progress of the ROCAP Project and its future actions should be included in the next Meeting of the Consejo Regional de Cooperación Agrícola (CORECA).

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13. APPENDICES

13.1 Documents consulted (Lista de documentos consultados).

1. Documento Base Informativo y Analítico sobre el Diseño, Vigencia de Objetivos y Progreso del Proyecto Regional de Control de Pestes del Cafeto. Proyecto IICA/PROMECAFE-AID/ROCAP No.596-0090. Miguel Muyschondt, Consultor. Costa Rica, agosto de 1984.
2. Final Report on Consultancy to develop residue and tolerance data for the uniform registration of pesticides. ROCAP Project 596-0090. "Regional Coffee Pest Control. Joseph G. Cummings, Consultant. IICA, June 17-30, 1984.
3. Lineamientos de Acción Regional para el establecimiento del Sistema de Información Básica para la Caficultura Mesoamericana (SIBCA). IICA/PROMECAFE. Jorge Castillo Velarde, Consultor. Guatemala, marzo de 1984.
4. Estudio de la Epidemiología y Control de la Roya del Café en Centroamérica. PROMECAFE. Zía U. Javed, Fitopatólogo de PROMECAFE. San Salvador, El Salvador.
5. Informe a la Comisión Evaluadora del Proyecto PROMECAFE/ROCAP sobre Pestes del Café. Actividad: Desarrollo y Reproducción de Variedades de Café Resistentes. Jorge Hernán Echeverri R., Coordinador. Turrialba, agosto de 1984.
6. Resumen de Actividades y Logros de la Actividad "Generación, Adaptación y Extensión de Tecnologías Apropriadas". Gilberto Vejarano M., Comunicador/Extensionista del Proyecto PROMECAFE/ROCAP. Honduras, 31 de agosto de 1984.
7. Aspectos a Considerar en la Ayuda-Memoria. Período 1982-1984. Costa Rica. 1984.
8. Instituto Salvadoreño de Investigaciones del Café (ISIC). El Salvador. 1984.

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9. Trabajo presentado a la Misión Evaluadora del Proyecto IICA/PROMECAFE-ROCAP. ANACAFE. Guatemala, 7 de setiembre de 1984.
10. Proyectos PROMECAFE-ROCAP Realizados en Honduras. IHCAFE. Tegucigalpa, agosto de 1984.
11. Informe de Actividades Desarrolladas con el Convenio PROMECAFE/ROCAP/Nicaragua, Managua, setiembre de 1984.
12. Memorando de José J. Galindo y Franklin Rosales al Dr. Rodrigo Tarté, Director del CATIE sobre el funcionamiento del Laboratorio de Cultivo de Tejidos. Turrialba, 30 de julio de 1984.