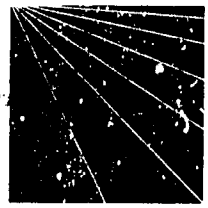

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FINAL DRAFT

Environmental Assessment and Analysis of Pesticide Use in the Small Farmer Coffee Improvement Project (A.I.D. Project Number 520-0381)

February 12, 1990

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LIST OF ACRONYMS AND ABBREVIATIONS

ANACAFE	Asociacion Nacional del Cafe (National Coffee Association)
A.I.D.	Agency for International Development
A.I.D./LAC	A.I.D. Bureau for Latin America and the Caribbean
BANDESA	Banco Nacional de Desarollo de la Agricultura (Guatemala's Agricultural Development Bank)
CATIE	Centro Agronomico de Investigacion y Ensenanza/ Tropical Agricultural Research on Training Center - Turrialba, Costa Rica
CFR	Code of Federal Regulations (USA)
CICP	Consortium for International Crop Protection
CLUSA	Cooperative League of U.S.A.
CONAMA	Comision Nacional del Medio Ambiental (National Environmental Comision)
CP/DGSS	Comision de Plaquicidas de la Direccion General de Servicios de Salud (Pesticide Commission of the General Directorate of Health Services)
DIVAGRO	Programma de Diversificacion Agricola (Agricultural Diversification Program of FUSADES in El Salvador)
DTSV	Direccion Tecnia de Sanidad Vegetal - GOG/MAGA (Technical Plant Health Directorate - GOG/MAGA)
EA	Environmental Assessment
EAP	Escuela Agricola Panamericana (Panamerican Agriculture School at El Zamorano, Honduras)
EPA	Environmental Protection Agency (USA)
FAO	Food and Agriculture Organization of the United Nations
FDA	Food and Drug Administration (USA)
FEDECOCAGUA	Federacion de Cooperativas Cafetaleras de Guatemala (Guatemalan Coffee Cooperative Federation)
FEDECOVERA	Federacion de Cooperativas de las Vera Paces (Upper & Lower Vera Paz Cooperative Federation)
FUSADES	Fundacion de Desarrollo (Foundation for Development) (in El Salvador)
GOG	Government of Guatemala
GREPAGRO	Gremial de Proveedores de Productos para la Agricultura (Guatemalan Agrichemical Association)
ICAITI	Instituto Centro Americano de Investigacion y Tecnologia Industrial (Central American Institute of Research and Industrial Technology)
ICTA	Instituto de Ciencia y Tecnologia Agricola (Institute of Agricultural Science and Technology of MAGA)
IEE	Initial Environmental Examination
IGSS	Instituto Guatemalteco de Seguridad Social (Guatemalan Social Security Institute of MOH)

IICA	Interamerican Institute for Cooperation on Agriculture (Instituto Interamericano de Cooperacion para la Agricultura)
IPM	Integrated Pest Management (Manejo Integrado de Plagas)
LD_{50}	Lethal dose, expressed in milligrams of pesticide per kilogram of body weight, required to kill 50% of the test population
LOP	Life of Project
LUCAM	Laboratorio Unificado de Control de Alimentos y Medicamentos (United Food and Medicine Control Laboratory of MOS)
MAGA	Ministerio de Agricultura, Ganaderia y Alimentos (Ministry of Agriculture)
MIP	Manejo Integrado de Plagas (Integrated Pest Management)
MIS	Management Information System for SFCIP
MOS/MOH	Ministerio de Salud (Ministry of Health)
MOSCAMED	US/Mexico/Guatemala organization responsible for eradicating the medfly from Mexico and Guatemala
PID	Project Identification Document
PP	Project Paper
PPM	Parts Per Million
PROMECAFE	Programa Cooperativo para la Proteccion y Modernizacion de la Caficultura en Mexico, Centro America, Panama y El Caribe (Cooperative Program for the Protection and Modernization of Coffee Production in the area given)
RENARM	Regional Environmental and Natural Resources Management Project - ROCAP/CATIE
ROCAP	Regional Office for Central America and Panama (A.I.D.)
RPAR	Rebuttable Presumption Against Registration
SFCIP	Small Farmer Coffee Improvement Project (U.S.A.I.D./G)
TAP	Technical Assistance Program of the SFCIP
U.S.A.I.D./ANACAFE	
US (USA)	United States of America
U.S.A.I.D./G	United States Agency for International Development in Guatemala
UCONOFEC	Union de Cooperativas No Federadas de Cafe (Organization of Non-federated Coffee Cooperatives)
WHO/FAO	World Health Organization/Food and Agriculture Organization of the United Nations

SUMMARY

The Small Farmer Coffee Improvement Project 520-0381 has two major elements: (1) establishment of a technical assistance, education, and training program for coffee producers with small land holdings which focuses on safe and rational pesticide and fertilizer use; and (2) the establishment of credit sources for coffee farmers with small land holdings. The project will emphasize training on non-chemical control methodology in an integrated pest management (IPM) approach as an alternative to pesticides. Fertilizer use will be based on soil analysis and proper application technology. Therefore, a negative determination is recommended. In fact, the project should have a positive effect on the environment by providing alternative pest management technology and rational fertilizer use to a wide segment of Guatemalan agriculture.

To assure compliance with FAO pesticide residue standards and A.I.D. pesticide regulations, a pesticide residue testing program was outlined in Section 13 of this document. This program is envisioned as an integral component or the quality assurance component of the project. Execution of this residue program will be a requirement for the implementation of the Project.

The following suggestions, although not required, should also be strongly considered by the Mission and/or A.I.D./W.

SUGGESTIONS

1. To assure the availability of alternative IPM strategies and an effective pesticide arsenal, it is recommended that an IPM research component be established. Part of the proposed studies are already planned as a part of the on-going research programs of PROMECAFE and ANACAFE. To assure its execution, a portion of the institutional support budget line item must be set aside from this project to satisfy immediate needs. A careful analysis of the coffee IPM data base should be conducted as soon as possible and recommendations made to PROMECAFE in cooperation with the ROCAP/RENARM to seek support for a separate budget to address the research needs identified.

2. To assure the success of the project and the competitiveness of participating producers, it is recommended that, at a minimum, project producers be allowed to use selected restricted use pesticides in emergency situations where extensive crop loss will otherwise occur. This use can be limited to cases where the use will be under the direct supervision of highly trained (U.S. Commercial Certified Applicator Equivalent) project personnel. A pesticide

training program was already planned in the project and minimal subject matter to be covered was outlined in Section 13 of the EA to assure an adequate certification program.

3. Approval should be sought for the use the products listed in Table 1 that are not registered in the U.S., based on established WHO/FAO residue tolerances for these pesticides.

4. To assure availability of up-to-date pesticide information and "shelf" IPM technology, the PROMECAFE computer-supported technical information center should be made available to project technicians as soon as possible. This will require some additional computer hardware, but it may already be included in the plans for the Management Information System (MIS).

5. Determine the availability of correlation data for soil analysis (N,P,K,B, etc) for coffee responses on various soil types in Guatemala. If not available, priority should be given in the research program to obtain these data. In the meantime leaf tissue analyses should be used to determine fertilizer needs as outlined in Section IV. B.

I. BACKGROUND AND RATIONALE (From PP 520-0381):

Agriculture employed 51% of the economically active population of Guatemala which was estimated at 1.2 million people in 1987. Agriculture has historically played a major role in the economy. About 4.25 million hectares of the total surface area of 10,888,900 hectares is arable or permanent cropland. Traditionally a wide range of food crops, fiber, spices, and animals have been produced. Agriculture accounted for 25% of the 1980 GNP and generates 60% of foreign exchange earnings.

Depressed worldwide sugar prices and a generally depressed market for traditional export crops have forced farmers to attempt to diversify into non-traditional crops both for export and to replace imports. These non-traditional export and import substitution crops include winter fruits and vegetables, corn, and sorghum. Many of the products are produced by small or medium-scale farmers who work closely with agribusinesses. Agribusinesses store, package, process, and market the farmers' production and, at times, help obtain credit, technical advice, and services such as land preparation. However, these crops are not grown in all areas.

This A.I.D./G "Small Farmer Coffee Improvement Project" (SFCIP) Number 520-0381 is focusing on two of the key components to the continued growth of this traditional crop in the small farm sector. These are: 1) provide a technical assistance, education, and training program to enable small farmers to renovate one manzana of old coffee plantings, and 2) the establishment and operation, through the commercial Banking system and the GOG Agricultural Development Bank (BANDESA), of a credit fund mechanism for target group coffee producers. A third component is to assist in the development or renovation of existing coffee processing facilities to handle the increased production. These components will alleviate constraints that limit the realization of the sector's employment and foreign exchange earning potential and limit the benefits to producers' agribusiness linkages.

Specifically, the project's goal is to increase the participation of Guatemala's rural poor in sustained, real economic growth. This will contribute to sustained and equitably distributed economic growth in Guatemala by accelerating the movement of this sector into high yielding traditional crops and aquiculture enterprises, thereby increasing small- and medium-scale farmer incomes and rural employment, and foreign exchange.

The project's purpose is to increase the income of farmers with small land holdings by increasing production, productivity, and product quality. This will be accomplished through the establishment and implementation of a closely-linked, technical and financial assistance program for the target producers. This

improved technology is in the form of a production, quality, and processing program derived from existing and on-going, on-farm and experiment station research. The purpose will be achieved by:

1. Establishment, implementation, and support of a technical assistance program (TAP) through the already established extension service of ANACAFE will:

   a. Transfer a technification package to small farmers to effectively use new technology in coffee production;

   b. Train small farmers in the proper procedures and applications of a tech-pack. Training will be done by project extension agents, para-technicians, and credit extension agents, as well as provision of third-country and participant training to provide for the "institutionalization" of project extension benefits; and

   c. Conduct feasibility analyses and studies required to plan for the construction or enhancement of existing processing facilities and to ensure proper utilization of such facilities to improve marketing capabilities and value-added income benefits to small farmers.

2. Establishment and operation of a credit fund mechanism for target group coffee producers.

3. Establishment of a specialty/gourmet coffee certification program in cooperation with the Central American Institute of Research and Industrial Technology (ICAITI).

4. In addition to the computer-supported Management Information Center (MIS), a technical information center will be made available from PROMECAFE to make available shelf IPM and other production technology and detailed pesticide information from both national and international sources. A total of $11 million dollars is being provided under this project over the next eight years.

Pest control will be one of the inputs being extended in the TAP tech-pack. Pest control will also be one of the technologies to be investigated in the on-going research programs in ANACAFE as well as in the ROCAP funded regional coffee project and the PROMECAFE/FRENCH funded biological control studies in Mexico. Pesticides are one of the pest management strategies commonly used in crop production. The application of inorganic

fertilizers is one of the methods commonly used to achieve higher production levels. To evaluate the potential environmental impact that pesticides and fertilizer use on the Small Farmer Coffee Improvement Project may have, an Environmental Assessment (EA) was conducted. What follows is the result of that EA, along with the results and recommendations on related matters requested in the EA team's Scope of Work (Annex No. 1).

II. ENVIRONMENTAL ASSESSMENT OF PESTICIDE USE.

A. INTRODUCTION:

To meet its objectives, the activities under the Small Farmer Coffee Project will require some pesticides and fertilizers for use in the technical assistance program (TAP) tech-pack, as well as in research plots, farmer demonstrations, and training in the on-going research phase. This project will propose operational pest control programs within which pesticides play a major or minor role. It is A.I.D. policy to try and use only pesticides that the U.S. EPA has registered for general use without restriction. In the U.S., pesticides in the general use category can be purchased and used without special permits. By contrast, "restricted" pesticides present high risks to humans or the environment and can only be used by licensed applicators or persons under their direct supervision.

B. PROJECT SPECIFICATIONS:

Project Location	:	Guatemala
Name of A.I.D. Project	:	Small Farmer Coffee Improvement Project
Number of A.I.D. Project	:	520-0381
Project Implementor	:	U.S.A.I.D./Guatemala
Life of Project	:	8 years (FY 1989-96)
Funding	:	$11 million grant
IEE Prepared by	:	Alfred Nakatsuma, A.I.D./G
PID Approved by	:	Gordon Straub, Chief Rur. Dev. Office, U.S.A.I.D./G

C. ENVIRONMENTAL ASSESSMENT OF PESTICIDE USE:

The IEE (Annex No. 2) made a positive determination on the project indicating that some environmental effects could be expected. This was primarily due to the fact that the Small Farmer Coffee Project proposes to support a technology assistance program (TAP) based on IPM strategies and involves financing the purchase of pesticides by target producer groups and for use in on-going experimental or demonstration purposes. The TAP is expected to increase the production of coffee while reducing the quantity of pesticide used and increasing the safety to users of what is used. As per 22 Code of Federal Regulations (CFR) Section 216.3(b) (iii) categorical exclusions, A.I.D.'s environmental regulations are generally not required for projects that do not purchase pesticides with A.I.D. funds for experimental use when that use will be supervised by project personnel. The experience thus far under U.S.A.I.D./G Projects is that most agribusinesses exporting to the U.S. are extremely careful to comply with US pesticide use and application

requirements because of the potential closure of export markets. So far coffee producers in Guatemala have had no insecticide residues causing problems in this regard. However, some exporting segments have a history of residue and other problems with 19 of 89 shipments rejected in 1988 and 8 through November 22, 1989. Because the project will involve the use of IPM technology, the project will insure that adverse environmental impacts do not occur or are minimized while fulfilling the original project goal of increasing production and export of coffee and conducting needed research. The TAP procedure, expands basic essential characteristics of a similar program in Honduras and the ANACAFE "Grupos de Amistad y Trabajo" (Social and Work Groups) which preceded the preliminary investigations for this component.

With respect to the technology support services and development activities, these would utilize the services of experienced US crop production specialists and technology packages which are acceptable under U.S. environmental regulations. The testing, demonstration, and use of chemical inputs would, therefore, be under careful supervision. These types of projects involving carefully controlled experimentation are specifically excluded as requiring an Environmental Assessment (216.2(c)(2)(ii)).

However, when it became evident that the target small farmer coffee producers would involve financing the purchase and use of pesticides and fertilizers, it was decided to do an EA to identify pesticides and procedures acceptable for use in the TAP and on-going research and demonstration phases of the project. It is also projected that the TAP will extend technology developed in the on-going research phase that will result in the expansion of the project to cover over 4,500 target producers in the first 5 years. What follows are the results of this EA.

In the EA, the term "pest" includes any group of organisms - insects, bacteria, viruses, weeds, nematodes, snails, slugs, birds, rodents, or others - that adversely affect the production, preservation, or use of agricultural plants (including seed and planting stock) or harvested products (including meats). "Pesticide" is any chemical preparation used to kill, repel, mitigate, destroy, or stop the action of pest populations and includes the following: (1) insecticides (to control insects), (2) acaricides (to control mites), (3) herbicides (to control weeds), (4) fungicides (to control fungi, molds, etc.), (5) nematicides (to control nematodes - small round worms), and (6) rodenticides (to control rodents).

1. <u>EPA Registration Status of the Proposed Pesticides</u>.

In the US, pesticides are registered by the Environmental Protection Agency. The EPA registers a pesticide product in one

of two categories: "restricted use" (RU) or "general use" (GU). A restricted use pesticide is available for purchase and use only by pesticide applicators who are certified by law. It potentially presents a very high toxicity and/or environmental hazard. A general use pesticide, by contrast, is available for purchase and use by the general public. It is not A.I.D. policy to provide highly toxic pesticides to small farmers.

Table 1 shows pesticides available and tentatively approved for use in the Small Farmer Coffee Project. The products currently recommended for use in coffee in Guatemala from which these pesticides were selected are given in Annex 3. Table 2 shows pesticides restricted for use in the US and/or Guatemala or those not registered in the U.S. but still available in Guatemala. NONE of the pesticides listed in Table 2 are considered suitable for use in coffee production in the TAP component of the Small Farmer Coffee Project. However, it will be proposed in the recommendation section that A.I.D./Washington give consideration to giving project personnel that have undergone appropriate (U.S. equivalent) training a "certification" to supervise the application of selected RU pesticides. This would allow use of RU pesticides on the fields of farmers in the TAP phase of the project as well as in research/demonstration plots. Growers already use most of these restricted use pesticides in Guatemala and GU substitutions are not as effective (see Section 6). It will put TAP personnel and project growers with A.I.D. credit at a distinct disadvantage to growers without A.I.D. credit if they are not allowed to utilize these pesticides where required in emergency situations when proposed alternatives have failed to control a seriously damaging pest. The proposed program is explained in more detail in Section 10.

ANACAFE and associated coffee producer cooperatives and the MAGA/DTSV plant protection and agromedical groups are aware of carbofuran, dimethoate, endosulfan, paraquat, and metaldehyde hazards. The Small Farmer Coffee Project does not plan to distribute these or any other pesticide to farmers. Use of these products would be for small-scale experimentation, training, demonstrating safe use to farmers, or small-scale control programs carried out by project staff. Metaldehyde can be used with the restriction that the label must bear the words "this pesticide may be fatal to children and dogs or other pets if eaten. Keep children and pets out of treated area". Carbofuran granular formulations containing 5% or less active ingredient are not RU and can be purchased and used on the project. For all cases, protective clothing will be worn.

Table 1. Pesticides recommended for use on the Small Farmer Coffee Improvement Project in Guatemala (1) and their toxicity, registration status, and other characteristics (2-12).

Pest and Pesticide name(s) Technical (2)	Commercial (1,2,4,5)	Registration status: Toxicity category (2)	US (5)	GDG (6)	WHO/FAO (6)	Coffee (3)	Mammalian LD50 ranges (2): Oral	Dermal	Inhalation	Non-target LD50 (2,8): Bird ppm	Fish ppm	Bees	Dispersal measurements: Water solubility ppm @ deg C	Sorption coefficient Koc (2,7)	Fire (2) hazard (Flash point)	Comments
INSECTICIDES																
COFFEE BERRY BORER (BROCA DEL FRUTO)																
diazinon	Diazinon (RS)	II-III	Y	Y	N(0.002)	Y(0.2)	12-300	633-3600	3.5	3.1-8.4	T(0.38)	T	40 @ 25		180F	Test efficacy ASAP; not bioaccumulated (12)
LEAF MINER (MINADOR DE LA HOJA)																
diazinon	Diazinon (RS)	II-III	Y	Y	N(0.002)	Y(0.2)	12-300	633-3600	3.5	3.1-8.4	T(0.38)	T	40 @ 25		180F	Test efficacy ASAP; not bioaccumulated (12)
malathion	Malathion (RS)	III	Y	Y	N(0.02)	N	1375	>2000	>5.2		(Y)0.1	T	145 @ 25	1,778	>325F	Tent. approval based on FAO ADI (6)
MEALYBUGS (COCHINILLAS DEL CAFETO)																
malathion	Malathion (RS)	III	Y	Y	N(0.02)	N	1375	>2000	>5.2		(Y)0.1	T	145 @ 25	1,778	>325F	Tent. approval based on FAO ADI (6)
ROOT MEALYBUGS (COCHINILLAS DE LA RAIZ)																
carbofuran	Furadan, Curaterr (RS,SR)	I-II	RUc!	Y	Y(0.1)	Y(0.1)	11	10,200	85	25-39	0.28	NT(6)	700 @ 25	29	MF	85G form. not RU; determine SR status before use
SCALES (LAS ESCAMAS DEL CAFETO)																
malathion	Malathion (RS)	III	Y	Y	N(0.02)	N	1375	>2000	>5.2		(Y)0.1	T	145 @ 25	1,778	>325F	Tent. approval based on FAO ADI (6)
LEAF BEETLES (LAS TORTUGILLAS)																
diazinon	Diazinon (RS)	II-III	Y	Y	N(0.002)	Y(0.2)	12-300	633-3600	3.5	3.1-8.4	T(0.38)	T	40 @ 25		180F	Test efficacy ASAP; not bioaccumulated (12)
SPIDER MITES (LA ARAÑA ROJA)																
diazinon	Diazinon (RS)	II-III	Y	Y	N(0.002)	Y(0.2)	12-300	633-3600	3.5	3.1-8.4	T(0.38)	T	40 @ 25		180F	Test efficacy ASAP; not bioaccumulated (12)
LONG-HORNED GRASSHOPPERS AND CRICKETS (EL CHACUATETE Y EL GRILLO DEL CAFETO)																
diazinon	Diazinon (RS)	II-III	Y	Y	N(0.002)	Y(0.2)	12-300	633-3600	3.5	3.1-8.4	T(0.38)	T	40 @ 25		180F	Test efficacy ASAP; not bioaccumulated (12)
malathion	Malathion (RS)	III	Y	Y	N(0.02)	N	1375	>2000	>5.2		(Y)0.1	T	145 @ 25	1,778	>325F	Tent. approval based on FAO ADI (6)
STEM BORER (EL BARRENADOR DEL TALLO)																
diazinon	Diazinon (RS)	II-III	Y	Y	N(0.002)	Y(0.2)	12-300	633-3600	3.5	3.1-8.4	T(0.38)	T	40 @ 25		180F	Test efficacy ASAP; not bioaccumulated (12)
SLUGS (LA BABOSA)																
metaldehyde	Metaldehide, Metaldehido	II-III	Y(10)	Y	?	N	100-250	2275	203-258			NT!			F	! As bait (2); see label & appl. requirements (10)
NEMATODES (NEMATODOS)																
carbofuran	Furadan, Curaterr (RS,SR)	I-II	RUc!	Y	Y(0.1)	Y(0.1)	11	10,200	85	25-39	0.28	NT(6)	700 @ 25	29	MF	85G form. not RU; determine SR status before use
SOIL FUMIGANTS to Control DAMPING OFF (Fumigantes del Suelo para Controlar MAL DEL TALLUELO)																
PCNB	PCNB(Terraclor, Fungiclor)(RS)	I-II	Y	Y	N(0.007)	N	1700	<4000	--	--	--	--	--	--	--	Also seed dressing (2); USE CAT. II FORM. ONLY
carbanolate	Banrot	I-III	Y	Y	N(?)	Y(0.1)	5000	2000	--	2.4-4.2	--	--	87 @ 20	--	--	USE ONLY WPs Category II or Gs Category III
dazomet	Basamid G, Crag, DMTT	I-III	Y	Y	N(?)	N	640	--	--	--	T	NT	--	--	--	USE CAT. II OR III FORM. ONLY IF FAO TOL. EST.
thiabendazole	Mertect,Tecto (RPH)	III	Y	Y	N(0.3)	N	3100	--	--	--	ST	NT	--	--	--	Tent. approval based on FAO ADI (6)

FOOTNOTES: See page 3 of 3.

Table 1. Pesticides recommended for use on the Small Farmer Coffee Improvement Project in Guatemala (1) and their toxicity, registration status and other characteristics (2-12). Page 2 of 3

Pest and Pesticide name(s)			Registration status				Mammalian LD50 ranges (2)			Non-target LD50 (2,8)			Dispersal measurements		Fire (2)	
Technical (2)	Commercial (1,2,4,5)	Toxicity category	US (2)	GDG (5)	WHO/FAO (6)	Coffee (3)	Oral	Dermal	Inhalation	Bird ppm	Fish ppm	Bees	Water solubility ppm @ deg C	Sorption coefficient Koc (2,7)	hazard (Flash point)	Comments
PLANT DISEASES (ENFERMEDADES)																
COFFEE RUST (ROYA DEL CAFETO)																
copper oxychloride	Oxycloro de Cu, Cuprivit (RS)	III	NR	Y	E(?)	E	1000	--	--	--	--	NT	--	--	--	56-58% copper; not sold in US(2); exempt
copper hydroxide	Hidroxido de Cu, Cuprivit azul	I-III	Y	Y	E(?)	E	200-1000									Kocide 20%; USE CATEGORY II-III FORMS. ONLY
copper oxide	Cobre Sandoz or Nordox		Y	Y	E(?)	E[Y(1)]	1500				T		Insoluble			USE CATEGORY II-IV FORMULATIONS ONLY
propiconazole	Tilt (Banner, Desmel)	III	Y	Y	Y(0.1)	N										Tent. approval based on FAO coffee tol. (6)
triadimefon	Bayleton (Admiral)	II-III	Y	Y	Y(0.1)	N	1020	5000			40-60	NT	70 @ 20		104F(1,REC)	Tent. approval based on FAO coffee tol. (6)
COFFEE LEAF SPOT (OJO DE GALLO)																
chlorothalonil	Daconil, Bravo (Exotera) (RS)	I-II	Y	Y	N(.0005)	Y(0.2)	>10,000	>10,000			T(0.25)		Insoluble			Skin and eye irritant; C,M (12)
copper oxychloride	Oxycloro de Cu, Cuprivit (RS)	III	NR	Y	E(?)	E	1000	--	--	--	--	NT	--	--	--	56-58% copper; not sold in US(2); exempt
PHOMA (PHOMA)																
benomyl	Benomyl (RS)	III	Y	Y	N(.0005)	N	>10,000	>10,000			ST	NT	P. Insoluble			Tent. approval based on FAO ADI tol. (6)
carbendazim	Carbendazim (Equitdazim)	III	Y	Y	Y(0.1)	N	>10,000	>2,000			T(2.4mg/l	NT				Tent. approval based on FAO coffee tol. (6)
chlorothalonil	Daconil, Bravo (Exotera) (RS)	I-II	Y	Y	N(.00005)	Y(0.2)	>10,000	>10,000			T(0.25)		Insoluble			USE CATEGORY II FORMULATIONS ONLY
RED LEAF SPOT (MANCHA DE HIERRO)																
benomyl	Benomyl (RS)	III	Y	Y	N(.0005)	N	>10,000	>10,000			ST	NT	P. Insoluble			Tent. approval based on FAO ADI tol. (6)
copper oxychloride	Oxycloro de Cu, Cuprivit (RS)	III	NR	Y	E(?)	E	1000	--	--	--	--	NT	--	--	--	56-58% copper; not sold in US(2); exempt
ANTHRACNOSIS, FRUIT ROT, AND RED DISEASE (ANTRACNOSIS. PUDRICION DEL FRUITO Y MAL ROSADA)																
copper oxychloride	Oxycloro de Cu, Cuprivit (RS)	III	NR	Y	E(?)	E	1000	--	--	--	--	NT	--	--	--	56-58% copper; not sold in US(2); exempt
copper hydroxide	Hidroxido de Cu, Cuprivit azul	I-III	Y	Y	E(?)	E	200-1000									Kocide 20%; USE CATEGORY II-III FORMS. ONLY
copper oxide	Cobre Sandoz or Nordox		Y	Y	E(?)	E[Y(1)]	1500				T		Insoluble			USE CATEGORY II-IV FORMULATIONS ONLY
TRUNK CANCER AND BLACK ROOT ROT (CANCER DELTRONCO Y PUDRICION DE LA RAIZ)																
carbanolate	Banrot	I-III	Y	Y	N(?)	Y(0.1)	5000	2000	--	2.4-4.2	--	--	87 @ 20	--	--	USE ONLY WPs Category II or Gs Category III
thiabendazole	Mertect,Tecto (RPH)	III	Y	Y	N(0.3)	N	3100	--	--	--	ST	NT	--	--	--	Tent. approval based on FAO ADI (6)
(AHORCAMIENTO DEL TALLO)																
benomyl	Benomyl (RS)	III	Y	Y	N(.0005)	N	>10,000	>10,000			ST	NT	P. Insoluble			Tent. approval based on FAO ADI tol. (6)
copper oxychloride	Oxycloro de Cu, Cuprivit (RS)	III	NR	Y	E(?)	E	1000	--	--	--	--	NT	--	--	--	56-58% copper; not sold in US(2); exempt
copper hydroxide	Hidroxido de Cu, Cuprivit azul	I-III	Y	Y	E(?)	E	200-1000									Kocide 20%; USE CATEGORY II-III FORMS. ONLY
copper oxide	Cobre Sandoz or Nordox		Y	Y	E(?)	E[Y(1)]	1500				T		Insoluble			USE CATEGORY II-IV FORMULATIONS ONLY
SOOTY MOLD (FUMAGINA) - Prevent by controlling the honeydew producing insects																
HERBICIDES (HERBICIDAS) - Only manual weed control recommended in the project but these may be needed in other phases																
dalapon	Dalapon, Devipon (Revenge) (RS)	II	Y	Y	?	Y(2.0)	970-8120	--		>5000	105-179		450,000 @ 25		NF	Selective GR herbicide; CORROSIVE, M,S (12)
fluazifop-butyl	Fusilade (Unecide, Hache U.S.)	II-III	Y	Y	?	Y(0.1)R#	621-3328	--					Insoluble			Selective (2); #EPA regional tolerence (3)
glyphosate	Roundup (Herbolex, Glycel) (RS)	II	Y	Y	N(0.03)	Y(1.0)	1568-4873	7940					V. Soluble		>200F	Selective herbicide; C,M (12)

FOOTNOTES: See page 3 of 3.

Table 1. Pesticides recommended for use on the Small Farmer Coffee Improvement Project in Guatemala (1) and their toxicity registration status and other characteristics (2-12). Page 3 of 3

FOOTNOTES:

(1) Sources: Manual de Caficultura, ANACAFE, Guatemala, 1988; Personal communications with ANACAFE technicians and market survey; and selection for use based primarily on toxicity, registration status, and residue tolerances. In some cases efficacy data for the pest(s) need to be collected as soon as possible (ASAP) and a request made for approval of alternate products if required.

(2) Data from 1989 Farm Chemicals Handbook. RU signifies that at least some uses are Restricted Use by the USEPA due to user or other hazards.

(3) Coffee registration data from the Pesticide Chemicals News Guide dated May 1, 1989; Mann (pers. comm.) 1989; and SilverPlatter Version 1.6.

(4) Selected trade names provided for convenience only and does not imply endorsement; not intended to be all inclusive. Commercial names in parentheses () are not registered in Guatemala (5).

(5) GOG/MAGA Departamento de Sanidad Vegetal (DTSV), pers. comm., Nov. 17, 1989. Trade names in parentheses are not registered in Guatemala, they are provided as reference only.

(6) WHO/FAO Codex of residue tolerances. Y = Yes toterance established for coffee and tolerance given in (). N = No tolerance for coffee but the ADI (Averave Daily Intake in mg/kg) allowed is given in (). In most cases the Codex could only be searched in issues published through August 1988 (for this draft 12/29/89). Where WHO/FAO tolerances are established, use is approved if the harvested product will not be exported to the U.S. If a specific tolerance has not been established and only an ADI is established, it may be difficult to get approval for use as it is easy to exceed the "market basket" residue tolerance.

(7) Ward, Mann, and Miller, 1988; Mann, pers. comm., 1989; and (12). The larger the Koc, the more strongly the pesticide is held in the soil organic matter and the less likely it will leach through the soil. Note that glyphosate and paraquat are ionic and are exceptions to the inverse solubility to Koc relationship. H = Highly soluble or insoluble; P = Practically insoluable; S = Slightly soluble ; and V = Very soluble.

(8) ST = Slightly Toxic; T = Toxic; MT = Moderately Toxic; HT = Highly Toxic. Given in ppm unless otherwise stated.

(9) Schultz (1989) Restricted Use Pesticides. Details are as follows:
a. Carbofuran - All liquid formulations and all granules (above 5%); also under Special Review.

(10) Metaldehyde labels must bear the following: "This product may be fatal to children and dogs or other pets if eaten. Keep children and pets out of the treated area." Use as a bait only, application not to be made to plants.

(11) Several products are still under Special Review (SR) by the EPA for various reasons. The current status of the special review must be determined before using carbofuran.
The SR process was recently completed on benomyl, diazinon, and PCNB (reduce HCB contaminant).
Most products have undergone the initial Reregistration process and have been issued Reregistration Standards (RS) and these products have been marked by placing an (RS) after the trade or commercial name.
The copper fungicides are Exempt from a tolerence and are designated as "E" in the coffee column.

(12) SilverPlatter Version 1.6 (Through Sept. 1989) was used to confirm U.S. registration status on coffee and to obtain other data on products in this list. Additions in the COMMENTS section indicate: C = tumorigen, M = mutigen, T = reproductive-effector, O = organometallic, or S = primary irritant. When these letters are present it indicates some positive data were found in the literature.

NOTE: Due to not having ready access to the latest WHO/FAO standards (6), some products still need these data. These products are indicated with a "?" in the WHO/FAO Column. This should be determined before use to avoid illegal residues. Also please note the comments in footnote 6 above. This is especially true for dazomet and PCNB. Also note that heavy use is being made of diazinon and this use is not being supported by the primary manufacturer, CIBA-GEIGY, in the reregistration process. If this registration is lost an alternative must be requested and approved.

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Table 2. Restricted and/or U.S. prohibited pesticides currently used in Guatemala.

1. Aluminum Phosphide (DETIA GAS-EX-T, PHOSTOXIN); Fumigant.
2. Azinphos methyl (GUTHION, GUSATION); Insecticide
3. Carbofuran (FURADAN); Insecticide[1]
4. Cyfluthrin (BAYTHROID, BAYTROID, SOLFAC); Insecticide
5. Cyhalothrin (KARATE); Insecticide
6. Cypermethrin (AMMO, ARRIVO, CYMBUSH, RIPCORD); Insecticide
7. Deltamethrin (DECIS, K-OBIOL); Insecticide
8. Dicrotophos (BIDRIN, CARBICRON); Insecticide
9. Disulfoton (DI-SYSTON, SOLVIREX); Insecticide, Acaricide
10. Esfenvalerate (ASANA); Insecticide
11. Fenamiphos (NEMACUR; Nematicide, Insecticide
12. Fenitrothion (SUMITHION); Insecticide
13. Fenpropathrin (HERALD); Insecticide[2]
14. Fenvalerate (PYDRIN, BELMARK); Insecticide
15. Flucythrinate (PAY OFF, AASTAR); Insecticide
16. Isofenphos (OFTANOL, PRYFON); Insecticide
17. Metaldehyde (METALDEHYDE); Molluskicide
18. Methamidophos (TAMARON); Insecticide
19. Methyl parathion (FOLIDOL, PARATION METILICO); Insecticide
20. Methidathion (SUPRACIDE); Insecticide
21. Methomyl (LANNATE); Insecticide
22. Mevinphos (PHOSDRIN); Insecticide
23. Mirex (MIREX); Insecticide[2]
24. Monocrotophos (AZODRIN); Insecticide
25. Oxamyl (VYDATE); Insecticide, Nematocide
26. Paraquat (GRAMOXONE, PILLARXONE); Herbicide
27. Permethrin (POUNCE, AMBUSH, TORPEDO); Insecticide
28. Phorate (THIMET); Insecticide
29. Phoxim (VOLATON); Insecticide[2]
30. Prothiophos (TOKUTHION); Insecticide[2]
31. Profenofos (CURACRON, TAMBO, SELECRON); Insecticide,
32. Terbufos (COUNTER); Insecticide, Nematicide[3]
33. Vamidothion (KILVEL); Insecticide[2]

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[1]Only liquid formulations are restricted; granules 5% or under are not restricted use.

[2]This product is not permitted for use in U.S.

[3]Only formulations with 15% ai or greater are restricted.

The TAP phase of this project features an effective training component on pesticide safety and will provide protective equipment and clothing to project staff. In addition, the proposed research phase of the project will provide considerable technical assistance in pesticide management research to seek safe, cost-effective pesticide application techniques, and alternative control strategies. Initially the research project should focus on evaluation of the alternative pesticides proposed for controlling certain pests (See Section 6).

As indicated, not all the pesticides in Table 1 have been registered by EPA for use in the U.S. (noted as NR "not registered"). However, the FAO and WHO of the United Nations have recommended "residue tolerances" for some of these materials. A residue tolerance is the amount (expressed in parts per million) of a pesticide that may legally and safely remain in or on any raw farm products at the time these products are sold for consumption by humans or livestock. As noted in the table, some have tolerances specifically established for coffee, but for others only an "Average Daily Intake" or "ADI" level has been established. Another aspect of the proposed research project will be to provide assistance in seeking alternative, non-restricted use pesticides for use on coffee that meet EPA criteria. This will be more difficult for products not having a specific tolerance due to an already heavy residue load of some crops.

One of the pesticides in Table 1 is under "Special Review" (SR) by EPA:

*carbofuran (FURADAN)

The special review process was known previously as the RPAR or "Rebuttable Presumption Against Registration". They are still designed to gather information and stimulate public debate about a pesticide being scrutinized because of adverse effects on human health or the environment. If at the end of this process the risks are found to outweigh the benefits, the pesticide may be cancelled (banned) or greatly restricted in the US. Section 5 discusses why a Special Review has been issued for carbofuran (FURADAN). As noted in Annex 3, several other pesticides suggested for use on coffee are or have been subject to special review.

2. The Basis for Selection of the Proposed Pesticides.

After discussions with the ANACAFE technicians Ing. Jose Luis Jimenez, Eddie Garcia, Ramon Donis G., Jorge Hurtarte, Oscar Makepeace, Julio Lima, Clodomiro Guzman M., and David Makepeace; Ing. Arnoldo Arevalo J. (MAGA/DTSV); and Mr. George Allen (ICI

Panamericana, S.A. and President of GREPAGRO Agrochemical Dealers Association), the lists in Table 1 and Table 2 and Annex 3 were compiled. The pesticides in Table 1 are presently registered for use in Guatemala, are locally available, and are presumed to be effective. There is a lack of research data for most crops in the country, however considerable regional and Guatemalan research efforts have been directed at coffee. Therefore, considerable published data are available to judge pesticide effectiveness in coffee. These data indicate that some of the proposed alternative pesticides may not be as effective as those currently in use. This is particularly true for the substitution of diazinon for endosulfan for broca (coffee berry borer). It is the goal of the proposed research phase of this project to address part of the data needs to obtain additional registrations for coffee. Therefore, the pesticides being investigated include, but are not limited to, those on the list of approved pesticides.

A list of pesticides currently available for purchase in Guatemala which are considered to be too toxic for use in the TAP extension phase of this project or which have been cancelled/ suspended by EPA is in Table 2. A list of pesticides that have been banned from use or have use restrictions in Guatemala are listed in Annex 4.

3. Extent to which the Proposed Pesticide Use is Part of Integrated Pest Management Programs.

Reliance on pesticides alone is expensive and these rarely give lasting control. Pests often become physiologically or behaviorally resistant to pesticides used extensively. Such resistant pest strains offer serious consequences to both farmers and the general public. Resistance is most likely to occur in areas where sole reliance is placed on pesticides and use is heavy. The reliance on only one or a limited number of pesticides in the same chemical group can also hasten the development of resistance. Control failures and suspected resistance problems have been suspected for several insects, especially in the cotton growing areas of Guatemala.

Experience worldwide has shown that the best way to avoid pest resistance and also to increase and sustain agricultural production is to employ a variety of control tactics, including biological (predator, parasite, and pathogenic natural enemies of pests), cultural, genetic, physical, and legislative. This multi-tactic, balanced approach is termed integrated pest management (IPM) or "manejo integrado de plagas" (MIP).

Under IPM/MIP, crops are regularly monitored (called "scouting") for presence of pests, natural enemies, and other factors which may influence a decision concerning a control measure. Pesticides are applied only a s pest populations have

exceeded unacceptable density levels and there is reasonable assurance that pesticide use will be profitable and non-disturbing to the environment.

The IPM concept is currently playing a role in Guatemalan agriculture. Multi-tactic approaches can now be found: for example, the cabbage production packages being used include the use of Bacillus thuringiensis product for "worm" control. However, much improvement can be made in monitoring programs and use of economic injury levels and thresholds. This A.I.D. project stresses training and technical assistance to advance IPM concepts and techniques in Guatemala. However, development and implementation of IPM will be a long-term undertaking. During the 8 year duration of this project, one should seek to firmly establish the movement toward IPM where pesticides are truly only used on an "as needed" basis in coffee produced under this project. Many IPM strategies are already included in the TAP program for the major coffee pests. However, IPM research is required on specific phases of pest management to provide alternative tactics for the full pest complex. The most critical immediate research need will be to test the alternative pesticides being proposed to assure efficacy on the full pest complex under Guatemalan conditions where these data do not already exist. One of the goals in the first year of the project should be to define these data gaps.

The proposed tech-pack to be extended in the TAP extension program includes several IPM strategies. The broca management program is a good example. First, the project will be concentrated in the higher altitude coffee production areas. Due to the more ideal growing conditions, broca and rust are generally less severe even without chemical intervention in these areas. Second, a cultural control program is being demonstrated in those areas. This involves the removal (called "repella") of all fruit remaining on the trees that resulted from late blooms and late maturity and recovery of all fallen fruit from the ground (called "pepina") after normal harvest is completed. These demonstrations have shown income from sales of recovered beans to more than pay for additional labor requirements, in most cases. Removal of these beans greatly reduces suitable overwintering habitat for broca and reduces populations the following season. Finally, researchers have demonstrated a simplified sampling plan to determine broca population levels and an action threshold that must be exceeded before sprays are recommended.

IPM programs are also available for rust and nematodes. Again rust problems are minimal at the higher altitudes and proper fertilization enhances this effect. Where nematodes are a problem, recommended coffee varieties are to be grafted onto resistant arabica rootstock which has a large and vigorous rootsystem that overcomes nematode injury (tolerance type of

resistance). In addition to nematode damage compensation, the vigorous root system results in a more vigorous plant that better resists rust infections. However, rust resistant varieties are also being tested and will be used in the grafting program when suitable verities are identified.

It is A.I.D. policy to stress IPM and make every effort to minimize the use of pesticides. As indicated above, the TAP phase of this project certainly fulfills this requirement for existing or "shelf" IPM technology they plan to extend to coffee producers with small land holdings. However, there is no provision made for set-aside funds to fulfill the research needs to be identified above and to test or develop new alternative IPM management strategies under Guatemalan conditions except as a part of the on-going research program in another ANACAFE department (Departamento de Asuntos Agricolas, that includes Asistencia Tecnica y Investigacion). Past experience in A.I.D. projects shows that this can only be accomplished by budgetary "set-asides" or concurrent complementary projects, so that within the term of the project there is assurance that needed testing and technical assistance will be accomplished. Short-term technical assistance from plant protection specialists in the U.S. in a collaborative effort with local plant protection scientists is considered to be a key part of this process. Only in this way can there be assurance of completion of successful field trials and studies in the short term and a trained, experienced team to continue IPM research after the project is terminated.

These pest management research activities should be coordinated with the regional PROMECAFE and ROCAP/MIP Project (to be continued under the ROCAP/Regional Environmental and Natural Resources Management (RENARM) Project) to avoid duplication. This is suggested as coffee is an important export crop in the entire region and research results should be applicable to all countries in the region and should receive regional financial support. However, a set-aside should be made within the SFCIP budget to assure the testing the efficacy of pesticides being recommended as alternatives to those traditionally used, if these data do not already exist. Although other specific research needs are to be defined in the first year of the project, the research should focus, at a minimum, on the following:

a) identification of the nature and magnitude of existing pest management problems;

b) assistance in the design and identification of a testing/evaluation program on appropriate pesticide use and efficacy;

c) design of a system of pesticide and alternative technology field trials and evaluation which will

include some form of crop insurance for participating farmers;

d) identification, training, and use of appropriate personnel to monitor and evaluate field testing programs;

e) training in the safe use, handling, application, and storage of pesticides; and

f) sensitization of farmers as to the advantages of an integrated pest management program.

These field testing programs should include one or more, as appropriate, studies related to:

a) use of parasites, predators, and biorational pesticides as alternate pest control agents;

b) investigation related to crop loss assessment and establishment of "protocol" treatment threshold recommendations;

c) use of crop varieties which show acceptable levels of resistance to local pests;

d) effectiveness of resistant rootstock to reduce nematodes, disease, and soil pests;

e) maximized use of mechanical and/or cultural control based on availability of labor inputs; and/or

f) evaluation of the status of pesticide resistance and alternative control measures.

A minimal five-year budget that will allow the above pest management research needs to be partially addressed is presented below. The primary funding of this new project should be considered under the regional PROMECAFE and/or ROCAP/RENARM project budgets as a set-aside from existing budgets or (a) project amendment(s) should be considered for the SFCIP project to provide the needed funding.

PROPOSED IPM RESEARCH PROJECT BUDGET

Technical Assistance (from the U.S.)		
3 person months/year over a 5 year period		
$250.00 per day		$112,500
Travel/per diem for above		65,000
Technical Assistance (Guatemala)		
To conduct field plot studies		
12 person months/ yr for 5 yrs		
@ $25,000/yr		75,000
In Country Travel		10,000
Research Technicians (Guatemala)		
3 persons/yr for 5 yrs @ $10,667/yr		160,000
Vehicles (2)		26,000
Transportation Expenses @ $1,000/yr		5,000
General Supplies @$5,500 1st yr & $3,500/yr		19,500
Computer Hardware and Software		
(inc. backup power supply, etc.)		5,000
Pesticide Application Equipment @ 1,500/yr		7,500
Nematode Laboratory Equipment		45,000
Maintenance and operation @ 3,000/yr.		15,000
Meteorological Monitoring Equipment		10,000
Test Plot Rental @ 1,500/yr		7,500
Maintenance and Operation		
(of equipment and vehicles) $2,000/yr		10,000
Laboratory Analyses (pesticide residues and		
other studies) $5,000/yr		25,000
Audiovisual equipment and microscopes		
(camera, projectors, video, etc)		15,000
	Subtotal	$603,000
Institutional overhead		
(est. 30% of US salaries)		33,750
	Total	$636,750

4. The Proposed Methods of Application, Including Availability of Appropriate Application and Safety Equipment.

If pesticides are used, the project would utilize both gasoline-powered and hydraulic backpack sprayers. However, the latter is much more common. Foliar applications would be made primarily with these sprayers, however, in some cases, mist blowers and specialized low-volume sprayers could be used. Granular pesticides would be incorporated in the soil and rat and slug baits would be selectively placed in known pest habitats.

The TAP phase of the project will require the financial institutions include funds in the loan for the purchase and use of all appropriate protective devices and clothing if pesticides are included in the loan. Rubber boots and coveralls or long-sleeved shirts and full-length pants were observed by this EA team as being available in the market-place. However, approved face masks and rubber gloves were not easily found, but were reported to be available at some establishments in some areas. If not currently available, these required items may need some special consideration.

The research project will provide and enforce the use of all appropriate protective devices and clothing - face masks, gloves, boots, and coveralls - for project personnel who apply pesticides. Agreement must be reached with all project contractees or grantees that the highest safety standards are upheld, and costs for protective devices and clothing must be a part of contract/grant budgets let by this project if pesticide use is proposed. It is the Project Manager's responsibility to see that pesticides are transported, stored, mixed, applied, and disposed of properly as specified on the pesticide's label.

The project manager will see to it that the project follows the principles of safe pesticide management as outlined in "The World Bank Guidelines for Selection and Use of Pesticides". From time to time the Regional Bureau Environmental Officer will provide to the mission current A.I.D./W interpretations of these guidelines.

Based on appropriate label statements on the pesticide package, A.I.D./G will require loan recipients to follow all recommendations, rates and frequency of application, time of application, and the number of days before harvest the pesticide may be applied. Failure to meet label standards will be grounds for the project manager's cancellation of specific grants, contracts or loans let by this project. Partial enforcement of these requirements in the TAP will be accomplished through periodic, random sampling of harvested crops and conducting residue analyses for the most likely pesticides to have been used. However, this will require that a Guatemalan laboratory be

available and have the capability to test for the required pesticides. Preliminary contacts made with the LUCAM residue laboratory revealed heavy use and would require long-term advance notice and special ordering of reagents to do the required analyses. Otherwise, an approved residue analysis laboratory outside the country will need to be located and arrangements made to conduct the required analyses.

Pesticides should be stored in their original containers in a facility specifically designated for that purpose. The facility should be locked with keys assigned only to authorized personnel. A sign reading "DANGER: PESTICIDE STORAGE AREA" (in spanish) should be posted. Pesticides should never be stored near food, animal feed, animals or drinking water. According to Guatemalan law a distance of 100 meters should be observed. The storage place should be in an area protected from tropical storms and fire hazards.

Special attention should be given to the pesticide storage facilities. This EA team observed the pesticide storage facilities at several farms. In each case all classes of pesticides were being stored in the same location as were fertilizers, and hand implements. Cross-contamination could occur as well as damage to the planting seed by herbicides. Storage facilities should not be part of a larger building where fumes could penetrate to offices, work, and sleeping areas. When possible, separate pesticide storage facilities should be constructed and herbicides should be separated from other pesticides and fertilizers. They should always be locked to prevent access by children and other unauthorized persons.

Empty containers should never be reused - there is no practical method for removing all of the toxic residues.

Liquid containers should be treated as follows: empty the container's content into the spray tank, drain in a vertical position for 30 seconds. Refill the container 1/4 full with water, rinse and pour into the tank, drain. Repeat rinsing and draining three times. Use the rinse water in the sprayer. Punch several large holes in the container's bottom. Bury the container in a designated land disposal site on high ground away from water.

Containers and small quantities of leftover pesticides should be buried in pits in the soil about 1/2 meter deep. Bottoms and sides of the pits should be lined with lime, carbon, charcoal, or organic matter such as leaves, straw or other plant debris. Any of these materials is a good absorbent and facilitates breakdown of the chemical. The pits should be refilled and mounded above ground level with soil. Empty paper containers and bags also should be buried in similar burial pits. The project will initiate an intensive training program in

pesticide safety and management for project personnel, collaborators, and loan recipients.

5. Acute and Long Term Chronic Hazards, either Human or Environmental, Associated with the use of Pesticides and Measures Available to Mitigate the Hazards.

All pesticides are potentially hazardous to humans and the environment and should be treated with caution regardless of their relative toxicity. The potential health hazard depends on the toxicity and the amounts swallowed, absorbed or inhaled. The relative toxicity of a pesticide can be found by examining its LD50 value which is the amount of the chemical necessary to kill 50% of the test animal population (usually laboratory rats). It is expressed in the weight of pesticide per unit weight of body (mg/kg) when swallowed (oral toxicity), absorbed through the skin (dermal toxicity) or inhaled. The latter value, inhalation toxicity, is usually expressed in parts per million (ppm) per unit volume of air.

Pesticides with the lowest LD50 value are potentially the most toxic to humans. Ingestion of just a few drops to a teaspoon of a pesticide with an oral LD50 value of less than 50 might be sufficient to kill an adult person. An adult would probably have to consume 16 tablespoons to 1/2 kilogram or more of a pesticide with an oral LD50 of 5,000 before dying. However, the pesticide's formulation, percentage active ingredient, and other factors determine its actual hazard level. Rodenticides (rat poisons), for example, have low oral toxicity values but would be considered only moderately hazardous to humans because their pellet formulations contain only about 2% active ingredients.

Acute oral and dermal LD50 values of most of the proposed pesticides and inhalation toxicity for some are shown in Table 1. Acute toxicity results from a severe case of poisoning due to a single dose of exposure to the pesticide.

Table 1 also shows EPA's toxicity category for each chemical and Table 3 shows the "signal word" for each category and their relative toxicity. These words have been assigned by levels of toxicity and appear on the labels of EPA registered pesticides. Pesticides assigned the signal word "DANGER" are highly toxic compounds and are not recommended by EPA for general use. Materials showing the words "WARNING" or "POISON" also present a high potential hazard to the user. Some of these possible effects on humans are discussed below.

TABLE 3. Toxicity Categories of Proposed Pesticides by Hazard Indicator.

Hazard Indicators	Toxicity Categories EPA I[1] DTSV I & II	II III	III IV	IV V
Oral LD_{50} (mg/kg)	50 or less	50-500	500-5,000	>5,000
Inhalation LD_{50} (mg/liter)	0.2 or less	0.2-2	2.0-20	>20
Dermal LD_{50} (mg/kg)	200 or less	200-2,000	2,000-20,000	>20,000
Eye Effects	Corrosive; corneal opacity not reversible within 7 days	Corneal opacity reversible within 7 days; irritation persisting for 7 days	No corneal opacity; irritation reversible within 7 days	No irritation
Skin Effects	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation at 72 hours
EPA Signal Word	"DANGER"	"WARNING"	"CAUTION"	"CAUTION"
DTSV Signal Word	"PELIGRO"	"CUIDADO"	"PRE-CAUCION"	"PRE CAUCION"
DTSV Label Color	RED	YELLOW	BLUE	GREEN

[1] The word "POISON" and also a picture of a skull and crossbones appear on the labels of EPA registered in Category I and DTSV registered in Categories I and II.

Possible Human Effects

Organophosphates and carbamates (see Table 4) are cholinesterase inhibitors causing symptomatology of varying severity from illness to death by paralysis depending on the dose (concentration) exposure. The LD_{50} is an indicator of human sensitivity (extrapolated from animal studies) to a particular pesticide. The mixer/loader/applicator group and laboratory workers handling technical grade pesticides have the greatest risk of exposure and therefore has the greatest risk of intoxication. Treatment is possible with atropine and 2-PAM, and the effect is reversible if treated in time. No known long term effects are noted with the organophosphates available in Guatemala, with the exception of: 1) chlorpyrifos and dichlorvos which are lipophilic and can be stored in body fat and; 2) mephosfolan (Citrolane) which was shown to cause demyelinization (removal of myelin nerve sheath) and permanent paralysis in chickens. Leptophos (Phosvel) was not observed to be available. Leptophos is more lipophilic than DDT and is known to cause delayed neurotoxic effects and demyelinization.

Carbamate exposure can be treated with atropine (2-PAM is contra-indicated). Bisdithiocarbamate metabolites include ethylene dithio-urea (EDTU) which is a carcinogen. There is very little evidence of EDTU being found under actual field conditions.

If labeling instructions are followed for the use of these types of pesticides, there should not be any long term effects associated with organophosphate or carbamate residues on food, excluding the noted exception. Organochlorinated pesticides are lipophilic and are stored in body fat. Since they are carcinogens, exposure should be minimized. Studies should continue to be conducted to determine the half-life of available pesticides as used on coffee (Urbina 1988). Dicofol contains DDE, DDD, and DDT as impurities. Use of this product will lead to residues of DDT and its metabolites.

Use of the esters of chlorophenoxy acids instead of the salts is more dangerous because of respiratory exposure even though the oral LD_{50} of both are approximately the same. The salts are systemic, therefore, there is a chance of residues within the food crop. Chlorophenoxy acids and organochlorines are central nervous system stimulators. The organochlorines are also known for their persistence. Endosulfan is an organochlorine and has been the product of choice for many years for broca control, in part for this long-term effectiveness.

Pyrethroids have low mammalian toxicity and do not pose an acute poisoning threat to applicators. Residues may build up in human tissue, but little is known of long term effects.

Pyrethroids are primary irritants and can cause dermal problems for applicators.

Table 4. Pesticides used in Guatemala According to Categories.

ORGANOPHOSPHATES

Acephate, Chlorpyrifos, Dichlorvos, Dicrotophos, Disulfoton, Diazinon, Ethoprop, Dimethoate, Fenamiphos, Fenitrothion, Fenthion, Glyphosate, Malathion, Mephosfolan, Methamidophos, Methidathion, Methyl Parathion, Monocrotophos, Phosalone, Profenofos, Triazophos, and Vamidothion.

CARBAMATES
Aldicarb, Carbaryl, Carbofuran, Carbendazim, Methomyl, Oxamyl, and Benomyl.

BISDITHIOCARBAMATES

Maneb, Propineb, and Zineb.

ORGANOCHLORINES

Captafol, Captan, Endosulfan, Dicofol, Oxyfluorfen, and Propanil.

TRIAZINES

Atrazine, and Metribuzin.

PYRETHROIDS

Cyfluthrin, Cypermethrin, Deltamethrin, and Permethrin.

MISCELLANEOUS

DCNA, Fentin Acetate, Linuron, Oxadiazon, Paraquat, Pendametholin, Phoxim, and Trichlorfon.

CHLOROPHENOXY ACIDS

2,4-D and MCPB.

The proposed pesticides are generally non-persistent and, if used in accordance with their labels, should present no unusual hazards to the natural environment (see Section 7). The project will share with the Plant Protection (MAGA/DTSV) and ANACAFE Agromedical Personnel information concerning toxicity of pesticides and procedures for mitigating hazards. Some of the possible environmental hazards are discussed below.

Possible Environmental Effects

Organophosphates, carbamates, and synthetic pyrethroids are less persistent than the organochlorines and, therefore, pose less of a danger to the environment than the more persistent organochlorines. The triazines and miscellaneous pesticides generally are the most water soluble. Usually, the higher the water solubility, the lower the soil sorption. The higher the water solubility, the greater the threat to water systems. As the soil sorption coefficient increases, the stronger the chemical is held in the soil, which lessens the chance of contaminating water systems. Table 1 and Annex 3 included data on water solubilities and sorption coefficients for some products used in coffee. Table 5 gives comparative data for other products.

One of the other possible non-target effects is the hazard of pesticides to honeybees. These data were included in Table 1 and Annex 3 where available. The relative danger of selected insecticides is as follows:

HIGHLY TOXIC - CARBARYL, CARBOFURAN, CHLORPIRIFOS, DIAZINON, DIMETHOATE, MALATHION, PERMETHRIN
MODERATELY TOXIC - DISULFOTON, METHOMYL
RELATIVELY NON-TOXIC - TRICHLORFON

Beef cattle are raised mainly in areas where pesticide use is not concentrated. Cotton is grown in several areas. If chlorinated pesticides are used on cotton, and cattle are allowed to feed on cotton stalks and on the cotton seed cake left after cottonseed oil extraction, beef cattle will bioaccumulate the organochlorines in their fat. This can lead to residue levels which exceed the tolerances of importing countries and impose an economic burden on Guatemala as well as a health hazard.

Similar dangers are present for the expansion of agriculture and aquiculture enterprises. Extreme care must be taken to select these sites with both current and past pesticide use history in mind. Residues present in the soil from pesticides used up to 25 years ago are possible if organochlorines were involved.

Table 5. Toxicity of selected pesticides.

Common Name and (Brand Name)	Acute LD_{50} Oral	Acute LD_{50} Dermal	EPA Signal Word[1]
Benomyl (BENLATE)	>10,000	>10,000	CAUTION
Bti (DIPEL)	-	-	CAUTION
Captan (CAPTAN)	9,000	-	CAUTION
Carbaryl (SEVIN)	850	-	CAUTION
Captafol (DIFOLATAN)	5,000-6,200	-	WARNING
Carbofuran (FURADAN)	11	10.200	WARNING/DANGER[2]
Copper hydroxide (KOCIDE)	1,000	-	CAUTION
Copper oxychloride (CUPRAVIT)	1,000	-	-
Coumatetralyl (RACUMIN)	-	-	-
Daconate (DCPA)	10,000	>10,000	CAUTION
Deltamethrin (DECIS)	128 >5,000	>2,000	-
Demeton Methyl (METASYSTOX)	170-300	260-410	WARNING
Diazinon (BASUDIN)	300-400	3,600	CAUTION
Dibromochloropropane (NEMAGON)	170-300	260-410	WARNING[3]
Dicofol (KELTHANE)	684-809	2,100	CAUTION[3]
Dimethoate (ROGOR)	215	>1,000	WARNING
Fenthion (FENTHION)	255-298	1,680-2,830	-
Fluazifop-butyl (FUSILADE)	1,490-3,328	>2,420	CAUTION/WARNING
Glyphosate (ROUNDUP)	4,300-4,900	-	CAUTION
Malathion (MALATHION)	1,000-1,375	4,100	CAUTION
Maneb (MANZATE)	7,990	-	CAUTION
Metalaxyl (RIDOMIL)	669	>3,100	WARNING
Metaldehyde (METALDEHYDE)	250-1,000	630	CAUTION/WARNING
Methomyl (LANNATE)	17-24	5,880	DANGER
Mevinphos (PHOSDRIN)	4.15	57	DANGER
Monocrotophos (AZODRIN)	8-23	354	DANGER[3]
Oxamyl (VYDATE)	37	2,960	DANGER
Paraquat (GRAMOXONE)	150	-	DANGER
Propineb (ANTRACOL)	5,000	>5,000	-
Spreader-Sticker (TRITON)	-	-	WARNING DANGER
Thiram (THIRAM)	780	-	CAUTION
Trichlorfon (DIPTEREX)	150-400	>500	WARNING
Warfarin (WARFARIN)	3	-	WARNING CAUTION
Zineb (ZINEB)	5,200	>2,500	-

Table 5. Toxicity of selected pesticides (cont'd).

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[1] See TABLE 3 for explanation. More than one signal word indicates a difference in formulation (dry vs. liquid) or percentage active ingredient.

[2] WARNING = granules
DANGER = liquid (liquid formulations cannot be used in the project).

[3] All uses cancelled by EPA.

Organic fertilizer development is being considered at coffee and other processing plants by using the otherwise discarded material such as coffee pulp, peelings, and culled fruits and vegetables. Pesticide residue levels in these materials should be determined to prevent crop and animal contamination. In Hawaii, an animal feed was developed from pineapple stock without consideration of residues of heptachlor which is used on pineapple. This led to contamination of milk (heptachlor epoxide) from cows fed this material.

As noted in section 1, EPA is making a Special Review of one of the proposed pesticides. Carbofuran granular formulations are under review for effects on avian populations. Captan (accused of causing tumors and toxic effects on the liver and kidney), mancozeb, and maneb are also under or have been the subjects of special review. The Selected or Special Review (formerly known as the RPAR process) is a continuing activity, and the EPA will not take final action on carbofuran until the process is completed. Ultimately, the only valid source for information concerning legal use of EPA registered pesticides is the pesticide label. The label should always be followed carefully, as this best assures minimum hazard to users.

In those cases where pesticides will be used on crops where no U.S. or international tolerances have been established, residue sampling will be undertaken according to established FAO/WHO Codex procedures and arrangements for analysis and submission of data to the FAO Joint Meeting on Pesticide will be made. ST/AGR/AP can provide assistance with sampling protocols, needed steps to obtain FAO/WHO review, and arrange for needed collaboration with pesticide manufacturers. Ultimately, this process should lead to the establishment of Guatemalan tolerances. Such procedures will be imperative for export crops destined for foreign markets and for assuring the safety of products for internal consumption. The regional IR-4 project should also be considered in satisfying these needs. These efforts should be coordinated with PROMECAFE and other donors to avoid duplication.

In the interim, A.I.D./W needs to help seek approval for the use of those products listed in Table 1 for use on coffee. These pesticides for which EPA has not established tolerances are anticipated to be required in the production of this crop on this project.

6. <u>The Effectiveness of the Requested Pesticides for the Proposed Uses</u>.

The pesticides listed in Table 1 have been evaluated under a variety of conditions including those of the Central American region and found to be effective for some of the pests attacking coffee. However, as previously indicated, published data are not

available on the efficacy of these products for all coffee pests in Guatemala. Few pesticides are registered in the U.S. for use on crops such as coffee which is not grown in the continental US. Therefore, one of the objectives of the research phase of the project and/or the proposed IPM Research Project (see Section 3) should be to collect the efficacy, residue dissipation, and cost/benefit data on products needed to control those pests where registered, non-restricted use pesticides are not available or where the product list is very limited. Where residue data are needed, consideration should be given to the use of the Regional IR-4 Project specifically designed for such studies.

Another reason for initiating the research project is the loss of many of the "minor use" registrations of some of the general use pesticides during the re-registration process that is currently in process in EPA. An example of the impact this can have is the case of diazinon. Use on "minor" crops such as asparagus, beans, coffee, and peas is being dropped. Additional crop registrations being dropped by CIBA-Geigy are included in Annex 5. An extensive list of other proposed changes by other companies is already available in the A.I.D./G RDO. The National Resources Defense Council (NRDC) law suit may lead to additional legislation in this area and a copy of a summary is being provided separately to the RDO. The impact of other pending legislation such as the Dingle Amendment could also critically impact the importance of this proposed research and TAP programs.

A sample of the pest management guides currently in use in ANACAFE can be found in their recently published coffee production Manual (ANACAFE 1988) as well as in various other ANACAFE and PROMECAFE sponsored publications. As can be noted (Annex 3), many of the products mentioned are in the EPA restricted use category and will be prohibited from use or mention in management guides for use under this project, if the letter of the regulations are followed. In some cases this will leave only one product, diazinon or malathion, for them to suggest as a control alternative for some pests listed. It is well known that diazinon is not as effective as endosulfan for broca control (ANACAFE 1985 for example). Routine posttreatment sampling should be conducted to monitor this key pest to determine if this pest survives diazinon treatment or resurges to outbreak population levels and crop destruction is imminent. Use of this restricted use, but highly effective and safe (with proper training) pesticide could save the crop and the grower's ability to repay the crop production loan if use can be approved under such "emergency" situations, if illegal residues will not result. If this occurs, special provisions should be made to use endosulfan, which is known to be an effective treatment (Urbina 1988, and others).

Producers with small land holdings will have had considerable experience in using restricted use pesticides prior

to becoming a part of the ANACAFE/A.I.D. project. The amendment is funding the TAP training program to teach these farmers how to handle pesticides properly. They will be taught how to properly handle both general and restricted use pesticides. As the later are the very pesticides that present the greatest threat to user safety.

Since project TAP personnel will have to have extensive training in pesticide use and management, it is proposed that this training be made equivalent to that required for the commercial certified applicator license in the U.S. Consideration should then be given by A.I.D./W to allow the use of the restricted use pesticide endosulfan under an emergency situation as that described above. At a minimum they should be allowed to use this and other selected RU products under their direct supervision, provided an applicator certification program is established and enforced.

Such a program will demonstrate that they can be trained to properly use these pesticides. Then they will continue to be competitive in the markets for which we are helping them develop products and will allow them to repay project loans and achieve project goals.

7. Effect of the Proposed Pesticides on the Target and Non-Target Ecosystems.

The proposed pesticides are generally non-persistent and, if used correctly and according to their labels, should present no unusual hazards to the target or natural ecosystem. Applying higher dosages, shrinking intervals between applications, spraying during windy conditions, storing or disposing carelessly, accidental spills of concentrates or rinsing equipment and/or containers in rivers would have harmful effects.

Most suggested insecticides are toxic to some natural enemies and bees, especially if applied at high rates. Thus, natural enemies and bees residing in treated fields and experimental, demonstration or control plots would likely decrease. Further, the threat of buildup of genetically resistant strains of insect pests, plant diseases, weeds, nematodes, and rats always exists. This is especially true where a limited number of products can be approved for use as a proper rotation of chemicals is not possible. This places added importance on the proposed research project to provide alternative pesticides and methodology.

Some of these possible effects were discussed in more detail in previous sections. A list of the endangered species known in Guatemala in 1987 are included in Annex 6. Accurate distribution data should be included in future studies of endangered species

to facilitate the possible implementation of the finalized Endangered Species Act if required by A.I.D. on this or other projects. However, such studies are beyond the scope of this project.

Some of these problems are unavoidable when pesticides are used. Minimal adverse effects result only when pesticides are used in combination with other control tactics in an IPM program and when users are educated to the hazards and proper use of the materials. In cases where pest control is necessary, the project will emphasize IPM and pesticide management and, through special training on these subjects, foster a more rational use of the materials.

The proposed IPM program for broca management (Section 3) is a good example of their methodology. First, the project will concentrate in the higher altitude coffee production areas where broca and rust problems are generally less severe. Second, a cultural control program is being demonstrated in these areas whereby all fruit remaining on the trees from late blooms are removed (called "repella") and all fallen fruit is picked up (called "pepina") after normal harvest is completed. These demonstration plots have shown recovered beans to more than pay for additional labor requirements in most cases. This greatly reduces suitable habitat needed to survive between production periods and greatly reduces populations the following year. Finally, they have demonstrated a simplified sampling plan to determine the need to spray and only spray if the threshold is exceeded. Two such plots were visited and the growers were very happy with the results. Most other groups knew of the program and practiced it to some degree in their renovated parcels. The rust and nematode non-chemical management strategies are also discussed in Section 3.

8. Conditions under which the Pesticides are to be used including climate, flora, fauna, geography, hydrology, and soil.

Guatemala occupies the area of Central America between Honduras and El Salvador on the southeast and Mexico on the Northwest. It has a total area of 10,888,900 hectares (ha), which makes it one of the biggest in Central America. The estimated population of Guatemala was approximately 7.7 million people in 1982 (U.S.A.I.D. 1987).

The country has a tropical climate. Temperatures along the costal areas average between 68° F and 77° F (20° C and 25° C), rarely falling below 60° F or rising above 90° F in the lower elevations. The weather is somewhat cooler in higher elevations with lowest temperatures reaching 45° F (7° C). Annual rainfall ranges between 16-177 inches (400-4500 mm), with the rainy season

lasting from May through October. In some areas the rainy season is divided into two parts by a "canicula" or dry period in July-August.

Much of Guatemala is mountainous, with the highest point being the Tajumulco Volcano in the south at 4200 m (13,780 ft). The most pronounced geological feature is the chain of 33 late Pleistocene volcanos in the south-central region of the country of which four are active. They range in elevation from 1,027 m (El Culma) to El Tajumulco mentioned above. This zone occupies about 45 % of the total area of the country and represents the major coffee production area.

Export crops include coffee, sugarcane, bananas, and cotton, with recent exports of meat and selected vegetables and fruits. Corn, beans, wheat, rice, potatoes, plantains, and yucca are national staples. The bulk of basic food staples are produced on small or medium farms; over 77% of the farms are less than 5 ha, occupying 41% of the total farmland. Only 2% of the farms exceed 64 ha, but these farms occupied more than 20% of the total farmland in 1979 (U.S.A.I.D. 1987).

Of the seven soil use groups, those which have moderate to high agricultural potential cover 27,814 sq. Km. Another 32,054 sq. Km. are listed as forest or multiple uses. 52,496 sq. Km. are only suitable for forests.

Soil erosion is the most serious problem affecting the natural resource base in Guatemala. Threatened or endangered fauna includes at least 1 amphibian, 6 reptiles, 11 bird species, and 24 mammal species (see Annex 6). No data were found on endangered plants. Little is known of most endangered fauna, while marine fauna has been mostly ignored.

Abundant anecdotal information and the EA produced by Watson, et al. (1988) suggests that increasing abuse of pesticides is causing chronic or acute poisoning, contaminating agricultural products, and stimulating resistant pests. Recent data from the IGSS files indicate the trend is continuing (Annex 7). Some observers feel these figures should at least be doubled to more realistically reflect the true situation. The general problem in pesticide use is thought to be inadequate training. Only 30% of the pesticides are applied by trained personnel.

One source indicated that overuse of atropine was a serious problem. The suggestion was made that atropine was used no matter what pesticide was involved in intoxications. A visit to one of the ANACAFE health stations revealed the same tendency in an area where the major insecticide used was endosulfan. This gives more importance to the suggested need for training programs for agromedical and paramedical groups. A series of 3 to 4 seminars was suggested to cover the large coffee producing areas.

Since they overlap the area of the U.S.A.I.D./G HAD II (Highlands Agricultural Development Project - Phase II) project, perhaps costs could be jointly shared since similar seminars were suggested by Watson, et al. (1988) for that project also.

9. Availability and Effectiveness of other Pesticides of Non-chemical Control Methods.

Proposed pesticides, as well as others, are available through commercial outlets and as contraband in Guatemala.

Crop rotation, use of clean (pest free) planting material, destruction of diseased crop plants, crop residue destruction, biological control, and a host of other cultural practices reduce pest severity. This project plans to utilize several established non-chemical control methrods (Section 3) and the proposed research phase will develop and encourage use of these kinds of non-chemical control methods in its programs.

Successes of the Commonwealth Institute of Biological Control (CIBC, Trinidad) and CIES (Centro de Investigaciones Ecologicas del Sureste, Chiapas, Mexico) with releasing the parasite, P. nasuta and C. stephanoderis for biological control of the broca (de Kraker 1989) should be studied. This project should establish a strong relationship with CIBC and CIES to attempt to exploit biological control successes. Also the latest data on the use of parasites in the IPM Project at the Escuela Agricola Panamericana (EAP) should also be obtained from Dr. Keith Andrews in Honduras. Bacillus thuringiensis (B. t.) has been used successfully in the cabbage production areas in El Salvador and the Dominican Republic as has previously been cited. This product was also a major component in the IPM programs observed at the three Fundacion de Deserollo/Departmento de Diversificacion Agricola (FUSADES/DIVAGRO) experimental farms visited in El Salvador in Sept. of 1989. Although no major lepidopterous pests were said to attack coffee, they were observed defoliating shade trees in two areas. Also, B. t. strains effective on coleoptera have been identified and is being released commercially in the US. Perhaps this strain should be tested on broca.

Further, demonstration and experimental plots under the guise of this project and the proposed IPM Project should be comprised of a variety of alternative, legitimate control tactics aimed at evaluation of cost/benefit of what will emerge as "options" for ultimate farmer user groups. This is a prime methodology for educating farmers to concepts of multiple and alternative tactics.

10. Guatemala's Ability to Regulate or Control the Distribution, Storage, Use, and Disposal of Pesticides.

The inappropriate use of pesticides is a classic example of the existence of external costs (externalities in economic jargon). External costs are the detrimental effects arising from pest control action, which affect parties other than the pest control decision-maker, but for which no compensation is paid. Pesticide external costs may be monetary or can be expressed in terms of reduced human health, adverse effects on animals, loss of yield potential, or negative environmental spill-overs. Since these costs do not directly affect the pesticide user, they go un-noticed and do not enter the pesticide use decision making process, leading to potential overuse. Three common approaches are used to reduce these losses. They are:

a. Education - training farmers, manufacturers, business persons, and health personnel of the consequences of their actions.

b. Market intervention - increasing pesticide prices through taxes or other forms of governmental action to force the recognition of the external cost by the user and, potentially, provide a method of compensation to the bearers of the external costs.

c. Governmental regulation - prohibition or control of pesticide use and manufacturing through the legal system.

Since the second approach requires valid estimates of the external costs, which are often difficult to obtain, education and/or regulation are commonly implemented by governments to reduce external costs.

Guatemala is no exception. The Government of Guatemala (GOG) has recognized the existence of pesticide externalities through the establishment of pesticide control regulations and through its desire for increased training for pesticide users. The Pesticide Control Act of 1974 (Decreto No. 43-74), and its related regulations (Annex 4) provide for the control of the manufacturing, reformulation, storage, importation, sale, and use of pesticides in Guatemala. Responsibility for its enforcement resides with the Ministry of Agriculture (MAGA) through its Department of Plant Protection (DTSV). The present capacity of DTSV is inadequate, however, to monitor and enforce the laws.

This project affords an opportunity to stimulate more active participation of the Ministry of Agriculture in pesticide use monitoring, enforcement, and training. The following activities are suggested to accomplish this increased participation and are as follows:

a. Development of a coordination committee composed of representatives from ANACAFE, PROMECAFE, DTSV, ICTA, Pesticide Commission of the General Directorate of Health Services (CP/DGSS), National Environmental Protection Committee (CONAMA), GREPAGRO, Cooperative League of U.S.A. (CLUSA), and FAO to assure passage and enforcement of the new Pesticide Law which was reportedly signed into law by the President of Guatemala in late Nov. 1987.

b. The coordinating committee formed in 1 (above) should seek additional legislation that would delegate the necessary authority and provide the infrastructure to enable DTSV to randomly sample and analyze shipments of foodstuffs proposed for export or import for pesticide residues.

c. The coordinating committee should also formulate legislation to institute a national pesticide applicator certification program. Purchase and use of pesticides in EPA Category I (GOG Categories I and II) would require the purchaser to be a certified public or private applicator. Minimum training standards for certification are outlined in Section 13.

d. Initiation of the proposed IPM Research Project as outlined in section 3 above and involve ICTA where appropriate.

e. Include DTSV technicians in education and training programs as budgeted in this project for TAP technicians and paratechnicians located in the regions to improve pesticide safety and to give instruction on sample selection and preparation of samples of crop and agrochemicals at the producer level for testing under Item 2 above.

f. A pesticide residue surveillance program with emphasis on TAP farmers, who provide coffee for exportation. This program is outlined in Section 11 (below).

11. <u>Ability of A.I.D. to Regulate or Control the Distribution, Storage, Use, and Disposal of Pesticides in the Small Farmer Coffee Project</u>.

In regular A.I.D. projects, careful control can be exerted in the selection, purchase, extension, use, and disposal of pesticides. Particular attention is given to assuring that only general use pesticides are used. Unless special measures are taken, no control can be assured in projects such as the one covered by this assessment since the farmers are provided with funds by BANDESA and private credit institutions, and the farmer

can purchase whatever he wants. All too frequently, highly toxic pesticides or pesticides which are bio-accumulative and persistent are used. In addition, products are used that may not be registered for use and have a residue tolerance established for coffee. This could result in illegal residues being present in the crop when used or sold for shipment, depending upon the regulations of the importing country. Some of the chemicals currently purchased are either severely restricted or banned for use in the U.S. A number of possible ways of controlling what a farmer purchases and uses have been explored, but all but one seem, at first glance, unwieldy and unworkable. One method, however, has merit and a refined version of it will be required for incorporation into the project to avoid the problem associated with the exportation and danger to Guatemalans internally utilizing coffee with illegal or excessive pesticide residues. Such a program could also be used to assure the activity is in compliance with A.I.D. Reg. 16. In essence, the following steps are required:

a. Place a condition into the A.I.D./bank loan agreement that the bank will agree to withhold future years loans to farmers whose coffee has excessive or illegal residues or who use pesticides other than "approved pesticides". To ensure compliance, maintain a list of farmers who have failed to comply with this agreement. Enforcement would be subject to an appeals procedure as outlined below.

b. Provide training in safe use of the approved pesticides along with assurances during the training program that the approved pesticides will indeed be effective.

c. Establish an inspectorship within the Project Specialty/Gourmet coffee certification and marketing activity to sample farm produce, at random, and without prior notice, on farms who are loan recipients. Coordination with the ministries of Health and Agriculture and the committee in Section 10 would help assure institutionalization of a quality assurance program for all crops.

d. Analyze samples in appropriate laboratory and notify the farmer, loan institution, ANACAFE technician, and proper enforcement officials of any farmer who is not cooperating, based on the finding of residues of non-approved pesticides. Guatemalan laboratories seem to currently be capable of performing such analyses but may need considerable advance notice if large numbers of samples will be submitted. However, the first few years monitoring may have to be conducted in collaborating U.S. laboratories due to their apparently over-loaded schedule.

e. All of the above is based on agreement of the farmer, as a condition of the loan, to have his crops sampled.

In the operation of this monitoring program, an appeals system must be developed to allow affected farmers to obtain the results of a second analysis or show proof of purchase of approved chemicals, evidence of drift or sabotage, or other extenuating circumstances. The possibility of prior years pesticide carryover should also be considered. Soil samples should be taken and analyzed to confirm or refute this possibility. Consideration could be given to sanctions being enforced during the first three years only after a second offense, especially in the case of drift, residue carryover or sabotage. However, care must be taken to avoid letting excessive residues enter either domestic or export marketing channels.

The residue testing program should be reviewed at each planned project evaluation to determine cost effectiveness in achieving stated goals. However, a special four-year evaluation should be conducted with the involvement of CICP and A.I.D./W to evaluate this program as a means of enforcing A.I.D. Regulation 16 provisions on future projects and the proposed method for mitigating the effects of utilizing RU pesticides.

12. Requirements for a Monitoring Program to Implement Control Over Pesticide Loans to Small Farmers.

Number of Samples

Considering the number of farmers involved, small numbers of samples collected e.g. 10-20 may be insufficient and 1000 samples would be excessive. One hundred and fifty (150) per year (two samples from each of 75 randomly selected farmers) would represent a reasonable effort and would be adequate to demonstrate the degree of farmer compliance.

Method of Analysis

Guatemalan laboratories should be fully utilized. However, until their capability for analysis can be developed, samples should be shipped to a commercial laboratory in the U.S. whose credentials are recognized by the LAC Bureau Environmental Officer. Multi-residue methodology, as used by FDA Regional surveillance laboratories, should be applied for all samples. Duplicate samples should occasionally be submitted to an approved lab to verify techniques and equipment calibration.

Location of Laboratories

Local Guatemalan laboratory capabilities for conducting large numbers of chemical analysis should be developed and is strongly encouraged. However, for at least the first year, in

the absence of demonstrated in-country capability to perform the monitoring analyses, samples should be shipped to a commercial laboratory in the U.S. whose credentials have been reviewed and approved by the LAC/G Bureau Environmental Officer.

Illustrative Budget (Exclusive of support of existing laboratories or setting up a new laboratory in Guatemala):

	$ / Year
Inspectors Salary (ANACAFE)	0
Training of Inspectors	2,500
Transportation for Inspector	0
Freezer for Sample Storage	500
Sample Shipping Containers	1,500
Shipping Charges	2,000
Chemical Analyses @ $200/Sample	30,000
	$36,500

13. The Provisions Made for Training of Users and Applicators of Pesticides.

Training in IPM and pesticide management for pesticide users is an appropriate response to the existence of external costs. Since the commodity stemming from the credit component of this project is for export, producers must be trained in the appropriate use of pesticides, to establish and maintain commodity markets. A special short course on pesticide management should be funded by the project. Its purpose is to train trainers, who will in turn train agricultural producers. The short course will be held in country or in the U.S., if required, to satisfy certification requirements by A.I.D./W. The minimum duration and topics to be covered in the course are detailed in the following table.

Having completed the course, the trainees, all of whom will be TAP Project and DTSV personnel, will train new extension agents, paratechnicians, and farmers using the materials provided and following the format of the certified course. They also will serve as a source of technical knowledge for their respective communities where the TAP is operating. From this nucleus, pesticide training can be spread throughout the country. CLUSA, GREPAGRO, FEDECOVERA, ANACAFE Health physicians and nurses, and other private and public institutions should be encouraged to participate.

Annual updates of project personnel should be planned. The assistance available through Dr. Joseph Saunders of the ROCAP-CATIE/MIP and the new RENARM Project should be utilized in this effort. The session could include a review of their latest

findings from the new ROCAP-RENARM Project and the French funded PROMECAFE Project as they might apply directly or indirectly to this project.

If deemed necessary by the initial training team, a special course may need to be scheduled for ANACAFE health unit personnel and, perhaps, selected IGSS personnel on treatment of pesticide poisoning. Need for such training was indicated by Dr. Mario Mazariegos M., Director of ANACAFE's Medico Accion Social program. The observation on the overuse of atropine should be confirmed or refuted in making this decision.

Baseline pesticide intoxication data should be recorded for each project area prior to project initiation. Data from subsequent years will be evaluated at the first scheduled project evaluation to determine the effectiveness of these mitigative actions.

PESTICIDE MANAGEMENT SHORT COURSE TOPICS

TOPIC	HOURS
The Pesticide Problem on a World Scale and in Guatemala.	0.5
Agroecosystem Concepts	1.0
Integrated Pest Management (IPM) Concepts	1.5
Pesticide Toxicology: Emphasis on Locally Used Pesticides	1.0
Pesticide Formulation	0.5
Elements of Chemical Control	1.0
Pesticide Poisoning and First Aid	1.0
Worker Protection	1.0
Pesticide Labels	1.0
Precautions in Preparing and Spraying Pesticides	1.0
Disposal of Excess Pesticides and Pesticide Containers	1.0
Pesticide Spill Cleanup	1.0
Pesticide Storage-Emphasis on "Planned Purchases" to Reduce Carry Over of Products.	1.0
Pesticide Application Equipment	1.0
Calculation of Pesticide Dosage	0.5
Calibration of Application Equipment; Field Calibration Exercise	8.0
Factors Affecting Foliar Applied Pesticides	1.0
Factors Affecting Soil Applied Pesticides	1.0
T O T A L	24.0

14. The Provisions Made for Monitoring the Use and Effectiveness of the Pesticides.

As envisioned in this project, loans will be made to producers through public and private banks. A problem immediately arises concerning the enforcement of A.I.D.'s Environmental Regulation 16. A complicated system could be developed to follow the flow of funds and to monitor the use of the loans. Such a system would be expensive to administer. A more efficient approach may be to monitor pesticide residues on the agricultural commodity. A workable scheme is discussed in Sections 11 and 12 above and constitutes a mandatory requirement of the Environmental Assessment. It also assures the export and internal consumption of coffee free of excessive or illegal pesticide residues.

Since the market price of pesticides is generally high, there is no economic or governmental incentive for "overuse". Misuse caused by insufficient training and "spill-overs" may continue. Misuse of this type can be partially resolved through education and training. Training was treated in Section 13 of this report. Sections 11 and 12 above outline the major method whereby small farmer compliance will be enforced.

The review team also evaluated the availability of small quantities of pesticides in small containers as a control method. Small containers might reduce inappropriate use by simplifying required instructions, or by reducing the possibility of excess product. For example, the container could be the appropriate amount for a designated area or for a specified volume of water. Packaging pesticides in small containers may increase their cost, however, by as much as 20 percent. This number was not supported by a review of existing pesticide price differentials in Guatemala. The availability of small packages for the commonly used pesticides does appear to be a problem. Herbicides were commonly found on the retail market in sizes of 1 lb. and/or 1 liter; while insecticide package sizes of 100 cc were readily available for many insecticides. However, the distributor still repackaged some products even though the practice is specifically banned in the various Guatemalan pesticide regulations (Annex 4) and strong pressure from GREPAGRO and major manufacturers to stop this practice. This leads to inadequately labeled product. This was discussed with Project and GREPAGRO personnel but no long-term solution was found. Thus, the actual status of availability of adequately sized containers of various pesticides approved for use on the project should be evaluated during the first year of the project and viable solutions sought.

D. REQUESTS FOR ADDITIONAL PESTICIDES AND/OR INFORMATION.

If project personnel determine a need for pesticides not in Table 1 (Section I) or if they need additional information about the pesticides or EA procedures, they should notify U.S.A.I.D. A.I.D./G can contact A.I.D.'S Bureau of Education, Science, and Technology, Office of Agriculture Production (A.I.D./S&T/AP) for any needed assistance. Before any actual demonstrations to/with farmers of pesticides not in Table 1, specific labels and compounds must be reviewed by the Bureau Environmental Officer. Also, CICP has purchased the "Silver Platter" pesticide database and will have the capability to rapidly respond to requests on the registration status of pesticides.

III. ENVIRONMENTAL ASSESSMENT OF FERTILIZER USE.

A. INTRODUCTION:

To meet its objectives, the activities under the Small Farmer Coffee Improvement Project (SFCIP) will require the use of fertilizers as will as pesticides in the TAP program and in research plots, farmer demonstration, and training programs. The primary concern in fertilizer use is the possible leaching and washing of these fertilizers into water supplies. Leaching into groundwater would be a greater potential in relatively level areas where water tables are relatively shallow. Even this potential hazard is reduced where soil texture is silt loam, clay loam or finer and where soil organic matter is 2.5 % or greater. Washing of soil and associated fertilizers is primarily a problem where slopes are in excess of 7 %.

In harvesting coffee, nutrients are removed from that environment. Rates of loss (in kg/ha) average: 25 kg N, 1.7 kg P, 16 kg K, 1 kg Ca, and 2 kg Mg for each metric ton of coffee beans harvested. Therefore, claims of soil depletion of these major and minor nutrients due to high density, high productivity, and previous low fertilizer dosage are unfounded. Vegetative production will produce considerable leaf- and weed-mulch and most nutrients should be recycled, reducing the need for high rates of fertilizer applications.

A system of soil sampling and laboratory analysis is currently being operated as part of the on-going program of ANACAFE. Farmers are currently encouraged to sample their coffee land each year to determine the level of fertilizer to apply. However, each of the four project areas visited seemed to have a level of fertilizer that was generally applied. These tended to follow levels outlined in the Project Paper (PP) Technical Analysis (Annex F) and the ANACAFE Technical Coffee Production Manual (1988). Table 6 outlines these suggested rates.

B. POTENTIAL ENVIRONMENTAL HAZARDS AND MITIGATIVE ACTIONS:

1. Leaching and washing of fertilizes can result in contaminated ground and surface water. As stated above this is more of a problem in flat areas with shallow groundwater. Since the project will be conducted in areas generally above 3,500 ft. this will not be a major factor in this phase of the project. However, this should be taken into consideration in future years if the project is expanded into these areas, especially if sandy soils are present.

Table 6. Fertilizer use recommendations for coffee production in Guatemala.

Application timing and type of fertilizer oz/plant	Year 1[a] oz/plant	Year 2 oz/plant	Year 3+
First Appl.[b]			
20-20-0	2	2	SA[d]
16-20-0			
Foliar (May)			
Second Appl.			
(Aug-Sept)			
15-15-15	2+	2+	SA
Foliar (Aug)			yes
Third Appl.			
(Nov-Dec)		1.5-	
Urea[c]	1.5	2.5	SA

[a] Nursery: Use 38 oz of 20-20-0 or 18-46-0 dissolved in 4 gal water; apply 40cc of solution to each bag each month. Starting the 6th month a foliar fertilizer mixture (20-20-0 or 20-20-20 plus 125cc of spreader-sticker) is dissolved in 200 liter of fungicide solution and used as the monthly fungicide sprays.

[b] First application to be made at the beginning of the rainy season, usually May or early June. Lime if needed should also be applied at this time.

[c] Ammonium sulfate or Ammonium nitrate may also be used.

[d] Rate of application to be based on soil analysis (SA) results.

Most of the soils involved in proposed project areas are of volcanic origin and these generally have very high phosphorous (P)-fixing capacities so P movement to streams from soul-incorporated fertilizers is only likely if erosion occurs. However, project renovation recommendations include planting the new coffee seedlings on terraces if slopes are 7 % or greater and this recommendation was being followed in the pilot demonstration plots observed. Also, coffee, weed, and shade tree leaf-liter was used as a ground cover mulch along with an undergrowth of weeds. This ground cover and associated roots, plus the protective action the plants have in reducing raindrop velocity before soil impact, greatly reduces erosion potential. Therefore, little erosion was observed in the fields visited.

2. Volatilization of applied fertilizes can be significant unless they are incorporated into the soil at the time of application. Prilled urea applied without incorporation could result in up to 50 % volatilization loss and would suffer increased runoff potential. The commonly used 15-15-15, 20-20-0, 16-20-0, 20-10-15, and other mixtures appear to be made of urea, triple super phosphate, and KCl. This would imply no sulfur (s) and high volatilization losses could also occur with these formulations if they are not incorporated when applied.

   Volatilization problems can be greatly reduced simply by lightly "forking" the fertilizer into the soil to a depth of 2-3 inches at the time of application. A fork-like implement will minimize root damage, therefore it would be preferred over the narrow spade-shaped tool observed as being used in one area. However, the spade-shaped tool would be preferred over surface application. Incorporation will also increase fertilizer use efficiency and reduce potential runoff losses of N.

3. Over-application is a concern as it could cause a significant N buildup and leaching below the root zone is likely and contamination of shallow groundwater is probable. Although fertilizer application is reported to be based on results of soil analyses, rates being used result in the seasonal application of over 400 kg N/ha. Since coffee removes only 25 kg N per M ton of beans produced, even 3 M tons/ha would remove only 75 kg N/ha. Therefore, in developing the final tech-pack, correlation data for soil tests (N,P,K,B,etc) for coffee responses on various soil types in Guatemala should be verified. Without these data, recommendations from soil tests are not meaningful. A preliminary literature search did not uncover the required data.

In the meantime, several mitigating actions are recommended:

a. If available, fill planting holes for coffee plants with a mixture of 1 part animal manure to 4 parts soil.

b. Three ounces of urea/hole should be sufficient for the first year, applied in 3, 1-oz. applications. N rate must be increased as tree comes into bearing and as production increases, but second year recommendations given do not reflect this.

c. There seems to be no consideration of sulfur (S). Trials using $CaSO_4$ should be conducted with adequate N and P present. S could be added as single super phosphate.

d. The two principal sources of N appear to be urea and ammonium sulfate, each of about equal nitrate leaching potential. It should be noted that urea contains about 2x as much N as ammonium sulfate and thus should be used at about half the rate per ha.

e. N (and P) applications should not exceed that level shown to be required for near-maximum yields based on a linear-plateau model. For new plantings the fertilizer dose per hole should be much smaller than for producing coffee trees. An annual total application split into 3 or more separate partial applications should reduce leaching potential, especially with the greater application is made near the end of the rainy season.

f. P dosage could be reduced by 25 to 50 % (from the recommended 100 kg P/ha/yr) by applying in two dribble-stick holes as 20-20-0 or DAP on either side of each coffee plants drip line. This will reduce fixation by soil and increase availability to the plant as well as reduce runoff losses.

If soil test calibration data are not available as suspected, leaf tissue analyses can provide some help in determining appropriate fertilizer application levels. The following guidelines should be helpful in using leaf tissue analyses:

a. Coffee leaf tissue sampling guide: Sample 4 pairs of leaves from each of 25 trees, midway in canopy. Avoid leaves with insect damage. Keep leaves cool. Wash with distilled water (preferably first

with 1:500 dilution of acetic acid with wetting agent). Pick non-bearing branches that are actively growing and take fourth pair of leaves from tip. Sample in dry season before fertilizer application.

b. Coffee is marginal or deficient if less than these values in dry leaf tissue:

N = 2.2 % P = 0.1 % K = 1.5 % SO_4 = 0.2 %
Mg= 0.1 % B = 25 ppm Zn= 10 ppm Cu = 10 ppm Ca= 0.4 %

Additional factors to consider include the following:

a. Use of minor or secondary elements does not present any field environmental hazard as amounts are small and mobility is low. However, spillage or improper storage of such materials as Na-Zn (Zinc) could contaminate waterways with fish-toxic metals (Cu, Zn, etc.). Special emphasis should be placed on this problem in pesticide applicator and other training sessions with project staff and producers.

b. Need to preserve VAM (mycorrhizae) in nurseries should be weighed against soil fungicidal treatment. Non-VAM seedlings will be weaker when planted out in field soils.

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Annex 1.

Scope of Work for the U.S.A.I.D./G Small Farmer Coffee Improvement Project Project No. 520-0381

Scope of Work

Environmental Assessment of U.S.A.I.D./Guatemala

Small Farmer Coffee Project (520-0381)

A. BACKGROUND

The purpose of the Project is to establish a program to design and transfer an integrated system of credit, technology, processing, and marketing improvements to small coffee producers. The intended result is to increase the productivity and profits of these producers. Some 4,500 small coffee producers will be direct beneficiaries of the Project efforts.

To meet its objectives, the Project will use chemical pesticides (insecticides, fungicides, and perhaps others) and fertilizers. U.S.A.I.D./Guatemala concluded in the Project Paper's Initial Environmental Examination (IEE) that use of these chemical materials has potential negative environmental consequences. The recommended Threshold Decision in the IEE was a "Positive Determination," meaning that an Environmental Assessment (EA) is required per 22 CFR Section 216.3 (b). The EA must meet A.I.D.'s requirements, as well as the requirements of the Guatemalan National Environmental Protection Law (Decree No. 68-86).

The EA will be conducted by the Consortium for International Crop Protection (CICP), 4321 Hartwick Road, College Park, Maryland/USA 20740

(telephone 301-454-5147; cable address CONSORTICP; telex 510 60 13963; Easylink 62929197; Fax 301-454-6676). CICP's participation will be arranged through its A.I.D./S&T/AGR Project No. 936-4130 (Integrated Pest Management and Related Environmental Protection).

B. PURPOSE OF SERVICES FACILITATED THROUGH PIO/T

The purpose of the services, described in C. SCOPE OF WORK below, is to:

1. Identify potential environmental problems related to pesticide and fertilizer use in the Small Farmer Coffee Project.
2. Evaluate environmental, economic, and social costs and benefits of pesticide and fertilizer use in small coffee farms.
3. Recommend specific measures to mitigate the potential negative environmental impacts in the Project.
4. Evaluate institutional capabilities and constraints for effective implementation of recommended mitigative measures.
5. Prepare (in English and Spanish) an Environmental Assessment of pesticide and fertilizer use in the Project that meets requirements of A.I.D. per 22 CFR

Section 216.3(b), as well as the Guatemalan National Environmental Protection Law (Decree No. 68-86).

6. Prepare (in English and Spanish) simple guidelines that show what specific pesticides and fertilizers are acceptable for use in the Project and how they can be used safely and economically by small coffee farmers.

C. SCOPE OF WORK

1. Nature of Technical Assistance

Section III of the attached Scope of Work identifies tasks to be performed by CICP. Procedures to complete the tasks and facilitate services shown in B. above will be as follows:

(a) Identify Potential Environmental Problems: The CICP consultant will interview staff of the coffee industry and associations (ANACAFE, FEDECOCAGUA, FEDECOVERA, and OCONOFEC), review literature on coffee production, and visit selected coffee producing sites. He will compile a list of chemical pesticides and fertilizers now being used and/or proposed for use in coffee. Further, he will

determine the availability of alternative pesticides and fertilizers, as well as pest management and fertilizer practices that may have potential in the Project. Finally, for each fertilizer and pesticide and alternative practice he will develop a profile to allow a ranking of potential environmental impacts. Ranking of pesticides will be based on LD_{50} values (dermal and oral), persistence in the environment, effect on selected non-target species (aquatic and terrestrial), phytotoxicity, and movement (dispersal) from the site of application. Ranking of fertilizers will be based on leachability, nitrate accumulation in ground water, potential human health efforts, and entrophication in aquatic systems. CICP/College Park will recruit a environmentalist-fertilizer expert (working from College Park) to assist in the assessment of environmental/health effects of the fertilizers. The potential environmental problems will be addressed fully in the EA.

(b) Evaluate Costs/Benefits:

The CICP consultant will examine economic cost benefit data (provided by the coffee industry and associa-

tions) on pesticide and fertilizer use. He will interview selected small farmers to get their views on pesticide and fertilizer use and assess their capability for properly selecting and applying the materials. He will also interview medical doctors and environmentalists familiar with human health aspects of pesticide and fertilizer use. The CICP team in charge of the Guatemala MOSCAMED Environmental Impact Analysis (1987-88) established contact with a number of leading health specialists and environmentalists. The CICP coffee project EA consultant will contact some of these persons. Based on the cost/benefit data estimations and interviews, the consultant will prepare an empirical cost/benefit assessment of pesticide and fertilizer use that considers not only strict economic costs/benefits but also social and environmental concerns. The costs/benefits assessment will be incorporated into the EA.

(c) Recommended Mitigative Measures:

The CICP consultant, with assistance from the environmentalist-fertilizer expert working from College Park, will identify practical and cost effective mitigative measures for reducing the

negative environmental/health impacts. The recommended mitigative measures will be incorporated into appropriate sections of the EA.

(d) Evaluate Institutional Capabilities and Constraints:

The CICP consultant will examine all Guatemalan laws and regulations affecting pesticide and fertilizer use. In addition, he will determine the Project's capability, the Government of Guatemala's capability, and small coffee farmers' capability to carry out the recommended mitigative measures. Any constraints to implementation and special needs to overcome the constraints will be discussed. The institutional analysis will be included in the appropriate sections of the EA.

(e) Prepare the Environmental Assessment:

An EA that meets A.I.D. requirements, per 22 CFR Section 216.3(b), will be drafted, revised after review, and finalized as shown in the Implementation Plan and Outputs (C.2). Twenty copies in English and 20 copies in Spanish will be submitted to USAID/Guatemala.

(f) Guidelines on Pesticide/Fertilizer Use:

Technical Guidelines in pesticide and fertilize use will be drafted, revised after review, and finalized a shown in the Implementation Plan and Outputs (C.2). Twenty copies in English and 20 copies in Spanish will be submitted to USAID/Guatemala.

2. Implementation Plan and Outputs

CICP services will be provided during the periods indicated in the following table:

TASK	DATE (1989) OCTOBER	NOVEMBER	DECEMBER
CICP consultant in Guatemala	22.....22		
CICP fertilizer consultant backing up from College Park	30.....4		
CICP consultant submits detailed work plan for EA to ORD, U.S.A.I.D./Guatemala and CONAMA	25		
CICP consultant provides briefing to ORD, U.S.A.I.D./Guatemala	30.....6.....20		
CICP consultant submits 10 copies of English draft of complete EA to ORD, U.S.A.I.D./Guatemala		10	
CICP consultant submits English draft of technical guidelines on pesticide/ fertilizer use		10	
CICP consultant's oral presentation of EA document and technical guidelines		13	
CICP consultant submits 20 copies of final EA in English		22	
CICP consultant submits 20 copies of final technical guidelines in English		22	
Final CICP consultant debriefing with ORD, U.S.A.I.D./Guatemala		22	
CICP submits 20 copies of final EA in English			22
CICP submits 20 copies of final technical guidelines in Spanish			22

Dale G. Bottrell, pest management specialist at CICP headquarters, will provide back-up support and technical guidance and manage the CICP project with U.S.A.I.D./Guatemala. He has extensive experience in designing, evaluating, and implementing USAID projects and conducting environmental assessments. He headed the MOSCAMED Environmental Impact Analysis for USAID/Guatemala in 1987-88.

E. FACILITIES

The CICP consultant will recruit help for word processing requirements in Guatemala. He will lease a rental car for use in the country.

Annex 2

Initial IEE for the U.S.A.I.D./G Small Farmer Coffee Improvement Project A.I.D. Project No. 520-0381

AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON D C 20523

LAC-IEE-89-32

ENVIRONMENTAL THRESHOLD DECISION

Project Location	:	Guatemala
Project Title	:	Small Farmer Coffee
Project Number	:	520-0381
Funding	:	$10.5 million
Life of Project	:	Eight years
IEE Prepared by	:	Alfred Nakatsuma USAID/Guatemala
Recommended Threshold Decision	:	Positive Determination
Bureau Threshold Decision	:	Concur with Recommendation
Comments	:	An Environmental Assessment for the project will be carried out focusing on issues identified in the IEE and EA Scoping Exercise, including pesticide use, soil and water conservation and environmental contamination.
Copy to	:	Anthony J. Cauterucci, Director USAID/Guatemala
Copy to	:	Gordon Straub, ORD USAID/Guatemala
Copy to	:	Alfred Nakatsuma, USAID/Guatemala
Copy to	:	Elizabeth Warfield, LAC/DR/CEN
Copy to	:	Frank Zadroga, ROCAP/San Jose
Copy to	:	IEE File

John O Wilson Date MAR -2 1989

John O. Wilson
Deputy Environmental Officer
Bureau for Latin America
and the Caribbean

INITIAL ENVIRONMENTAL EXAMINATION

Project Location	:	Guatemala
Project Title	:	Small Farmer Coffee (520-0381)
Funding	:	$10,500,000

I. PROJECT DESCRIPTION

The goal of the project is to increase the income of Guatemala's rural poor. This project will establish a program to design and transfer an integrated system of credit, technology, processing and marketing improvements to small coffee producers in order to increase their productivity and profits. This will be achieved by the implementation of the following project components:

1. The Credit Trust Fund will be used mainly to finance the planting of coffee for participating farmers.

2. The Coffee Renovation Program will be developed to assist farmers to improve their coffee production through the use of credit, training and technical assistance.

3. The Training Element will introduce new technical packages to participating farmers to improve coffee production and processing. In addition, selected technicians will receive graduate training in related areas.

4. Product Processing facilities will be built for coffee, where farmers will be taught the best methods of harvesting, fermenting and drying. These plants will be owned and operated by the participating farmer groups.

5. The Specialty Coffee Marketing Unit will assist in the formation of a small, privately managed processing unit to prepare products for the rapidly growing market for

II. POTENTIAL ENVIRONMENTAL CONSEQUENCES

As proposed, the Small Farmer Coffee Project has potential negative environmental consequences that may result from the use of chemicals including fungicides, insecticides and fertilizers. Since the use of these chemicals must comply with A.I.D's safety regulations on type, amounts and preferred methods of application, it is recommended that an environmental assessment for pesticide/fertilizer usage under the technological packages for coffee be undertaken.

III. MAJOR ENVIRONMENTAL CONCERNS

The identified areas of concern are fungicide, insecticide and fertilizer procurement and use.

A team of environmental specialists will be contracted to perform the Environmental Assessment of this project. Under this contract, the team will:

1) Identify the critical pest management, fertilizer and pesticide use, handling and disposal problems;

2) Evaluate environmental, economic and social costs and benefits of the current trends and practices in pesticide use;

3) Identify specific measures to mitigate the potential negative environmental impact of pesticide use under this project.

4) Evaluate institutional capabilities and constraints for effective implementation of integrated pest management programs.

IV. CONCLUSIONS AND RECOMMENDATIONS

Under this Project, significant environmental impacts could result from the procurement and use of fertilizers, fungicides and insecticides. Therefore, the preparation of an Environmental Assessment is required per 22 CFR Section 216.3(b).

USAID/Guatemala agrees to modify Project implementation plans to incorporate recommended mitigative measures for the Project, in accordance with the approved Environmental Assessment.

Concurrence:

Anthony J. Cauterucci
Mission Director

2/10/89
Date

6523R

Annex 3.

1. List of Pesticides Known to Be Used in Coffee Production in Guatemala and Some of Their Characteristics.

2. Basis for the Request for Approval to Use Endosulfan for Broca Control on the U.S.A.I.D./G SFCIP in Guatemala.

3. Notes on Other Pests.

4. References supporting the use of endosulfan.

Table 1. Pesticides suggested for use in coffee in Guatemala (1) and their toxicity, registration status, and other characteristics (2-12).

Pest and Pesticide name(s) Technical (2)	Commercial (1,2,4,5)	Toxicity category	Registration status US (2,12)	GDG (5)	WHO/FAO (6)	Coffee (3,12)	Mammalian LD50 ranges(2,12) Oral (mg/kg)	Dermal (mg/kg)	Inhalation	Non-target LD50 (2,8,12) Bird ppm	Fish ppm	Bees	Half-life in Soil(S) H2O(W)	Dispersal measurements Water solubility ppm @ deg C	Sorption coefficient Koc(2,7,12)	Fire(2,12) hazard (Flash point)	COMMENTS (From Ref. 2 if not otherwise indicated)
INSECTICIDES																	
COFFEE BERRY BORER (BROCA DEL FRUTO)																	
endosulfan	Thiodan, Thionex (Malix) (RS)	I	RUc	Y	N(0.1)	N	30	539	80.0	T	T	T		Insoluble		SFL	AD LD50 70 in water; Persistent (12)
carbaryl	Sevin (RS)	I-III	Y	Y	N(0.01)	N	128-710	4000	2000	56-3000	0.4-28	T	7-10d(S)	1000 @ 25	229	NF	BCWP Cat. III; C,H,T,S (12)
diazinon	Diazinon (RS)	II-III	Y	Y	N(0.002)	Y(0.2)	17-300	633-3600	3.5-5.5	3.1-8.4	0.38	T		40 @ 25		180F	Not bioaccumulated, S (12)
LEAF MINER (MINADOR DE LA HOJA)																	
dimethoate	Perfektion, Roger (Cygon) (RS)	II	Y	Y	N(0.002)	N	215	>2000			40-60	T		2.5% @ 21			May cause eye irritation; C,H,T (12)
fenthion	Lebaycid (Baycid, Entex)	II	Y	Y	N(0.0005)	N	250	2000	1	H	H - H		1hr(Air)	Insoluble			Degrades fairly rapidly (2,12)
malathion	Malathion (RS)	III	Y	Y	N(0.02)	N	1375	>2000	>5.2		0.1	T		145 @ 25	1,778	>325F	Degrades fairly rapidly (12)
MEALYBUGS (COCHINILLAS DEL CAFETO)																	
aldicarb	Temik (RS)	I	RUat	Y	Y(0.1)	Y(0.1)	1	20			1.5	T		9,000 @ 30	10		15% LD50=5 & >5000; DO NOT WET GRANULES (2)
disulfoton	Disyston (RS)	I	RUe	Y	Y(0.1)	Y(0.2)	2-12.5	6-20		HT(3.2)	HT(3.0)	T	MP	25 @ 25		>200F	1.5% nonfac.; No bioaccumfica. likely (12)
malathion	Malathion (RS)	III	Y	Y	N(0.02)	N	1375	>2000	>5.2		0.1	T		145 @ 25	1,778	>325F	Degrades fairly rapidly (12)
phorate	Thimet (RS)	I	RUo	Y	N(0.0002)	N	2-4	20-30			HT	T		50 @ 25			15% dermal LD50 (dry) 1360 mg/kg (2)
ROOT MEALYBUGS (COCHINILLAS DE LA RAIZ)																	
aldicarb	Temik (RS)	I	RUat	Y	Y(0.1)	Y(0.1)	1	20			1.5	T		9,000 @ 30	10		15% LD50=5 & >5000; DO NOT WET GRANULES (2)
disulfoton	Disyston (RS)	I	RUe	Y	Y(0.1)	Y(0.2)	2-12.5	6-20		HT(3.2)	HT(3.0)	T	MP	25 @ 25		>200F	1.5% nonfac.; No bioaccumfica. likely (12)
isobenzan	Telodrin		NR	Y	--	N											
phorate	Thimet (RS)	I	RUo	Y	N(0.0002)	N	2-4	20-30			HT	T		50 @ 25			15% dermal LD50 (dry) 1360 mg/kg (2)
SCALES (LAS ESCAMAS DEL CAFETO)																	
fenthion	Lebaycid (Baycid, Entex)	II	Y	Y	N(0.0005)	N	250	2000	1	H	H - H		1hr(Air)	Insoluble			Degrades fairly rapidly (2,12)
malathion	Malathion (RS)	III	Y	Y	N(0.02)	N	1375	>2000	>5.2		0.1	T		145 @ 25	1,778	>325F	Degrades fairly rapidly (12)
oxydemeton-methyl	Metasystox-R (RS)	III	Y	Y	N	N	30-75	150			T	T		H Soluble			Will hydrolyze; unstable in alkali(2)
LEAF BEETLES (LAS TORTUGILLAS)																	
carbaryl	Sevin (RS)	I-III	Y	Y	N(0.01)	N	128-710	4000	2000	56-3000	0.4-28	T	7-10d(S)	1000 @ 25	229	NF	BCWP Cat. III; C,H,T,S (12)
fenthion	Lebaycid (Baycid, Entex)	II	Y	Y	N(0.0005)	N	250	2000	1	H	H - H		1hr(Air)	Insoluble			Degrades fairly rapidly (2,12)
malathion	Malathion (RS)	III	Y	Y	N(0.02)	N	1375	>2000	>5.2		0.1	T		145 @ 25	1,778	>325F	Degrades fairly rapidly (12)
trichlorfon	Dipterex (Dylox) (RS)	II	Y	Y	N(0.01)	N	250-5000	>2100	1300	40-5000	3.8-180		3.2hr(W)	130,000 @ 25		NF	Will hydrolyze and dehydrohalogenate; No bioaccum., C,H,T,S (12)
SPIDER MITES (LA ARAÑA ROJA)																	
amitraz	Mitac (Baam) (RS)	II	Y	Y	N(0.003)	N	400-1600	>1600						Slightly			Some uses are RU (2); SR completed (11)
chlorobenzilate	Akar (Acaraben) (RS)	III	RUd	Y	N(0.02)	N	1800	>10,200				NT		Insoluble			All uses but citrus cancelled (11)
cyhexatin	Plictran (cihexatin) (C)		NR(C)	NR	N(0.008)	N	650-1000										Cancelled (11); T (12)
dicofol	Kelthane (RS)	II-III	NR(C)	Y	N(0.025)	N	820	1000			T	NT					
dimethoate	Perfektion, Roger (Cygon) (RS)	II	Y	Y	N(0.002)	N	30-660	>2000		25-42	T(40-60)	T		1000 @ 21		SFL	May cause eye irritation (2)
ethion	Ethion, Nialate, Hylemox (RS)	II	RUf	NR	N(0.0005)	N	208	838	0.864								
oxethoate	Folimat		NR	Y	N(.0003)	N	30-100	1000		125		T		H Soluble			H (12)
tetradifon	Tedion	III	Y	NR	--	N	556-4000	>2500		>5000	T	T		Slightly			H,T (12)
triazophos	Hostathion		NR	Y	Y(0.05)	N	64	1100	280		8.4	T					

SEE FOOTNOTES ON PAGE 4 OF 4

Table 1. Pesticides suggested for use in coffee in Guatemala (1) and their toxicity, registration status, and other characteristics (2-12). (Continued)

Pest and Pesticide name(s) Technical (2)	Commercial (1,2,4,5)	Toxicity category	Registration status US (2,12)	GDG (5)	WHO/FAO (6)	Coffee (3,12)	Mammalian LD50 ranges(2,12) Oral (mg/kg)	Dermal (mg/kg)	Inhalation	Non-target LD50 (2,8,12) Bird ppm	Fish ppm	Bees	Half-life in Soil(S) H2O(W)	Dispersal measurements Water solubility ppm @ deg C	Sorption coefficient Koc(2,7,12)	Fire(2,12) hazard (Flash point)	COMMENTS (From Ref. 2 if not otherwise indicated)
LONG-HORNED GRASSHOPPERS AND CRICKETS (EL CHACUATETE Y EL GRILLO DEL CAFETO)																	
carbaryl	Sevin (RS)	I-III	Y	Y	N(0.01)	N	128-710	4000	2000	56-3000	0.4-28	T	7-10d(S)	1000 @ 25	229	NF	BCWP Cat. III; C,N,T,S (12)
fenthion	Lebaycid (Baycid, Entex)	II	Y	Y	N(0.0005)	N	250	2000	I	H	M - H		1hr(Air)	Insoluble			Degrades fairly rapidly (2,12)
malathion	Malathion (RS)	III	Y	Y	N(0.02)	N	1375	>2000	>5.2		0.1	T		145 @ 25	1,778	>325F	Degrades fairly rapidly (12)
trichlorfon	Dipterex (Dylox) (RS)	II	Y	Y	N(0.01)	N	250-5000	>2100	1300	40-5000	3.8-180		3.2hr(W)	130,000 @ 25		NF	Will hydrolyze; C,N,T,S (12)
parathion (ethyl)	Folidol, Bladan, Niran (RS)	I	RUn	NR	N(0.005)	N	2-6	55						24 @ 25	7,079	174C	Little potential for water pollution (2)
STEM BORER (EL BARRENADOR DEL TALLO)																	
aluminum phosphide	Phostoxin (RS)	I	RUb	Y	N(-)	N	--	--	0.3					S Soluble		212F	Fire hazard with water contact
oxydemeton-methyl	Metasystox-R (RS)	III	Y	Y	N	N	30-75	150			I	T		H Soluble			Will hydrolyze; unstable in alkali (2)
carbon bisulfide	Carbon disulfide (C)	II	C	NR	N(-)	N			200							Y	Explosion hazard (2); cancelled (11)
SLUGS (LA BABOSA)																	
metaldehyde	Metaldehide, Metaldehido	II-III	Y(10)	Y	?	N	100-250	2275	203-258			NT?				F	5% bait; see requirements (10); N,T (12)
NEMATODES (NEMATODOS)																	
aldicarb	Temik (RS)	I	RUat	Y	Y(0.1)	Y(0.1)	1	20		T	1.5	T		9,000 @ 30	10		15G LD50=5 & >5000; DO NOT WET GRANULES (2)
carbofuran	Furadan, Curaterr (RS)	I-II	RUct	Y	Y(0.1)	Y(0.1)	11	10,200	85	25-39	0.28	NT(6)		700 @ 25	2?	NF	15G formulation not RU; Not persistent (12)
ethoprop	Mocap (Joit) (SRP)	I-II	RUg	Y	N(-)	N	61.5	2.4		HT	M-HT			750 @ ??			
fenamiphos	Nemacur (RS)	I	RUh	Y	Y(0.1)	N	5	80						400 @ ??			Subject to hydrolysis (2)
fensulfothion	Terracure, Basanit (RS)	I	RUi	Y	N(.0003)	N	2-10	3-30						1,600 @ ??			
oxamyl	Vydate (RS)	I	RUk	Y	Y(0.1)	N	5.4	2,960			5.6	T		280,000 @ 25	6		Rapid degradation in soil (2)
terbufos	Counter, Terbuter (RS)	I	RUp	Y	?	N	3.5	1.1						15 @ ??			
PLANT DISEASES (INFERMEDADES)																	
Soil Fumigation to control DAMPING OFF (Fumigacion del Suelo para Controlar MAL DEL TALLUELO)																	
carbanolate	Banrot	I-III	Y	Y	?	Y(0.1)	30-5000	2000	--	2.4-4.2	--	--	--	--	--	--	WPs Category II; G = III
carboxin	Vitavax (DCMO) (RS)	III	Y	Y	?	N(1)	430-3820	>800-8000		24gm	>0.1	NT				203C	Systemic fungicide, seed protectant; N (12)
dazomet	Basamid G (Crag, DMTT)	I-III	Y	Y	?	N	120-640	--			T	NT					Fung., Herb., and Nematicide actions; S (12)
ethazol	Terban	I-III	Y	NR	?	N	779-4700	1700	--	--	--	--	--	--	--	--	Also form. with carbanolate; N (12)
methyl bromide	Methyl Bromide (RS)	I	RUj	Y	N(-)	Y(75)	214	--	3120	--	--	NT	--	1.75/100g @ 20	--	--	Skin and eye burn; use SCUBA
PCNB	PCNB (Terraclor, Fungiclor) (RS)	I-II	Y	Y	N(0.007)	N	1700	<4000	--	--	--	--	--	0.87 @ 20	--	--	Also used as seed dressing
thiabendazole	Mertect, Tecto (RPH)	III	Y	Y	N(0.3)	N	3100-3600	--	8000	4000	ST	NT	--	--	--	--	Systemic fungi. and anthelmintic; N,T (12)
COFFEE RUST (ROYA DEL CAFETO)																	
copper oxychloride	Oxicloruro de Cu, Cupravit (RS)	III	RM	Y	E?	E	1000	--	--	--	--	NT	--	--	--	--	Copper content 56-58% ; Not sold in US(2)
copper hydroxide	Hidroxido de Cu, Cupravit azul	I-III	Y	Y	E?	E	200-1000										Kocide 20%; exempt from tolerance in US (2)
copper oxide	Cobre Sandoz or Nordox		Y	Y	E?	E	1500	--	--	--	T	--	--	Insoluble	--	--	Cuocobre; exempt from tolerance in US (2)
copper sulfate	Cuproxat (Blue Copperas) (RS)	I	RU?	Y	E?	E					T(>1.0)	T					Avoid skin & eye contact (2)
hexaconazole (P)	Anvil		?	Y	?	N	2189-6071	--	--	--	--	--	--	Low	--	--	ICI fungicide; common name (P) pending (2)
propiconazole	Tilt (Banner, Desmel)	III	Y	Y	Y(0.1)	N	1517	>4000		PNT	PNT			110 @			Systemic and eradicative properties (2)
triadimefon	Bayleton (Amiral)	II-III	Y	Y	Y(0.1)	N	400-1020	5000			40-60	NT	--	70 @ 20	--	104F(1.8EC)	
triadimenol	Bayfidan (Baytan, Summit)	II	Y	Y	?	N	22-689	5000		>10,000	23.5	NT		95 @ 20			Systemic Triazole fungicide; O,N (12)

SEE FOOTNOTES ON PAGE 4 OF 4

Table 1. Pesticides suggested for use in coffee in Guatemala (1) and their toxicity, registration status, and other characteristics (2-12). (Continued)

Pesticide name(s) Technical (2)	Commercial (1,2,4,5)	Toxicity category (2,12)	Registration status US (2,12)	GDG (5)	WHO/FAO (6)	Coffee (3,12)	Mammalian LD50 ranges(2,12) Oral (mg/kg)	Dermal (mg/kg)	Inhalation	Non-target LD50 (2,8,12) Bird ppm	Fish ppm	Bees	Half-life in Soil(5) H2O(W)	Dispersal measurements Water solubility ppm @ deg C	Sorption coefficient Koc(2,7,12)	Fire(2,12) hazard (Flash point)	COMMENTS (From Ref. 2 if not otherwise indicated)
COFFEE LEAF SPOT (OJO DE GALLO)																	
chlorothalonil	Daconil, Bravo (Exotera) (RS)	I-II	Y	Y	N(.0005)	Y(0.2)	>10,000	>10,000			T(0.25)			Insoluble			Skin and eye irritant; C,H (12)
copper oxychloride	Oxycloruro de Cu, Cupravit (RS)	III	NR	Y	E?	E	1000	--	--	--	--	NT	--	--	--	--	Copper content 56-58% ; not sold in US(2)
tridemorph	Calixin	III	Y	Y	?	N	562-980	1350			T(3.5)	NT		W/Ag.		>120C	Systemic fungic., no antidote; H,T (12)
PHOMA (PHOMA)																	
benomyl	Benomyl (RS)	III	Y	Y	N(0.02)	N	>10,000	>10,000			ST	NT		P. Insoluble			Dimolecarbonate syst. fungic.; H,T,S (12)
captafol	Difolitan (Mycodefol) (RS)	II	C	Y	N(0.01?)	N	5000	--			0.05	NT		P. Insoluble			Registration voluntarily canceled (11)
captan	Captan, Orthocide (RS)	I-III	SR?	Y	N(0.01?)	N	9000	--		>2400	NT(0.066)		MP	Low((5mg/l) @ 25		SFL	Dicarboximide protectant-eradicant fungic.
carbendazim	Carbendazim (Equitdazim)	III	Y	Y	Y(0.1)	N	>10,000	>2,000			T(2.4mg/l	NT					Systemic fungic., no antidote; C,H,T (12)
chlorothalonil	Daconil, Bravo (Exotera) (RS)	I-II	Y	Y	N(.0005)	Y(0.2)	>10,000	>10,000			T(0.25)			Insoluble			Skin and eye irritant; C,H (12)
RED LEAF SPOT (MANCHA DE HIERRO)																	
benomyl	Benomyl (RS)	III	Y	Y	N(0.02)	N	>10,000	>10,000			ST	NT		P. Insoluble			Dimolecarbonate syst. fungic.; H,T,S (12)
captafol	Difolitan (Mycodefol) (RS)	II	C	Y	N(0.01?)	N	5000	--			0.05	NT		P. Insoluble			Registration voluntarily canceled (11)
copper oxychloride	Oxycloruro de Cu, Cupravit (RS)	III	NR	Y	E?	E	1000	--			--	NT	--	--	--	--	Copper content 56-58% ; not sold in US(2)
ferbam	Ferbam (Ferberk, Hexaferb)	III	Y	Y	N(0.02)	N	>17,000	--			NT	NT	MP(S)	120 @ 25			Protective carbamate fungicide
ANTHRACNOSIS, FRUIT ROT, AND RED DISEASE (ANTRACNOSIS, PUDRICION DEL FRUITO Y MAL ROSADA)																	
copper oxychlidride	Oxycloruro de Cu, Cupravit (RS)	III	NR	Y	E?	E	1000	--	--	--	--	NT	--	--	--	--	Copper content 56-58% ; not sold in US(2)
copper hydroxide	Hidroxido de Cu, Cupravit azul	I-III	Y	Y	E?	E	1000										Kocide 20%; exempt from tolerance in US (2)
copper oxide	Cobre Sandoz or Nordox		Y	Y	E?	E	1500	--			T			Insoluble			Caocobre; exempt from tolerance in US (2)
copper sulfate	Cuprozat (Blue Copperas) (RS)	I	RU?	Y	E?	E					T(>1.0)	T					Avoid skin & eye contact (2)
TRUNK CANCER AND BLACK ROOT ROT (CANCER DELTRONCO Y PUDRICION DE LA RAIZ)																	
carbanolate	Banrot	I-III	Y	Y	?	Y(0.1)	30-5000	2000		2.4-4.2	--	--	--	--	--	--	EPs Category II; G = III
thiabendazole	Mertect, Tecto (RPH)	III	Y	Y	N(0.3)	N	3100-3600	--	8000	4000	ST	NT	--	--	--	--	Systemic fungi. and anthelmintic; H,T (12)
(AHORCAMIENTO DEL TALLO)																	
benomyl	Benomyl (RS)	III	Y	Y	N(0.02)	N	710,000	>10,000			ST	NT		P. Insoluble			Dimolecarbonate syst. fungic.; H,T,S (12)
captafol	Difolitan (Mycodefol) (RS)	II	C	Y	N(0.01?)	N	5000	--			0.05	NT		P. Insoluble			Registration voluntarily canceled (11)
copper oxychloride	Oxycloruro de Cu, Cupravit (RS)	III	NR	Y	E?	E	1000					NT					Copper content 56-58% ; not sold in US(2)
copper hydroxide	Hidroxido de Cu, Cupravit azul	I-III	Y	Y	E?	E	1000										Kocide 20%; exempt from tolerance in US (2)
copper oxide	Cobre Sandoz or Nordox		Y	Y	E?	E	1500				T			Insoluble			Caocobre; exempt from tolerance in US (2)
copper sulfate	Cuprozat (Blue Copperas) (RS)	I	RU?	Y	E?	E					T(>1.0)	T					Avoid skin & eye contact (2)
SOOTY MOLD (FUMAGINA) - Prevent by controlling the honeydew producing insects																	
HERBICIDES (HERBICIDAS) - Only manual weed control recommended in the project																	
dalapon	Dalapon, Devipon (Revenge) (RS)	II	Y	Y	?	Y(2.0)	970-8120	--		>5000	105-179		56(S)	450,000 @ 25		MF	Selective GR herbicide; corrosive, H,S (12)
fluazifop-butyl	Fusilade (Onecide, Hache U.S.)	II-III	Y	Y	?	Y(0.1)R	621-3328	--						Insoluble			Selective (2); REPA regional tolerance (3)
glyphosate	Roundup (Herboles, Glycel) (RS)	II	Y	Y	N(0.3)	Y(1.0)	1568-4873	7940						V. Soluble		>200F	Safe selective herbicide; C,H (12)
napropamide	Devrinol (Data base comp.)	III	Y	NR	?	Y(0.1)	>500	4640			S	NT					Selective herbicide (2)
paraquat	Gramoxone (Paraquat) (RS)	I	RUa	Y	N(0.001)	Y(0.05)‡	150			NT	ST	--		1,000,000 @ 25	15,423		‡Negligible residue permitted (3)

SEE FOOTNOTES ON PAGE 4 OF 4

Table 1. Pesticides suggested for use in coffee in Guatemala (1) and their toxicity, registration status and other characteristics (2-12). (Continued) Page 4 of 4

FOOTNOTES:

(1) Sources: Manual de Caficultura, ANACAFE, Guatemala, 1988; Personal communications with ANACAFE technicians and market survey. All products listed were not found to be available in the market survey.

(2) Data from 1989 Farm Chemicals Handbook. RU signifies that at least some uses are Restricted Use by the USEPA due to user or other hazards. NR = Not Registered.

(3) Coffee registration data from the Pesticide Chemicals News Guide dated May 1, 1989 and Mann (pers. comm.) 1989.

(4) Selected commercial names provided for convenience only and does not imply endorsement; not intended to be all inclusive. Commercial names in parentheses () are not registered for use in Guatemala (5).

(5) GOG/MAGA Departamento de Sanidad Vegetal (DTSV), pers. comm., nov. 1989. Commercial names in parentheses are not registered for use in Guatemala, they are provided for reference only.

(6) WHO/FAO Codex of residue tolerances. Y = Yes toterance established for coffee and tolerance given in (). N = No tolerance for coffee but the ADI (Averave Daily Intake in mg/kg) allowed is given in ().

(7) Ward, Mann, and Miller, 1988 and Mann, pers. comm., 1989. The larger the Koc, the more strongly the pesticide is held in the soil organic matter and the less likely it will leach through the soil. Note that glyphosate and paraquat are ionic and are exceptions to the inverse solubility to Koc relationship. H = Highly soluble or insoluble; P = Practically insoluable; and V = Very soluble.

(8) ST = Slightly Toxic; T = Toxic; MT = Moderately Toxic; HT = Highly Toxic. Given in ppm unless otherwise stated.

(9) Schultz (1989) Restricted Use (RU) Pesticides in the US. Details are as follows:

a. Aldicarb - all formulations and all uses; also under Special Review.
b. Aluminimum phosphide - All sole ingredient formulations; all uses.
c. Carbofuran - All liquid formulations and all granules above 5%; also under Special Review (SR).
d. Chlorobenzilate - All formulations; citrus only registered use.
e. Disulfoton - All granular formulations 19% and greater; all solutions 95% and greater; all ECs 65% and greater; mixes with other active ingredients vary.
f. Ethion - All formulations; all uses.
g. Ethoprop - ECs above 40%; all granular and fertilizer formulations.
h. Fenamiphos - ECs 35% and greater.
i. Fensulfoton - Solutions 63% and greater; all ECs 43% and greater; all granules.
j. Methyl bromide - All formulations; all uses.
k. Oxamyl - All liquid formulations; granules on case by case basis; all uses.
l. Oxydemeton-methyl - All formulations; all uses.
m. Paraquat - All formulations above 0.44%; all uses.
n. Parathion, ethyl - All formulations; all uses.
o. Phorate - All EC formulations above 65%; all granules; all uses.
p. Terbufos - All granular formulations 15% and greater; all uses.

(10) Metaldehyde labels must bear the following: "This product may be fatal to children and dogs or other pets if eaten. Keep children and pets out of the treated area." Application not to be made to plants.

(11) Several products are still under Special Review (SR) by the EPA for various reasons. The current status of these special reviews must be determined before using any of these products: aldicarb, captan, and carbofuran.
The SR process was recently completed on the following products: amitraz, benomyl, captafol, chlorobenzilate (cancelled all but citrus uses), diazinon, dicofol, diaethoate, and PCNB (reduce HCB contaminant).
Most products have undergone the initial Reregistration process and have been issued Reregistration Standards (RS) and these products have been marked by placing an (RS) after the trade or commercial name. Those that have undergone the Second Round Review (SRR) are so indicated.
Some product registrations were Cancelled (C) in the SR process and have been so indicated in the Registration Status column marked US (United States).

(12) SilverPlatter Verson 1.6 (Through Sept. 1989) used to confirm US registration status on coffee and to obtain other data on products in this list. Additions in the COMMENTS section indicate: C = tumorigen, M = mutigen, T = Reproductive-effector, O = Organometallic, or S = primary irritant. When these letters are present it indicates some positive data were found in the literature.

File: GLIST10 Dec. 29, 89

Basis for the Request for Approval to Use Endosulfan for Broca Control on the U.S.A.I.D./G SFCIP in Guatemala

Becazy (1988) reported that the only alternative to endosulfan be found in the literature was a result of work in Honduran (IHCAFE) by Munoz and Zeloya (1985) who indicated primiphos-methyl (Actellic) and chlorpyrifos (Lorsban) were the most promising alternatives to endosulfan. However, in 1985 Decazy (1985) mentioned Lindane as an alternative. Urbina (1987) did not find suitable alternatives to endosulfan in his literature search other than these above and like Decazy (1988), he found a wide variation in the rates of application recommended for endosulfan. Munoz (1985) indicated BHC and Aldrin were used in Guatemala for Broca control in earlier years.

Munoz and Urbina (1987) found one application of endosulfan 35% per season at 1.5 liters or two applications at 1 liter of formulation per ha was as effective as three applications for broca control if broca population was from 5-10% on above 10%, respectively. Urbina's (1987) studies on residues of endosulfan, malathion, and dimethoate indicated very low residue levels of all three insecticide 21 days after application. Milan et al. (1987) evaluated carbaryl and Larvall^{R}, but they were inferior to endosulfan (Thiodan^{R} and Thionex^{R}) used alone.

Rosales (1985) only recommended endosulfan for broca control. He indicated only 1 or 2 applications per season were required. No other alternatives were offered. Guimaraes (1988) found 2 or 3 applications of endosulfan were required in Brazil. He mentioned no effective substitutes. Villanueva (1988 a&b) also found endosulfan and a mixture of carbaryl and endosulfan (Sevidan 70% WP) to be the most effective in Mexico. ANACAFE (1985) Workers (Ochoa 1985) have evaluated 35 products for broca control and none were as effective as endosulfan 35%.

Munoz and Zelaya (1985) and Urbina (1987) also reviewed the literature on the chemical control of broca in coffee and came to the same conclusion. Endosulfan is the most effective chemical found to date. Fenthion at 4 lt/ha., endrin (banned in the US), and Actellic^{R} were the only other promising treatments found. Munoz and Zelaya (1985) compared endosulfan, Actellic^{R} and Lorsban and they were similar in effectiveness. Carbaryl, fenthion, monocrotophos (Nuvacron^{R}), and dimethoate were inferior in their studies.

Villanueva (1985) studied the residual properties of endosulfan, BHC, and gamma BHC in coffee and found residues in the 0.1, 0.001-0.009, and 0.001-0.005 range, respectively. Additional studies with endosulfan in coffee showed up to three applications resulted in no residues in the coffee beans after they had been processed to the "pergamino" stage (see attached

copy of data). However, Urbina (1987, 1988) did find some endosulfan residues when samples were taken at 1 to 21 days after application. Residue levels would have been expected to be lower if samples had been taken at a normal harvest intervals of 60-90 days after the last treatment.

No additional alternative insecticides were found for broca as a result of a computer literature search conducted by Dr. Bottrell of CICP at the University of Maryland. However, diazinon was added to the list for leaf miner control as a result of an article by Vega Rosalis and Berios (1982) found in the literature search.

Notes on Other Pests

Rhodes and Williamson (1985) evaluated endosulfan on the coffee leaf miner and found it to be ineffective. Carbofuran significantly controlled both the leaf miner and broca, but the rates, formulation, and method of application were not given in the DIALOG abstract. Haenssler et al. (1987) also obtained good control of leaf miners with soil applied Carbofuran (5G). When applied to the soil in combination with Byaleton, good rust control was also obtained.

Monterrey et al. (1985) found dicrotophos and fenvalerate were the best organophosphate and pyrethroid insecticides for leaf miners. Diazinon, chlorpyrifos, and several synthetic pyrethroids were also tested. However, several other references (Vega R. and Verrios 198? and others) indicated that diazinon was effective for leaf miners. A copy of the literature search will be provided to ANACAFE for future reference if additional pesticides are needed.

Carbofuran 5G is being substituted for other RU insecticides such as aldicarb, disulfoton, isobenzan, and phorate. Diazinon was added to the list for controlling grasshoppers and crickets since it is known to be generally effective for orthopteran pests. This may be needed if malathion cannot be approved on the basis of it's FAO ADI tolerance. Diazinon was added to the list for spider mites since it is sometimes effective on mites and since the registration status of triazophos in the US was still not confirmed at the writing of this draft of the EA. Some pests may be left with no approved products for their control. If this should occur, A.I.D./G-ANACAFE should request additional assistance from CICP to locate alternatives and request their approval from A.I.D./W.

The literature reviews had numerous references to the biological control of broca, leaf miners, and rust. These references should be studied carefully in determining the direction the proposed research program should take. This decision could have considerable consequences on the future need of pesticides for coffee production in Guatemala.

25 AÑOS DE PROGRESO

Asociación Nacional del Café

M E M O R I A

PRIMER TALLER DE TRABAJO INTERNACIONAL SOBRE MANEJO INTEGRADO DE LA BROCA DEL FRUTO DEL CAFE

3 - 5 DE DICIEMBRE DE 1985

FINCA BUENA VISTA, RETALHULEU, GUATEMALA

EVALUACION DE INSECTICIDAS PARA EL CONTROL DE LA BROCA DEL FRUTO DEL CAFETO (Hypothenemus hampei Ferr.)

Raúl Isaís Muñóz*
Ricardo Zelaya P.**

1. RESUMEN

Con el fin de determinar el efecto de siete insecticidas sobre la broca del fruto del cafeto, se instaló un ensayo a nivel de campo utilizando plantas del cultivar Caturra Rojo, sembrado a una densidad de 3000 plantas por hectárea. Con promedio de 8% de infestación natural.

Los insecticidas evaluados y la dosis en gramos de ingrediente activo por hectárea, fueron las siguientes: Los fosforados Nuvacron (858); Lebaycid (571), Perfektion (320), Actellic (750) y Lorshan (545); el Carbámico Sevin (868) y el Clorado Endosulfán (525). Hubo un testigo absoluto al cual no se le aplicó ningún químico. Se efectuó una sola aplicación de cada insecticida realizándose un total de tres muestreos a los 5, 25 y 38 días; cada muestreo consistió en colectar 30 frutos brocados por parcela útil, a los cuales mediante disección se les determinó las brocas vivas y muertas; tanto al estado adulto como larval. Determinándose también el número de frutos que fueron perforados y abandonados.

Para el análisis estadístico, los datos fueron transformados a $\sqrt{X + 1}$. Se usó la fórmula Abbott para establecer la eficiencia de los productos.

Se empleó un diseño de bloques al azar, con 8 tratamientos y 4 repeticiones, parcelas de 16 plantas (4 hileras de 4 plantas c/u), siendo las 4 plantas centrales la parcela útil.

No se encontró diferencias significativas entre los insecticidas evaluados y el testigo en el control de larvas; sin embargo, en el control

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CUADRO 2. EFECTO DE LOS INSECTICIDAS SOBRE LA POBLACION ADULTA DE LA BROCA (Hypothenemus hampei Ferr.) 1/

La Fé, Ilama, Santa Bárbara

I H C A F E 1985

TRATAMIENTOS	DIAS DESPUES DE HABER REALIZADO LA ASPERSION						TOTAL DE TRES MUESTREOS	
	CINCO		VEINTICINCO		TREINTA Y OCHO			
	B.M. 2/	B.V.	B.M. 2/	B.V.	B.M. 2/	B.V. 2/	B.M.	B.V.
Thiodán	3.86 a	2.3 c	3.13 a	13.5 a	3.47 a	2.81 a	36.8 a	24.0 b
Actellic	3.28 ab	8.3 bc	3.32 a	9.0 a	2.68 ab	4.16 a	28.8 ab	34.0 ab
Lorsban	2.64 ab	18.5 abc	3.18 a	9.5 a	2.64 ab	3.98 a	23.0 abc	43.3 ab
Sevin	2.15 ab	18.8 abc	1.64 c	16.5 a	1.98 ab	4.38 a	10.8 bc	54.3 ab
Lebaycid	1.89 b	24.0 ab	2.06 b	24.5 a	1.87 ab	3.61	8.8 c	71.1 a
Nuvacron	1.78 b	22.8 ab	1.93 bc	23.5 a	1.80 ab	4.30 a	7.5 c	64.1 a
Perfekthion	1.45 b	28.0 a	1.71 c	17.5 a	1.18 b	4.86 a	3.8 c	57.8 a
Testigo	1.61 b	18.0 abc	1.77 bc	18.3 a	1.49 b	4.56 a	5.3 c	56.8 ab

1/ Se presentan las medias de los tratamientos, tomadas en base a 30 cerezas brocadas por parcela experimental.

2/ Datos transformados a $\sqrt{Y + 1}$

Medias en columnas con la misma letra son estadísticamente iguales, según la prueba de Tukey ($\alpha = 0.05$).

B.M. Broca Muerta.

B.V. Broca Viva.

RESIDUOS DE ENDOSULFAN 35% CE EN GRANOS DE CAFE

ALFONSO E. VILLANUEVA MARRUFO
INSTITUTO MEXICANO DEL CAFE

INTRODUCCION

Ha sido preocupación del Instituto Mexicano del Café el problema de contaminación de granos de café debido al uso de pesticidas empleados en el control de plagas y enfermedades del cafeto.

Desde la detección de la broca del grano de café Hypothenemus hampei Ferrari 1867 (Coleóptera Scolytidae) en la región del Soconusco en el estado de Chiapas, ha sido objeto de evaluación de pesticidas disponibles en el mercado, con la finalidad de contar con alternativas para el control químico de esta plaga.

En base a los resultados obtenidos en ensayos y experimentos realizados por el Instituto Mexicano del Café (Villanueva 1983), Endosulfan 35% CE ha sido recomendado para combatir la broca del grano del café H. hampei. El objetivo de este trabajo experimental es la determinación de residuos por métodos analíticos del insecticida Endosulfán 35% CE en granos de café.

Angeli Cleusa María et al (1974), establecieron un experimento a fin de determinar residuos de insecticidas utilizados en el combate de la broca del grano de café. Los tratamientos empleados fueron Thiodán 35% CE (Endosulfán) a la dosis de 2 litros por hectárea; Isolín 20 E (Lindano), 2 litros por hectárea; B.H.C. 1.5% polvo a la dosis de 40 kilogramos por hectárea efectuaron dos aplicaciones; de cada uno de los tratamientos en estudio se tomaron muestras de café cereza y se llevaron al beneficiado, posteriormente. Se analizaron muestras de 10 gramos del pergamino (cáscara) y del café verde (granos); para esto utilizaron un cromatógrafo de gases marca Pye Unicam, los resultados obtenidos fueron los siguientes:

En el pergamino:	Endosulfán:	Residuos menores que 0.01 ppm.
	B.H.C.:	Residuos mayores que 0.002 ppm.
		Residuos menores que 0.001 ppm.
	Lindano:	Residuos menores que 0.001 ppm.
En los granos:	Endosulfán:	Residuos menores que 0.01 ppm.
	B.H.C.:	Residuos mayores que 0.009 ppm.
		Residuos menores que 0.001 ppm.
	Lindano:	Residuos mayores que 0.005 ppm.
		Residuos menores que 0.001 ppm.

Ribas Clovis et al (1974a). Establecieron un trabajo, teniendo en cuenta el problema de la contaminación de alimentos consecuente del uso de agroquímicos en las diferentes fases de la producción. En este trabajo determinaron la persistencia de residuos tóxicos de Endosulfán aplicado en condiciones de campo. El producto utilizado fue Endosulfán 35% CE y fueron hechas 4 aplicaciones a la dosis de 2 litros por hectárea; a partir de la última aplicación se efectuaron los análisis de las muestras de café obtenidas en el campo, empleando para ello un cromatógrafo de gases marca Pye Unicam. Después de la aplicación de los productos fueron realizados 7 registros de cosecha y en cada uno de ellos se obtuvo una media del valor mayor y menor de residuos en partes por millón; los resultados fueron los siguientes del primero hasta el séptimo registro de cosecha respectivamente: 1.65, 0.78, 0.54, 0.32, 0.27, 0.23, 0.07.

Ribas Clovis et al (1974 b), establecieron un trabajo en el cual determinaron la influencia del número de aplicaciones con Endosulfán en residuos de este producto en café beneficiado. El insecticida usado fue Thiodán CE a la dosis de 2 litros por hectárea; dieron cuatro aplicaciones, 28-12-73, 31-01-74, 05-03-74, 05-04-74, respectivamente. Las muestras de café beneficiado de cada tratamiento fue analizado en un cromatógrafo de gases marca Pye Unicam; los resultados fueron obtenidos de un total de 4 repeticiones:

Muestras que recibieron 2 tratamientos: Residuos menores que 0.005 ppm.

Muestras que recibieron 3 tratamientos: Residuos de valor medio 0.007 ppm.

MATERIALES Y METODOS

Este trabajo experimental se estableció en el Campo Experimental Garnica del Municipio de Xalapa, Veracruz en el mes de septiembre de 1982, situado a 19°30'58'' de latitud norte y 96°51'52'' de longitud oeste de Greenwich y a 1350 metros sobre el nivel del mar, el tipo de suelos corresponde a los Luvisoles, con textura de migajón arcilloso y con una precipitación promedio anual de 1320 mm.; se empleó la variedad de café Typica 947 de 8 años, con marco de plantación de 2.0 X 1.5 metros y con sombra a base de Grevillea robusta. Para el efecto se utilizaron 320 plantas en todo el lote experimental, dividido en tres parcelas integradas por 80 cafetos cada una y un testigo con el mismo número de plantas en el cual no se efectuó ninguna aplicación del insecticida. Los tratamientos consistieron en una aspersión con el pesticida Endosulfán 35% CE a la dosis de 800 centímetros cúbicos por hectárea en el mes de septiembre, dos aspersiones en los meses de septiembre y octubre, tres aspersiones en los meses de septiembre, octubre y noviembre de 1982, 1983 y 1984 frente a un testigo. Para las aspersiones se empleó una aspersora motorizada de espalda marca Polyjacto PL 45, con un gasto de 200 litros de agua por hectárea.

Para la interpretación de resultados de cada tratamiento, en la cosecha 1982-1983, se efectuaron tres registros, el primero en el mes de diciembre de 1982, el segundo y tercero en los meses de febrero y marzo de 1983 respectivamente. Durante las cosechas 1983-1984 y 1984-1985 se efectuaron tres registros, el primero en el mes de diciembre de 1983 y 1984, el segundo y tercero en los meses de febrero y marzo de 1984 y 1985 respectivamente. En cada registro de ambas cosechas se obtuvo una muestra de 10 kilogramos de café cereza las cuales se llevaron al beneficio húmedo hasta obtener café pergamino. Estas muestras de café pergamino preparadas en el Campo Experimental Garnica, Ver., fueron enviadas a los laboratorios Centrales de diagnóstico de residuos de la Dirección General de Sanidad Vegetal en la ciudad de México, Distrito Federal, para su análisis, utilizando el Cromatógrafo de gases marca "Tracor".

47.

RESULTADOS Y DISCUSION

Los resultados de este trabajo experimental se reportan en los cuadros siguientes:

CUADRO 1. RESULTADO DEL ANALISIS PRACTICADO EN LAS MUESTRAS DE CAFE PERGAMINO OBTENIDAS EN EL CAMPO EXPERIMENTAL GARNICA, VER., DE LA COSECHA 1982-1983 PARA DETERMINAR RESIDUOS DE ENDOSULFAN 35% CE EN GRANOS DE CAFE

No. DE RECOLECCION	No. DE APLICACION	INSECTICIDA ANALIZADO	R E S U L T A D O
1	I	Endosulfán	No detectado
	II	Endosulfán	No detectado
	III	Endosulfán	No detectado
2	I	Endosulfán	No detectado
	II	Endosulfán	No detectado
	III	Endosulfán	No detectado
3	I	Endosulfán	No detectado
	II	Endosulfán	No detectado
	III	Endosulfán	No detectado
Testigo		Endosulfán	No detectado

CUADRO 2. RESULTADO DEL ANALISIS PRACTICADO EN LAS MUESTRAS DE CAFE PERGAMINO OBTENIDAS EN EL CAMPO EXPERIMENTAL GARNICA, VER., DE LA COSECHA 1983-1984 PARA DETERMINAR RESIDUOS DE ENDOSULFAN 35% CE EN GRANOS DE CAFE

No. de recolección	No. de aplicación	Plaguicida Analizado	R E S U L T A D O
1	I	Endosulfán	No detectado
	II	Endosulfán	No detectado
	III	Endosulfán	No detectado
2	I	Endosulfán	No detectado
	II	Endosulfán	No detectado
	III	Endosulfán	No detectado
3	I	Endosulfán	No detectado
	II	Endosulfán	No detectado
	III	Endosulfán	No detectado
Testigo		Endosulfán	No detectado

CUADRO 3. RESULTADO DEL ANALISIS PRACTICADO EN LAS MUESTRAS DE CAFE PERGAMINO OBTENIDAS EN EL CAMPO EXPERIMENTAL GARNICA VER., DE LA COSECHA 1984-1985 PARA DETERMINAR RESIDUOS DE ENDOSULFAN 35% CE EN GRANOS DE CAFE

No. de Recolección	No. de aplicación	Plaguicida Analizado	R E S U L T A D O
1	I	Endosulfán	No detectado
	II	Endosulfán	No detectado
	III	Endosulfán	No detectado
2	I	Endosulfán	No detectado
	II	Endosulfán	No detectado
	III	Endosulfán	No detectado
3	I	Endosulfán	No detectado
	II	Endosulfán	No detectado
	III	Endosulfán	No detectado
Testigo		Endosulfán	No detectado

Las muestras de café pergamino que se prepararon en el Campo Experimental Garnica, Ver., fueron enviadas a los Laboratorios Centrales de diagnóstico de residuos de la Dirección General de Sanidad Vegetal en la ciudad de México Distrito Federal, con el objeto de realizar los análisis correspondientes para la determinación de residuos de Endosulfán 35% CE empleado a la dosis de 800 centímetros cúbicos diluídos en 200 litros de agua por hectárea, efectuando una, dos y tres aplicaciones con intervalos de cuatro semanas cada una al año. En los análisis practicados tanto para los registros de cosecha 1982-1983 como para los de 1983-1984, no se detectaron residuos de este plaguicida en granos de café.

CONCLUSIONES

El insecticida Endosulfán 35% CE, cuando se aplica a la dosis de 800 centímetros cúbicos diluídos en 200 litros de agua por hectárea, en cafetos de la variedad Typica 947 de 8 años y se realizan una, dos y tres aplicaciones con intervalos de 4 semanas en el año, al realizar los análisis con el cromatógrafo de gases no se detectaron residuos de este insecticida en granos de café.

Después de tres años consecutivos de aplicar el insecticida Endosulfán 35% CE, a las dosis de 800 centímetros cúbicos por hectárea y efectuando una, dos y tres aspersiones con intervalos de 4 semanas en el año; al realizar los análisis correspondientes para las cosechas 1982-1983, 1983-1984 y 1984-1985, no se ha detectado residuos de este plaguicida en granos de café.

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D. C. 20523

ROCAP

PROJECT PAPER

REGIONAL COFFEE PEST CONTROL

Amendment No 2

AID/LAC/P-387
CR LAC/DR-81-3

Project Number: 596-0090

The micro-cutting technique has only been developed in the last 6-8 months in the CATIE tissue culture laboratory. This is a major breakthrough. It has not, however, been carried to a commercial scale as yet. This procedure has major implications for new variety selection and the future of coffee production world-wide

If tissue culture applications can be made commercial, then new interspecific or widely different in-species crosses can be made, individual plants with desired characters identified (eg. combinations of rust, Colletotrichum coffeanum and other diseases resistance, insect resistance, as well as special cup quality characteristics or special morphological or physiologically advantageous characters), multiplied asexually, field tested under different conditions and immediately multiplied by millions of plants for use on producing farms.

This new propagation method must be proven commercially feasible in at least three participating countries for the multiplication of selected new lines from the five regional experiments. When proven commercially competitive with conventional procedures, private nurserymen will be trained at the national level in this new method of propagation and encouraged to produce the new outstanding clones for sale to farmers.

4. Only one chemical (Thiodan) has as yet been found which effectively controls the coffee berry borer. This places the entire industry at the mercy of one company which could increase the price or reduce the availability of the material in any country at any time. Likewise, the availability of only one product may result in the development of CBB resistance to this product. Screening of a wide range of insecticides is extremely urgent to find alternate effective insecticides as soon as possible.

The data banks, both nationally and regionally must be greatly strengthened. IICA has permitted the PIADIC data banks to become almost non-operational. With the large amount of new information being developed from national and regional trials, and new superior rust resistant germplasm being identified, the project needs to use an extrapolation data base to identify where these new selections can be commercially employed.

The initial analyses of coffee for harmful levels of pesticides and heavy metal residues are not conclusive (analyses have not been made on roasted and brewed coffee). They seem to indicate that there is a high level of lead in many commercial fungicides and possibly in the coffee bean itself. Further study of

PROYECTO REGIONAL DE CONTROL DE PESTES DEL CAFE

AID/ROCAP N° 596-0090

M E M O R I A

CURSO SOBRE MANEJO INTEGRADO DE PLAGAS DEL CAFETO

CON ÉNFASIS EN LA BROCA DEL FRUTO

(HYPOTHENEMUS HAMPEI, FERR.)

15 AL 19 DE JULIO DE 1985

Guatemala, Ciudad

C.A.

LAS PLAGAS DEL CAFETO EN GUATEMALA

Por: P. Agr. Héctor Ochoa M.*

INTRODUCCION

La caficultura en los países de Centroamérica, constituye uno de los renglones de mayor importancia en la Agro-exportación, generando divisas y utilizando mucha mano de obra, lo que significa una fuente de trabajo.

Actualmente, se tiene en las explotaciones cafetaleras insectos que afectan en menor o mayor escala, constituyendo algunas plagas de importancia económica.

La investigación es básica para conocer el comportamiento de estas plagas en nuestro medio, para así programar medidas de prevención o control.

El presente documento contiene el resúmen de varios estudios que se han realizado durante varios años, dándole énfasis a la Broca del Café (Hypothenemus hampei, Ferr.) por ser una de las plagas que mayor daño está ocasionando en Guatemala.

* Perito Agrónomo, Entomología, Asociación Nacional del Café (ANACAFE)

R E S U M E N

DE PRODUCTOS EVALUADOS PARA EL CONTROL

DE LA BROCA DEL FRUTO

Con el objetivo de encontrar mejores alternativas de control de la Broca del Fruto del Café, en Guatemala se han evaluado hasta la fecha los siguientes insecticidas en distintas dosificaciones.

1.	BHC 1%	Polvo	19.	Carbicrón 100 SCW	ce
2.	Lebaycid 5%	polvo	20.	Carbicrón	ce
3.	Lebaycid 50%	ce	21.	Sevin 5%	polvo
4.	Thiodán 3%	polvo	22.	Tokuthión 50%	ce
5.	Thiodán 6%	ph	23.	Oftanol 50%	ce
6.	Thiodán 35%	ce	24.	Low 6803 50%	ce
7.	Velexón	ce	25.	Thionex 35%	ce
8.	Etrofolán	ph	26.	Furadán 4-F	fluidificable (Fluidificable)
9.	Undén	ph			
10.	Bay 1937	ce	27.	Orthene 50%	PS
11.	Thimet 10%	granulado	28.	Pounce	ce
12.	Thimet 85%	ce	29.	Vydate L. 24%	ce
13.	Disystón 5%	granulado	30.	Lannate L. 24%	ce
14.	Bidrín 80%	ce	31.	Ekamet	ce
15.	Lannate 90%	ph	32.	F.M.C. 54617	ce
16.	Malathión 57%	ce	33.	F.M.C. 54800	ce
17.	Tamarón	ce	34.	Decis 2.5 %	ce
18.	Gusathión 57%	ce	35.	Nuván	ce.

De todos los productos evaluados, el producto comercial Thiodán 35% CE, fue superior de los demás, reportando altos porcentajes de mortandad del insecto.

PROMECAFE

Diez años de labores
1978-1988

INSTITUTO INTERAMERICANO DE COOPERACION PARA LA AGRICULTURA
PROGRAMA COOPERATIVO REGIONAL PARA LA PROTECCION Y MODERNIZACION DE LA CAFICULTURA

3

*Control de la broca del fruto del cafeto**

Hypothenemus hampei

*Bernard Decazy***

Introducción

La broca del fruto del cafeto, *Hypothenemus hampei* (Ferrari, 1887), se ha constituido en los últimos años como el principal problema entomológico de las zonas cafetaleras de Guatemala, El Salvador, Honduras y el sur de México. Se trata de una especie cuyas características biológicas (además de su naturaleza no endémica, por ser exótica) y la ausencia de enemigos naturales de importancia han permitido su rápida adaptación a varias zonas agroecológicas y un incremento acelerado de su población, que obliga a los técnicos y caficultores a utilizar medidas de control basadas la mayoría de las veces en el control químico.

Esta plaga fue detectada por primera vez en Guatemala en 1971, diseminándose luego hacia Honduras (1977), México (1978) y El Salvador (1981).

La práctica muy generalizada del uso de insecticidas para el combate de la broca ofrece una perspectiva poco alentadora en cuanto a la situación del equilibrio que guardan los cafetales en relación con otras especies de plagas potenciales, cuya presencia es endémica y que cuentan además con enemigos naturales que mantienen sus poblaciones a niveles por debajo de los niveles críticos de daño económico. La eliminación gradual de estos enemigos naturales ocasionará o ya está ocasionando el surgimiento de las plagas potenciales al status de plagas claves o primarias.

Debemos reconocer que es imposible erradicar la plaga, por lo que es la responsabilidad tanto de técnicos como productores desarrollar una estrategia de control basada en los principios y alternativas del manejo integrado de plagas.

Clasificación y sinonimia

La broca del fruto del cafeto fue descrita por primera vez en 1836 por J. D. Westwood quien la clasificó dentro del género Hypothenemus. En 1967, J. A. Graft Ferrari la describió

* La elaboración de este informe ha sido grandemente facilitada por la recopilación de las informaciones y de las síntesis hechas por el ingeniero Norberto E. Urbina, entomólogo de PROMECAFE hasta el 31 de mayo de 1987 en su informe final (febrero de 1985 a mayo de 1987).

** Entomólogo IRCC-PROMECAFE.

y abióticas. De todos los estudios realizados se sabe que la broca tiene una dispersión agregada o de contagio dentro del cafetal, esto es, no se le encuentra infestando uniformemente todo el predio, sino que en focos. Dentro de cada planta también se observan algunas bandolas más infestadas que otras, siendo las del tercio medio las más infestadas.

En lo referente a la altitud, se reporta que el rango óptimo para el desarrollo de la broca está entre 800 y 1.000 m.s.n.m. A alturas mayores de 1.300 m.s.n.m. la broca generalmente no representa un problema económico.

Estudios desarrollados en México, Guatemala, Honduras y El Salvador indican que las poblaciones de broca son mayores en cafetales con sombra muy densa mientras que su incidencia es bastante insignificante en cafetales al sol.

La temperatura y la humedad (precipitación) juegan un papel muy importante en el inicio del ataque de la broca. Los adultos permanecen durante la época seca en las cerezas abandonadas en la planta o en el suelo, las cuales mantienen algunas veces gran cantidad de insectos (más de 50) que salen después de las lluvias.

La altitud, la temperatura y la humedad relativa, además de influir en las poblaciones de broca y la duración de su ciclo de vida, ejercen una gran influencia sobre la fenología de los cafetos, esto es, el inicio y el número de las floraciones, así como los días requeridos para que los frutos alcancen el grado de semiconsistencia (20% de peso seco) que es cuando la broca hace su mayor daño.

Es fundamental señalar que la broca tiene una capacidad inherente de diseminarse por sí misma de un predio a otro por medio del vuelo. Se reporta que ataca con preferencia las cerezas de la primera floración debido a que son más maduras. Es por lo tanto primordial conocer la fenología del cafeto, especialmente en lo relacionado con el número de floraciones y la proporción de frutos de cada floración ya que esto influenciará las poblaciones de broca.

De un estudio de dinámica poblacional de la broca del fruto llevado a cabo en 1985 y 1986 en Guatemala, se estableció que el porcentaje de frutos perforados en el momento del primer corte de la cosecha es ligado al porcentaje de frutos dañados por broca al inicio de la fructificación, por una correlación de tipo exponencial (ver Figura 1). El conocimiento de esa ley será muy útil al momento de calcular los umbrales económicos.

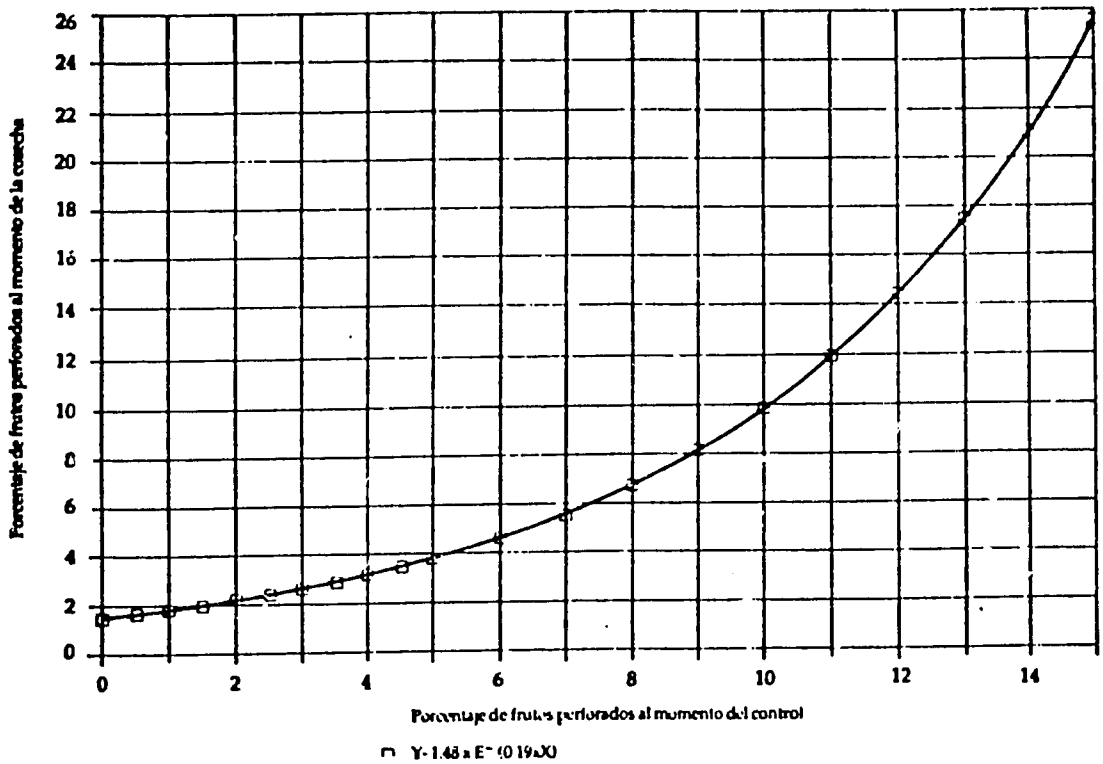
Los esfuerzos hechos para el control biológico de la broca del fruto del cafeto no han tenido mucho éxito hasta la fecha. Sin embargo, la eficiencia del hongo *Beauveria bassiana* en el control de esta plaga ha sido comprobada en forma experimental en Guatemala, Honduras y El Salvador. No se tiene hasta el momento ninguna experiencia en la utilización de parasitoides.

Evaluación de insecticidas

La recomendación más generalizada para el control químico en México, Guatemala, El Salvador y Honduras consiste en el uso del insecticida Endosulfán. Sin embargo, las opiniones discrepan según los autores y los países en cuanto a la dosis por utilizar: la recomendación en México es de 210 g de ingrediente activo por hectárea; en Guatemala y en Honduras es de 525 g i.a./ha; en El Salvador es de 750 g i.a./ha; aquí se puede recordar que en Africa se recomienda 1.000 g i.a./ha. De los ensayos hechos por PROMECAFE, se mostró que 525 g i.a./ha proporciona una eficiencia no superior al 70%. Por eso, se montó un ensayo en 1987 para determinar la dosis que brinda un buen control a menor costo.

La época recomendada para hacer la aplicación del insecticida (a veces son dos aplicaciones) es cuando el fruto de la floración representativa está en el estado de semi-consistencia

Figura 2. **Porcentaje de frutos perforados en el momento de la cosecha según el porcentaje de frutos perforados al momento del control**



y también cuando hay un 5% de frutos perforados. Sin embargo, de los estudios de dinámica poblacional de la broca hechos en México y en Guatemala por ANACAFE/PROMECAFE, se pudo demostrar que los frutos tempranos, fuera de época, son los primeros dañados por la broca y, por tal razón, sería muy oportuno adelantar la época de aplicación. Por lo tanto, convendría hacerla cuando los frutos tempranos ya son consistentes y cuando los frutos de la primera floración representativa permanecen aún lechosos, con el fin de proteger esos últimos frutos. Eso ocurre de los 2.5 a 3 meses después de la primera floración representativa en zona de baja altura y de los 3 a 3.5 meses en zona de media altura.

Para la aplicación, se recomienda usar 400 a 500 litros por hectárea de mezcla del insecticida con agua (el equipo de aspersión debe calibrarse previamente). Esta técnica representa una carga financiera alta en mano de obra para la aplicación y para el traslado del agua. Por eso, en un estudio manejado por ANACAFE/PROMECAFE, se demostró que unas técnicas de aplicación a bajo volumen (70 l/ha) con una dosis de Endosulfán de 525 g/ha brindan una eficacia por lo menos igual a la de los equipos que suelen utilizarse.

Otro estudio llevado a cabo por ANACAFE/PROMECAFE reveló que se pueden hacer mezclas de varios agroquímicos y aplicarlas sin problema para ahorrar trabajo o mano de obra aun cuando las épocas de aplicación para cada uno de los productos coincidan en una misma temporada: se demostró que no hay sinergia como tampoco antagonismo en la solución del compuesto formado por Ensosulfán y oxycloruro de cobre o por Endosulfán y oxycloruro de cobre más urea.

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Un estudio realizado por IHCAFE/PROMECAFE enseñó que como insecticidas alternos promisorios, se puede nombrar a Pirimiphos methyl (Actellic) a la dosis de 750 g i.a./ha y Chlorpyriphos (Lorsban) a la dosis de 545 g i.a./ha.

Evaluación de prácticas culturales

Control manual

El control manual consiste en la recolección de todos los frutos que han quedado en el cafetal después de la cosecha. La recolección de los frutos del suelo se denomina "pepena" y la de los frutos dejados en la planta se denomina "repela". La eliminación de los frutos perforados provenientes de las floraciones locas se llama "repase".

Estos frutos que quedan adheridos a las plantas y caídos en el suelo sirven de alimento a la broca durante el período más crítico de su subsistencia que equivale al tiempo transcurrido desde la finalización de la cosecha hasta que los frutos de las primeras floraciones de la siguiente cosecha alcancen el grado de consistencia adecuado para que la hembra empiece su oviposición.

Para que esta medida tenga éxito es indispensable que sea ejecutada por la mayoría de caficultores de una zona, ya que existe la evidencia de que la broca hembra adulta tiene la capacidad inherente de infestar nuevos predios a través del vuelo.

La finalidad de esta medida es eliminar o dificultar las condiciones que pudieran contribuir a la supervivencia de la broca en el campo durante la época en que no hay frutos en la planta; reducir drásticamente el número de brocas; y realizar la reducción de la plaga antes de la floración del café (control preventivo).

Los pequeños caficultores pueden desarrollar esta actividad utilizando mano de obra familiar. Al realizar una cosecha se recomienda tomar todas las medidas sanitarias posibles, especialmente en zonas donde la mano de obra es escasa, con el objeto de dejar la menor cantidad posible de frutos en el suelo y las plantas para minimizar así las probabilidades de sobrevivencia del insecto.

Argumentar que el control manual es muy costoso no tiene justificación si consideramos el ahorro que se deriva al disminuir el número de aplicaciones de insecticidas por el porcentaje de infestación cada vez menor en las futuras fructificaciones.

Al disminuir las aplicaciones de insecticidas se está también reduciendo al mínimo la contaminación del medio ambiente, el peligro de residuos de plaguicidas en la pulpa y el grano de café, y se preserva la fauna benéfica. Además, según evaluaciones hechas por técnicos del Instituto Salvadoreño del Café (ISIC), los costos de mano de obra que ocasiona el control manual se compensan con el valor del café recogido, especialmente cuando el valor del café es alto.

Control cultural

El control cultural consiste en la utilización de prácticas agrícolas ordinarias, o algunas modificaciones de ellas, que permiten manipular el agroecosistema del cafetal con el propósito de mantener las poblaciones de broca a niveles tolerables, procurando el ambiente menos favorable para su desarrollo, reproducción y dispersión.

Los cafetales que presentan mayores porcentajes de infestación de broca son aquellos en los cuales no hay regulación adecuada de la sombra, mal manejo del tejido productivo, inadecuado control de malezas y carencia de programas de fertilización.

Las prácticas agronómicas que se deben implementar en un programa de manejo integrado de la broca son las siguientes:

- Regulación de la sombra del cafetal. Hay que realizar esta práctica cada año, regularmente.
- Poda de los cafetos. Proporcionará mayor ventilación e iluminación dentro del cafetal; esta práctica no sólo incrementa la producción del cafetal sino que es adversa al comportamiento del insecto.
- Control de malezas. Se debe realizar una limpia inmediatamente después de la cosecha para facilitar la ejecución del control manual (pepena y repela).
- Fertilización adecuada. Los cafetales bien fertilizados producen una cosecha más abundante y presentan una floración más uniforme (pocas floraciones locas). Cuando hay muchas floraciones en un cafetal, la incidencia de la broca es mayor porque se pueden presentar varias generaciones de la plaga en el transcurso de la formación de la cosecha.

Determinación de las pérdidas en café causadas por broca

Las pérdidas en café causadas por la broca del fruto son de dos tipos: caída de frutos perforados en el transcurso de la fructificación y pérdidas de peso en la cosecha por una baja conversión de cereza a café (pergamino u oro).

Es preciso sumar esos dos tipos de pérdidas, lo que nunca habían hecho los estudios anteriores. Por otro lado, nunca se había concedido importancia al valor anexo que tiene el café de segunda calidad y el de nata mientras que sólo se había tomado en cuenta el café de primera para exportación. Esto significa que las pérdidas en la conversión cereza a café son un poco más bajas que lo que se pensaba.

Caída de frutos perforados

De varios ensayos manejados por ANACAFE/PROMECAFE, se pudo sacar una ley que muestra que el porcentaje de frutos que cae en el transcurso de la fructificación (y) es estrictamente proporcional al porcentaje de frutos perforados al inicio de la fructificación (x) (Figura 2):

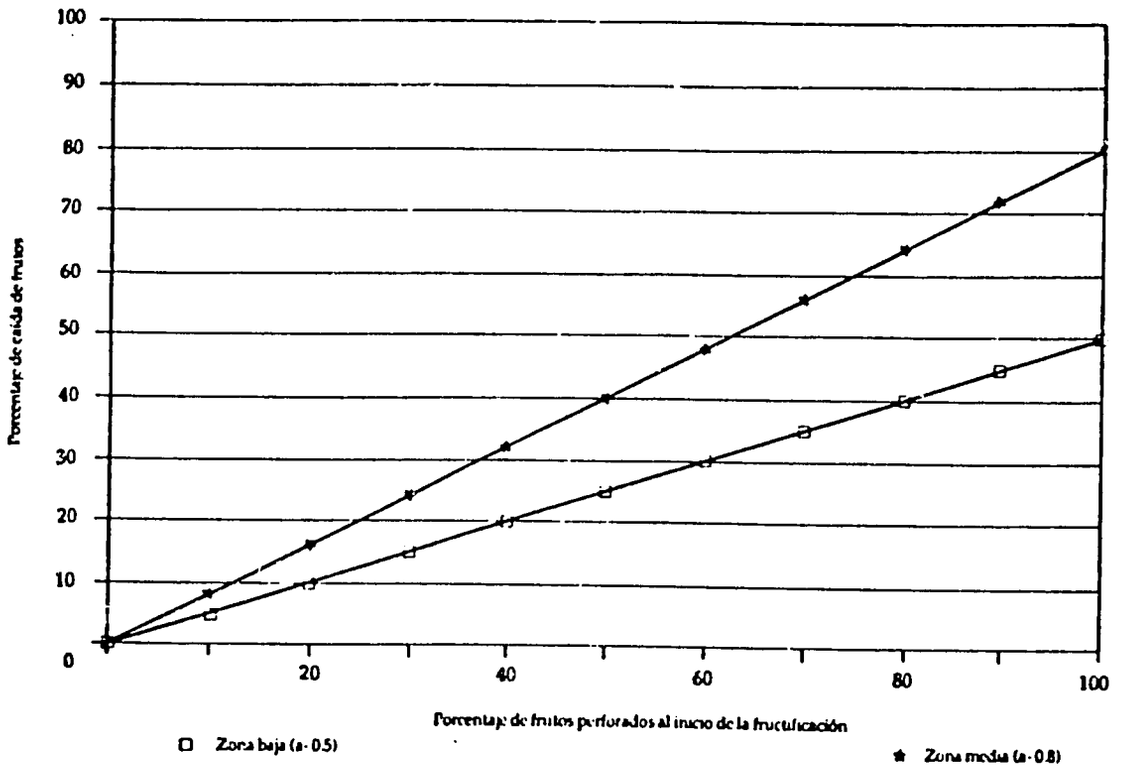
$$y = 0.5\,x \text{ en zona baja}$$
$$y = 0.8\,x \text{ en zona media.}$$

Ese porcentaje de caída de frutos determina un porcentaje de pérdidas en café cosechado estrictamente igual.

Pérdidas en café por el grado de infestación de los frutos en la cosecha

Los últimos resultados que se tienen son los de los ensayos preliminares de ANACAFE/PROMECAFE, en los cuales se calcularon con varios porcentajes de infestación en la cosecha las conversiones de cereza a café, restando del valor del café de primera perdido el valor del café de segunda y de nata.

Figura 2. Caída de frutos por la broca en el transcurso de la fructificación



Así se nota que el porcentaje de pérdidas de peso en la cosecha (y) es proporcional al porcentaje de frutos perforados encontrados (x) (Figura3):

$y = 0.224\ x$ en zona baja
$y = 0.337\ x$ en zona media.

Las pérdidas totales son la suma de las pérdidas por caída de frutos y de las pérdidas en la conversión de cereza a café. Es preciso tomar en cuenta esas pérdidas totales para el cálculo del nivel y del umbral económico de daño.

Control integrado del café

La manera más racional y económica de controlar la broca es a través del seguimiento de los principios del Manejo Integrado de Plagas (MIP). Se trata de un método ecológicamente orientado, que utiliza diversas técnicas de control, combinadas armónicamente en un sistema de manejo de plagas, tratando de proteger, preservar e incrementar los agentes bióticos de mortalidad natural, tales como parasitoides, depredadores y patógenos.

En el MIP, cuando se necesitan procedimientos de control artificial como aplicaciones de plaguicidas químicos o biológicos y liberaciones de insectos entomófagos, éstos se aplican del modo más selectivo posible y únicamente cuando su empleo esté justificado desde el punto de vista económico y ecológico.

El objetivo final del MIP es producir los máximos beneficios al costo mínimo, teniendo en cuenta las restricciones ecológicas y sociales existentes en cada ecosistema y la conservación a largo plazo del ambiente.

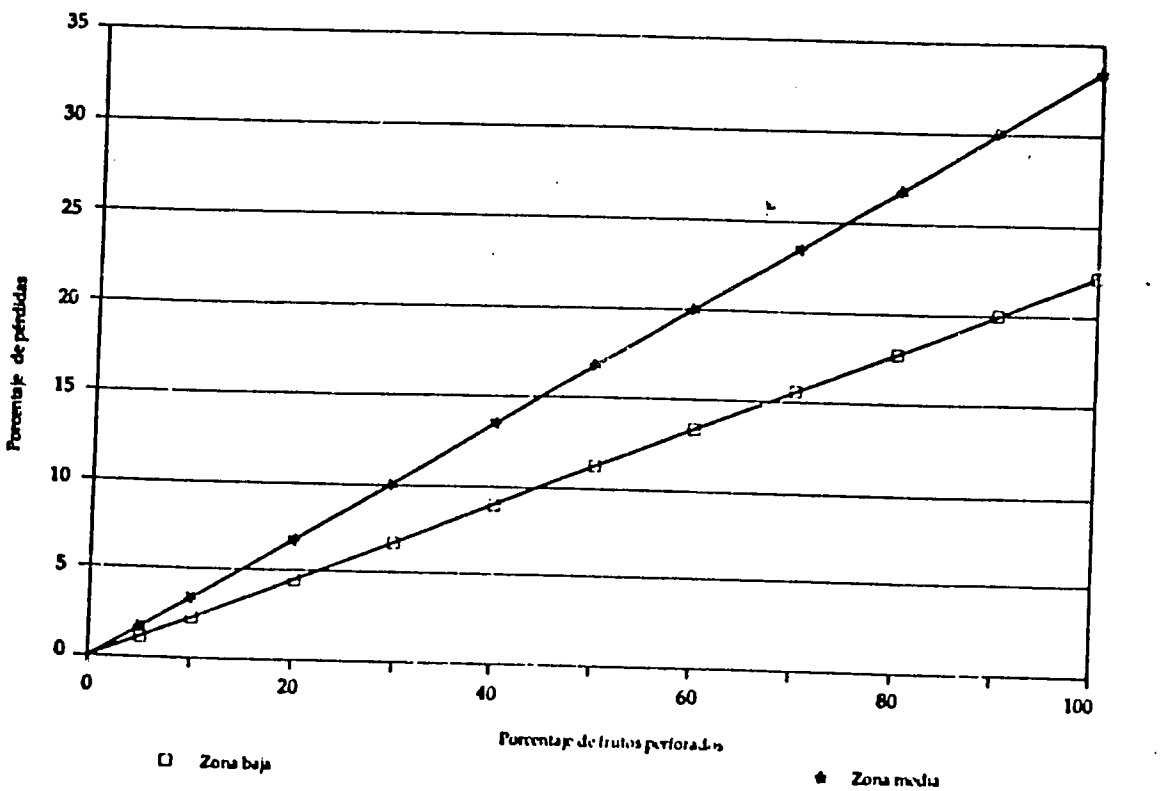
Control manual y cultural

Las actividades para esos controles se definieron y explicaron anteriormente. Sólo se recordará lo siguiente:

Control manual. Consta de la pepena, recolección de frutos dejados en el suelo, y la repela, recolección de frutos dejados en la planta. Dentro del MIP es una obligación para el caficultor, más que todo para el pequeño caficultor, realizar esas dos actividades que le permiten bajar las nuevas poblaciones de broca y de esta forma disminuir las aplicaciones de insecticidas.

El repase (eliminación de los frutos perforados en el transcurso de la fructificación) lo puede hacer el pequeño caficultor que nunca hace aplicaciones de insecticidas, porque esa actividad pide mucha mano de obra para una finca grande.

Figura 3. **Pérdidas en café según altitud de primera, de segunda y nata**



Control cultural. Consta de la regulación de sombra, la poda de los cafetos, el control de malezas y una fertilización adecuada. Sin embargo, esas prácticas agronómicas que crean un ambiente menos favorable al desarrollo de la broca no son específicas para el control de la broca, sino que son obligatorias en un buen manejo de un cafetal, porque debido al costo del control, es necesario aumentar la productividad de un cafetal antes de controlar plagas y enfermedades.

Control biológico

En vista de los grandes beneficios ecológicos y económicos derivados del control biológico, se recomienda a los técnicos en control de la broca en los países de la región de PROMECAFE iniciar lo antes posible las siguientes acciones:

- Validar la efectividad de varias concentraciones del hongo *Beauveria bassiana.*
- Desarrollar métodos prácticos para la cría masiva de este hongo.
- Estar en constante contacto con los investigadores del Consejo Interamericano, Económico y Social (CIES), para obtener de ellos ejemplares del parasitoide *Prorops nasuta* e implementar en sus respectivos países su cría masiva para una posterior liberación en el campo.

Control químico

Cuando los métodos de control recomendados anteriormente no son suficientes para mantener la plaga a niveles tolerables de daño, el fitoproteccionista se ve en la necesidad de utilizar el control químico como última alternativa. Sin embargo, antes de efectuarlo, se debe primero determinar el umbral económico de control químico en el cual está basada la decisión de control y luego muestrear la población de broca.

Determinar el umbral económico de control químico

El nivel económico de daño es la densidad mínima de población de broca a partir de la cual comienzan a producirse pérdidas económicas que justifican el costo de las medidas de control. Ese nivel depende:

- Del costo del control: precio de los productos, precio de la mano de obra, depreciación del equipo de aspersión.
- Del precio del café.
- De la producción del cafetal, dado que un mismo porcentaje de pérdidas entre un cafetal de baja producción y otro de alta producción proporciona pérdidas reales muy diferentes.
- De las pérdidas por broca en el café beneficiado. Esas pérdidas según la altitud son descritas en el capítulo anterior:

$$y = 0.22\,x \text{ en zona baja}$$
$$y = 0.34\,x \text{ en zona media.}$$

4

Control de residuos de plaguicidas usados en café

Norberto Urbina •
Zia U. Javed ••

Conceptos generales

Para los fines de la Comisión de Codex Alimentarius (1977) se entiende por residuos de plaguicidas cualquier sustancia o mezcla de sustancias encontrada en los alimentos para el hombre o los animales que resulta del uso de un plaguicida y que incluye cualquiera de sus derivados, tales como productos de degradación y conversión, metabolitos, productos de reacción e impurezas que se consideran importantes desde el punto de vista toxicológico.

La información sobre la frecuencia de residuos se obtiene con el propósito de determinar la cantidad máxima probable de residuos en la cosecha cuando el producto químico se utiliza siguiendo recomendaciones reconocidas como buenas prácticas agrícolas.

La reunión conjunta FAO/OMS y el comité del Codex para residuos de plaguicidas definen como "práctica agrícola correcta", en el uso de plaguicidas, "el uso oficialmente recomendado o autorizado de plaguicidas bajo condiciones prácticas de cualquier fase de producción, almacenamiento, transporte, distribución y procesamiento de alimentos, o cualquier otro producto agrícola teniendo en cuenta las variaciones y requisitos entre regiones y dentro de cada región, así como las cantidades mínimas necesarias para conseguir un control adecuado, aplicando los plaguicidas de tal forma que dejen los menores residuos prácticamente posibles y toxicológicamente aceptables. El uso "recomendado o autorizado" se refiere a los procedimientos, incluyendo la formulación, dosis, frecuencia de aplicación e intervalos anteriores a la recolección, aprobados por las autoridades pertinentes".

La cantidad de residuos que se deposita dentro o sobre el producto vegetal depende de diferentes parámetros de gran importancia, en particular: dilución por crecimiento, relación entre la superficie del cultivo y su volumen, volaticidad del depósito del plaguicida y grados de adsorción y absorción en la superficie del tejido. Los residuos resultantes de la aplicación de plaguicidas según un método dado y en determinados períodos y dosis variarán también de acuerdo con el lugar y el clima.

Los límites de dicha variación son importantes para evaluar la inocuidad y establecer los límites máximos de los residuos (LMR). Para obtener los datos necesarios para ese fin es preciso analizar cosechas obtenidas de cultivos tratados con plaguicidas conocidos, en los

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Recomendaciones

- De acuerdo con los resultados obtenidos en los análisis, considerados como preliminares, se recomienda que PROMECAFE continúe con este estudio a nivel regional por un mínimo de tres años consecutivos.
- Continuar con investigaciones sobre el período de vida y degradación de los plaguicidas usados en el combate de enfermedades y plagas del café, ya que los muy persistentes representan un peligro para el medio ambiente a mediano y largo plazo.
- Que los ensayos sobre residuos se concentren en las épocas de aplicación establecidas experimentalmente en cada país para el control de plagas y enfermedades del café.
- Realizar estudios de degradación de los plaguicidas en el suelo.
- Ampliar los análisis de laboratorio en café oro a tostado y molido así como a café beneficiado en seco.
- Continuar con la capacitación de los técnicos encargados de este tipo de investigaciones.
- Que el Reglamento sobre Registro de Plaguicidas sea promovido por los gobiernos de los países para su aceptación y cumplimiento fiel.
- Que OIRSA elabore un listado de productos cuyo perjuicio se ha comprobado a nivel mundial en el medio biótico y no biótico.

Anexo

Cuadro 1. Descripción de los ensayos supervisados sobre residuos de plaguicidas

Ubicación	Fecha de siembra	Variedad	Aplicaciones 1985			Plaguicidas	Cosecha de las muestras después de la aplicación (1985) [a]		
			1ª	2ª	3ª		1 DDA	7 DDA	21 DDA
GUATEMALA									
San Pablo Jocopilas, Suchitepéquez	06-78	Caturra	30-08	24-10		Bayleton 25W.P. y Tilt 25% C.E.	25-10	—	—
			29-05	29-07	24-08	Fungicidas cúpricos			
			24-06	24-10		Thiodan 35 C.E.			
			30-08	24-10		Malathion 57% C.E.			
San Antonio, Suchitepéquez	06-82	Caturra	29-08	15-10		Bayleton 25W.P. y Tilt 25% C.E.	16-10	—	05-11
			23-05	23-07	15-10	Fungicidas cúpricos			
			21-06	15-10		Thiodan 35 C.E.			
			29-08	15-10		Malathion 57% C.E.			
HONDURAS									
Trinidad, Santa Bárbara	06-80	Caturra	26-07	03-12		Bayleton 25W.P. y Tilt 25% C.E.	04-12	12-12	27-12
			17-06	26-07	03-10	Fungicidas cúpricos			
			01-08	03-12		Thiodan 35 C.E., Perfekthion 40% C.E. Malathion 57% C.E.			
San Jerónimo, Comayagua	06-81	Caturra	01-08	27-11		Bayleton 25W.P. y Tilt 25% C.E.	29-11	06-12	20-12
			07-06	01-08	28-11	Fungicidas cúpricos			
			07-06	01-08		Thiodan 35 C.E., Perfekthion 40% C.E. Malathion 57% C.E.			
EL SALVADOR									
Colón, La Libertad	b	Bourbon	25-07	02-12		Bayleton 25W.P., Tilt 25% C.E., Plantvax 20% C.E. y Thiodan 35 C.E.	03-12	09-12	23-12
			28-06	30-08	02-12	Fungicidas cúpricos			
Apaneca, Ahuachapán	b	Bourbon	30-08	04-12		Bayleton 25W.P., Tilt 25% C.E., Plantvax 20% C.E. y Thiodan 35 C.E.	05-12	11-12	25-12
			27-06	13-08	04-12	Fungicidas cúpricos			

[a] DDA: días después de la aplicación.
[b] Tienen una edad de 25 a 30 años.

Cuadro 2. Resumen de resultado de residuos de plaguicidas

FUNGICIDAS CUPRICOS

PLAGUICIDA	DOSIS		RANGOS EN mg/kg (ppm)			RESIDUO
	Concentración Kg (% i.a.)	Litros de P.C. /ha*	1 DDA**	7 DDA	21 DDA	
Oxicloruro de Cu 50 W.P.	0.35-0.50	2.50-4.60 Kg	11.75-23.00	11.25-20.03	11.25-19.70	Cobre
Oxicloruro de Cu 50 W.P.	0.70-1.00	5.00-9.20 Kg	10.00-21.00	11.70-20.60	11.00-20.00	Cobre
Oxido Cuproso 50 WP	0.35-0.50	2.50-4.60 Kg	11.75-22.35	11.30-22.30	11.70-21.10	Cobre
Oxido Cuproso 50 WP	0.70-1.00	5.00-9.20 Kg	12.20-21.60	12.35-21.10	11.70-21.00	Cobre
Oxicloruro de Cu 50 W.P.	0.35-0.50	2.50-4.60 Kg	0.51-0.65	0.50-0.92	0.48-0.95	Plomo
Oxicloruro de Cu 50 W.P.	0.70-1.00	5.00-9.20 Kg	0.50-0.70	0.48-0.79	0.44-0.90	Plomo
Oxido Cuproso 50 WP	0.35-0.50	2.50-4.60 Kg	0.56-0.84	0.48-0.86	0.48-0.68	Plomo
Oxido Cuproso 50 WP	0.70-1.00	5.00-9.20 Kg	0.54-0.71	0.47-0.85	0.48-0.6	Plomo
TESTIGO	-	-	11.25-21.30	10.00-20.00	11.00-19.60	Cobre
TESTIGO	-	-	0.50-0.72	0.46-0.72	0.45-1.00	Cobre

* Producto Comercial.
** DDA = Dias después de la última aplicación.

Cuadro 3. Resumen de resultados de residuos de plaguicidas

FUNGICIDAS SISTEMICOS

PLAGUICIDA	DOSIS		RANGOS EN mg/kg (ppm)			RESIDUO
	Concentración Kg (% i.a.)	Litros de P.C. /ha	1 DDA*	7 DDA	21 DDA	
Bayleton 25 W.P.	0.10	1.428-2.040 Kg	0.002-2.00	0.05-0.10	0.04-1.15	Triadimefon
Bayleton 25 W.P.	0.20	2.856-4.080 Kg	0.03-1.63	0.09-0.40	0.01-0.37	Triadimefon
Bayleton 25 W.P.	0.07	0.728-1.288 L	0.08-0.12	0.04-0.05	0.03-0.07	Triadimefon
Bayleton 25 C.E	0.14	1.456-2.576 L.	0.06-0.12	0.04-0.07	0.03-0.06	Triadimefon
Tilt 25 C.E.	0.035	0.500-0.714 L	0.02-1.72	0.02-0.62	0.13-0.45	Propiconazole
Tilt 25 C.E.	0.07-0.14	1.0-1.428 L	0.01-0.13	0.02-0.05	0.01-0.05	Propiconazole
TESTIGO	-		ND**	ND	ND	Triadimefon

* DDA = Dias después de la última aplicación.
** ND-No detectado.

Cuadro 4. Resumen de resultados de residuos de plaguicidas

INSECTICIDAS

PLAGUICIDA	DOSIS		RANGOS EN mg/kg (ppm)			RESIDUO
	Concentración Kg (% i.a.)	Litros de P.C./ha	1 DDA*	7 DDA	21 DDA	
Thiodan 35 C.E.	0.14	1.428-2.040 L	0.01-0.02	0.01-0.01	0.01-0.01	Endosulfan I + Sulfato de Endosulfan
Thiodan 35 C.E.	0.28	2.851-4.080 L	0.01-0.04	0.01-0.03	0.01-0.02	Endosulfan I + Sulfato de Endosulfan
Thiodan 35 C.E.	0.06	0.412-0.762 L	Trazas-0.01	Trazas-0.01	Trazas-0.01	Endosulfan I + Sulfato de Endosulfan
Thiodan 35 C.E.	0.12	0.884-1.564 L	Trazas-0.01	Trazas-0.01	Trazas	Endosulfan I + Sulfato de Endosulfan
Malathion 57% C.E.	0.17	1.071-1.530 L	0.01-0.33	0.03-0.07	0.03-0.16	Endosulfan I + Sulfato de Endosulfan
Malathion 57% C.E.	0.34	2.142-3.060 L	0.02-0.46	0.01-0.02	0.01-0.03	Endosulfan I + Sulfato de Endosulfan
Perfekthion 40% C.E.	0.06	0.720-0.765 L	Trazas-0.15	ND**	ND	Endosulfan I + Sulfato de Endosulfan
Perfekthion 40% C.E.	0.12	1.44-1.53 L	0.05-0.43	ND	ND	Endosulfan I + Sulfato de Endosulfan

* DDA= Días después de la última aplicación.

** ND=No Detectado.

INSTITUTO INTERAMERICANO DE COOPERACIÓN PARA LA AGRICULTURA - IICA -

OFICINA EN GUATEMALA

PROYECTO REGIONAL DE CONTROL DE PESTES DEL CAFE

AID/ROCAP No. 596-0090

INFORME FINAL

FEBRERO 1985 - MAYO 1987

"CONTROL DE LA BROCA DEL FRUTO DEL CAFETO"

"CONTROL DE RESIDUOS DE PESTICIDAS USADOS EN CAFE"

Norberto E. Urbina
Entomólogo de PROMECAFE

EN CONJUNTO CON:

- Asociación Nacional del Café (ANACAFE)
- Instituto Hondureño del Café (IHCAFE)
- Instituto Salvadoreño de Investigaciones del Café (ISIC)

Mayo, 1987

VI. CONTROL DE RESIDUOS DE PLAGUICIDAS USADOS EN CAFE

A. CONCEPTOS GENERALES

Para los fines de la Comisión del Codex Alimentarius (1977) se entiende por residuos de plaguicidas (pesticida) cualquier sustancia o mezcla de sustancias encontrada en los alimentos para el hombre o los animales, que resulta del uso de un plaguicida y que incluye cualquiera de sus derivados, tales como productos de degradación y conversión, metabolitos, productos de reacción e impurezas que se consideran importantes desde el punto de vista toxicológico.

La información sobre la frecuencia de residuos se obtiene con el propósito de determinar la cantidad máxima de residuos que es probable se encuentre en la cosecha cuando el producto químico se utiliza siguiendo recomendaciones reconocidas como buenas prácticas agrícolas.

La Reunión Conjunta FAO/OMS y el Comité del Codex para Residuos de plaguicidas, define como "práctica agrícola correcta", en el uso de plaguicidas ,"el - uso oficialmente recomendado o autorizado de plaguicidas bajo condiciones prácticas de cualquier fase de producción, almacenamiento, transporte, distribución y procesamiento de alimentos, o cualquier otro producto agrícola, teniendo en cuenta las variaciones y requisitos entre regiones y dentro de cada región, así como las cantidades mínimas necesarias - para conseguir un control adecuado, aplicando los plaguicidas de tal forma que dejen los menores residuos prácticamente posibles y toxicológicamente aceptables. El uso "recomendado o autorizado" se refiere a los procedimientos, incluyendo la formulación, dosis, frecuencia de aplicación e intervalos anteriores a la recolección, aprobados por las autoridades pertinentes".

La cantidad de residuos que se deposita dentro o sobre el producto vegetal depende de diferentes parámetros de distinta importancia, en particular: dilución por crecimiento, relación entre la superficie del cultivo y su volúmen, volatilidad del depósito del plaguicida y grados de adsorción y absorción en la superficie del tejido. Los residuos resultantes

CUADRO 21

RESUMEN DE RESULTADOS DE
RESIDUOS DE PLAGUICIDAS

INSECTICIDAS

PLAGUICIDA	DOSIS		Rangos en mg/Kg (ppm)			RESIDUO
	Concentración (% i.a.)	Kg litros de P.C./Ha.	1 DDA*	7 DDA*	21 DDA*	
Thiodan 35 C.E.	0.14	1.428-2.040 L	0.01-0.02	0.01-0.01	0.01-0.01	Endosulfan I + Sulfato de Endosulfan
Thiodan 35 C.E.	0.28	2.851-4.080 L	0.01-0.04	0.01-0.03	0.01-0.02	
Thiodan 35 C.E.	0.06	0.442-0.782 L	Trazas-0.01	Trazas-0.01	Trazas-0.01	
Thiodan 35 C.E.	0.12	0.884-1.564 L	Trazas-0.01	Trazas-0.01	Trazas	
Malathion 57% C.E.	0.17	1.071-1.530 L	0.01-0.33	0.03-0.07	0.03-0.16	
Malathion 57% C.E.	0.34	2.142-3.060 L	0.02-0.46	0.01-0.02	0.01-0.03	
Perfekthion 40% C.E.	0.06	0.720-0.765 L	Trazas-0.15	ND	ND	
Perfekthion 40% C.E.	0.12	1.44-1.53 L	0.05-0.43	ND	ND	

DDA = Días después de la última aplicación

ND = No Detectado

Trazas = Valores menores a 0.01 mg/Kg (ppm)

E. CONCLUSIONES Y RECOMENDACIONES

1. El origen de los residuos de Plomo y Cobre no se pudo establecer con claridad, debido a que los niveles de residuos en mg/Kg de estos dos elementos, en granos de café provenientes de parcelas sin aplicación de fungicidas cúpricos, es similar a los que se encontraton en el café proveniente de parcelas tratadas con cúpricos.

2. Los rangos promisibles de Plomo para varios productos alimenticios van desde 0.1 ppm hasta 2 ppm, según datos del Codex Alimentarius (Anexo 2). Los rangos de 0.5 a 1.0 ppm encontrados en estos ensayos están dentro de lo permitido.

3. Se han encontrado residuos de fungicidas sistémicos (Triadimefon y Propicanozol) y de insecticidas (Endosulfan, Dimetoato y Malathion), que no tienen establecidos tolerancias para café, por la Agencia Estadounidense para la Protección del Medio Ambiente (EPA) (Anexo 1).

4. Los niveles de residuos de todos los productos son mayores en los ensayos de Honduras, debido a que al usar mayor cantidad de mezcla de aspersión, se hizo un depósito mayor de ingrediente activo por área.

5. La precipitación pluvial en las zonas donde se establecieron los ensayos en Honduras es mucho menor que en las demás zonas de El Salvador y Guatemala, lo que pudo haber tenido influencia sobre el mayor nivel de residuos en Honduras. Por otro lado, los niveles de residuos son más bajos en Guatemala, donde la precipitación es bastante alta.

6. Se recomienda hacer análisis de café tostado y en en taza, de aquellas muestras que presentan los niveles más altos de residuos.

7. En futuros ensayos, cuando la dosis se presente en concentración (%), se recomienda que la misma sea hecha en % de ingrediente activo y no de producto comercial.

8. Se recomienda hacer más investigaciones de invernadero y campo, para determinar con exactitud el origen de los residuos de Plomo y así evaluar la contribución de las diversas formulaciones de fungici

das cúpricos en el contenido total de residuos.

9. Se recomienda que las muestras de café de los ensayos de residuos de la cosecha 86-87, establecidos en El Salvador, sean remitidos lo antes posible al ICAITI, para su análisis.

F. ACCIONES DE CAPACITACION

Se realizó en Guatemala, los días 24 y 25 de Febrero de 1987, un Curso Taller Regional sobre Residuos de Plaguicidas usados en Café, donde se dieron a conocer los resultados de los ensayos de la cosecha 85-86. En los Anexos 3 y 4 se presenta el Programa y la Lista de los participantes al mismo.

EVALUACION DE DOSIS Y NUMERO DE APLICACIONES DE ENDOSULFAN PARA EL CONTROL DE BROCA DEL FRUTO DEL CAFETO (Hypothenemus hampei Ferr.).

Raúl Isaías Muñoz *
Ricardo Zelaya R.**

1. RESUMEN

Con el objeto de determinar la dosis y el número de aplicaciones de Endosulfan económicamente eficientes en el control de la broca del fruto del café se evaluaron las dosis de 1.0, 1.5, 2.0 y 2.5 litros de Endosulfan (Thiodan 35 C.E.) por hectárea. Por cada dosis se evaluaron 12 parcelas (4 con una aplicación por año, 4 con dos aplicaciones y 4 con tres aplicaciones espaciandolas cada 30 días; con un testigo absoluto.

Se realizaron 4 muestreos, dos a los 8 y 30 días después de la primera aplicación de tratamientos, otro a los 6 días después de la segunda aplicación y el último a los 5 días después de la tercera aplicación.

El muestreo consistió en colectar 30 frutos brocados por parcela útil, a los cuales mediante disección se les determinó las brocas vivas y muertas, tanto al estado adulto como larval. También se determinó el número de frutos que fueron perforados y abandonados.

Para el análisis estadístico, los datos fueron transformados a $\sqrt{x+1}$. Se usó la fórmula Abbottpara establecer la eficiencia de los productos.

Se empleó el diseño de bloques al azar con 13 tratamientos y 4 repeticiones, usando parcelas de 16 plantas (4 por lado), donde la parcela útil la constituyeron las cuatro plantas centrales.

Todos los tratamientos en que se aplicó Endosulfan fueron efectivos en controlar la broca, analizando el número total de brocas muertas, se encontró que la dosis de 2.5 lts/ha, aplicado 3 veces al año fue mejor que la de 1.0 lts/ha, aplicado una vez/año, al nivel de 5% de probabilidad según la prueba de Tukey.

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** Ing. Agr., Coordinador del Programa Roya-Broca, IHCAFE, San Pedro Sula, Honduras.

lar la broca.

- El Thiodan aplicado a una mayor concentración mostró tener un efecto mas prolongado en la mortalidad de brocas que cuando se aplicó a dosis mas bajas.

7. RECOMENDACIONES.

Bajo las condiciones del estudio se puede recomendar lo siguiente:

- No hacer mas de 2 aplicaciones anuales de Endosulfan para el control de la broca.
- Si después de realizar un muestreo de la finca la infestación está entre 5 y 10% de infestación se recomienda realizar unicamente una aplicación de Endosulfan (Thiodan 35 C.E.) a razón de 1.5 lts de producto comercial por ha.(525 gr de i.a/ha).
- Si la infestación es superior a 10% es recomendable realizar dos aplicaciones de Endosulfan 35% a razón de 1.0 lts/ha (350 gr de i.a/ha) a intervalo de 30 días una de la otra; con el fin de controlar a nuevas generaciones que se esten desarrollando.

EVALUACION DE INSECTICIDAS PARA EL CONTROL QUIMICO DE LA BROCA DEL FRUTO DEL CAFE H. HAMPEI FERR.

* Héctor Ochoa Milian
* Oscar Campos A.
** Braulio Vidal S.
*** Edgar López de León

I. OBJETIVOS

- Evaluar otros insecticidas como una alternativa del Thiodan 35 % E.C., para evitar una posible resistencia de la broca a un determinado producto.

- Evaluar dos insecticidas que su principio activo es el Endosufan.

II. LOCALIZACION:

Finca	Municipio	Altitud s.n.m.	Temp. promedio	Temp. pluvial
P.A.C. Chocolá	Sn. Pablo Jocopilas	762:0 mts.	21.8°C	3 913 mm.

* Técnicos de ANACAFE
** Técnicos de OIRSA
*** Biometrista ANACAFE

CUADRO 1

EVALUACION DE INSECTICIDAS PARA EL CONTROL DE LA BROCA DEL FRUTO DEL CAFE

P.A.C. Chocolá, San Pablo Jocopilas, Suchitepéquez

"ORDENAMIENTO DE PROMEDIOS DE MORTANDAD"

Primera LECTURA FECHA 4 de agosto de 1984

15 DIAS TRANSCURRIDOS POST-ASPERSION

TRATAMIENTOS	PROMEDIOS	TUKEY 1%	TUKEY 5%
Thionex 35% E.C. 1.5 Lt/Ha	60.67 arcs. 76.00%	a	
Thiodán 35% E.C. 1.5 Lt/Ha	53.99 " 65.45%	a	
Sevin 80.S 1.3 Kg/Ha	18.00 " 9.54%	b	
Testigo	9.66 " 2.81	b	
Larval 600 cc/200 Litros/agua	8.72 " 2.30	b	

Los tratamientos con la misma letra son iguales estadísticamente.

CUADRO 2

EVALUACION DE INSECTICIDAS PARA EL CONTROL DE LA BROCA DEL FRUTO DEL CAFE

P.A.C. Chocolá, San Pablo Jocopilas, Suchitepéquez

"ORDENAMIENTO DE PROMEDIOS DE MORTANDAD"

Segunda LECTURA FECHA 14 de agosto de 1984,

25 DIAS TRANSCURRIDOS POST-ASPERSION

TRATAMIENTOS	PROMEDIOS	TUKEY 1%	TUKEY 5%
Tnionex 35% E.C. 1.5 Lt/Ha	58.62 arcs. 72.88%	a	
Thiodán 35% E.C. 1.5 Lt/Ha	43.92 " 48.12%	a	
Larval 600 cc/200 Lts. de agua	26.50 " 19.90%	b	
Sevin 80.S 1.3 Kg/Ha	25.88 " 19.05%	b	
Testigo	24.37 " 17.03%	b	

Los tratamientos con la misma letra son iguales estadísticamente.

CUADRO 3

EVALUACION DE INSECTICIDAS PARA EL CONTROL DE LA BROCA DEL FRUTO DEL CAFE

P.A.C. Chocolá, San Pablo Jocopilas, Suchitepéquez

"ORDENAMIENTO DE PROMEDIOS DE MORTANDAD"

Tercera LECTURA FECHA 29 de agosto de 1984

40 DIAS TRANSCURRIDOS POST-ASPERSION

TRATAMIENTOS	PROMEDIOS	TUKEY 1%	TUKEY 5%
Thionex 35% E.C. 1.5 Lt/Ha	62.80 arcs. 79.11%	a	
Thiodán 35% E.C. 1.5 Lt/Ha	43.83 " 47.96%	a	
Larval 600 cc/200 Litros/agua	25.22 " 18.16%	b	
Sevin 80.S 1.3 Kg/Ha	23.17 " 15.48%	b	
Testigo	20.40 " 12.15%	b	

Los tratamientos con la misma letra son iguales estadísticamente.

CONCLUSIONES

1. El Thionex 35 % E.C. y Thiodan 35 % E.C., ambos con 1.5 litros por hectárea fueron los que mejor controlaron la broca del fruto del café.

2. Los insecticidas Larvall y Sevin 80-S tuvieron un comportamiento igual al testigo.

3. Los productos Thionex 35 % E.C. y Thiodan 35 % E.C. demostraron su efecto a partir de los 15 días y lo mantuvieron aun a los 40 días después de la aplicación.

RECOMENDACIONES

1. Para efectos de control de la broca del fruto del café, se recomienda aplicar productos con ingrediente activo como el Endosulfan.

2. Efectuar más ensayos de campo para continuar evaluando el producto Thionex 35 % E.C.

Annex 4.

List of Pesticide Laws, Banned and Restricted Pesticides, and Pesticide Label Requirements in Guatemala (MAGA/DTSV)

The following is a list of the Guatemalan laws governing pesticides, fertilizers, and agricultural and forestry products.

	Law/Regulation	Date/Status
1.	Plant Health Law of Guatemala (Decree 446)	24 April 1974
2.	Regulation on the Importation, Manufacturing, Storage, Transportation, Sale, and Use of Pesticides	19 April 1974
3.	Regulations Concerning the Importation, Manufacturing, Storage, Transportation, Sale, and Use of Pesticides (Decree No. 43-74)	30 May 1974
4.	Regulation Concerning the Sale, Use, and Control of Agricultural Pesticides and Similar Substances (New Law - Replaces Decree No. 43-74 of 1974?)	? November 1989
5.	Law of the Stamp of the Ingeniero Agronomo (Decree 48-77)	5 October 1977
6.	Law for the Protection and Improvement of the Environment	5 December 1986
7.	Reglamento Para la Importacion, Formulacion, Almacenamiento y Comercializacion de Abonos y Fertilizantes (Reglamento No. 1121-85)	19 November 1985
8.	Forestry Law (Decree No. 118-84)	20 December 1984
9.	Plant Health Law (Decree No. 446)	25 October 1955
10.	Political Constitution of the Republic of Guatemala	31 May 1985
11.	Water Law (Proposed)	Under revision by the National Environmental Commission
12.	Forestry Law (Proposed)	Withdrawn from revision process in June 1988
13.	Natural Heritage Law of Guatemala	Withdrawn from revision process in June 1988

BANNED PRODUCTS (PRODUCTOS PROHIBIDOS)

1.- ALDRIN
2.- B H C
3.- CANFENO CLORADO
4.- CLORDANO
5.- CLORDIMEFORM
6.- CYHEXATIN
7.- D D T (Insecticida)
8.- D B C P (Fumazone, Nemagon, Dibromuro Chloropropano)
9.- DINOSEB
10.- 2,4,5-T (Herbicida)
11.- E D B (Fumigante)
12.- ENDRIN
13.- ETHYL PARATHION
14.- FHOSVEL (Insecticida)
15.- HEPTACLORO
16.- DAMINOZIDE

PRODUCTOS RESTRINGIDOS

1) Creosota, Pentaclorofenol y Arsenicales Inorgánicos

Uso de guantes impermeables, ropa protectora y respiradores prohibido su uso en interiores, solo para fines de construcción - comercial unicamente.

La aplicación debe de hacerse bajo supervisión de aplicadores calificados y certificados, las personas consumidoras de la madera tratada sepan sobre los riesgos a que se exponen al utilizarla.

Prohibir su uso a manera que pueda tener contacto con alimentos para humanos y animales y agua potable para humanos y animales.

2) Pentaclorofenol

No debe tener más de 15 ppm de dioxina PXCDD, en la etiqueta debe de ir anotado que el producto es teratogénico y fetotóxico exigir sistemas cerrados para mezclado y [illegible] formulaciones llenadas en forma de escamas o en polvo.

Prohibir su aplicación a la madera destinada a uso interior excepto para estructuras en contacto con el suelo en graneros, - establos y edificaciones similares y excepto para el trabajo de - aserraderos con superficies a la intemperie, pero solo si aplican selladores.

3) Arsenicales

Exigir sistemas cerrados para mezclar formulaciones en polvo exigir que trabajadores de planta usen respirador si el nivel de arsénico es mayor de 10 UG/M³/dí de 8 horas.

Exigir observancia de normas de la industria sobre eliminación de residuos superficiales de arsénico en madera tratada, permitir el uso de madera tratada a presión con arsénico en interiores residenciales siempre que todo el polvo sea aspirado de la superficie de la madera.

4) Creosota

Prohibir su aplicación a la madera destinada uso interior excepto para estructuras en contacto con el suelo en graneros, establos y edificaciones similares.

5) Dialatos

Los pueden usar aplicadores experimentados y certificados o bajo su directa supervisión.

6) Hidracida de Acido Maleico en productos técnicos

Contenido de hidracida debe ser menor a 15 ppm.

7) Trifluralina

Contenido no mayor de 0.5 ppm de N-Nitrosaminas.

8) Estricnina

Se prohibe su uso en áreas no agrícolas

9) Oxicloruro de Cobre

No debe contener más de 250 ppm de arsenato, especificación FAO 44-20 exch/1/5/14, no debe contener más de 250 ppm de plomo, especificación FAO 44. 2 Oxch/1/5/14.

10) Dicofol

Debe tener abajo de un 2.5% de impurezas relacionadas con el DDT.

11) Diazinon

No puede ser utilizado en canchas de golf y en producción de césped.

12) Nitrato de Amonio, Nitrato de Calcio
Nitrato de Potasio y Nitratos en General.

Debe tenerse una autorización del Ministerio de la Defensa para su importación por ser un producto de uso delicado.

13) P.C.N.B

Contenido de HCB menor de 0.1%

PRODUCTOS SUSPENDIDOS

Sal Dietanolamina del ácido maleico (DEA-MH)
Sal de potasio del ácido maleico (K-MH)
Dinoseb

MINISTERIO DE AGRICULTURA, GANADERIA Y ALIMENTACION
DIRECCION GENERAL DE SERVICIOS AGRICOLAS
DIRECCION TECNICA DE SANIDAD VEGETAL

INSTRUCTIVO PARA EL REGISTRO DE PLAGUICIDAS, EQUIPOS PARA SU APLICACION Y EMPRESAS QUE LOS COMERCIALIZAN

DEPARTAMENTO DE CONTROL Y
REGISTRO DE AGROQUIMICOS
GUATEMALA, 1983

IV.1.5 PARA EL CASO DE MATERIAS PRIMAS, LA ETIQUETA DEBERA LLEVAR LO SIGUIENTE:

a) Nombre del producto;

b) Nombre genérico o común del producto;

c) Frase: MATERIA PRIMA PARA FORMULAR INSECTICIDAS, FUNGICIDAS, HERBICIDAS, etcétera, dependiendo de su uso;

d) Leyenda: "Manténgase alejado de los niños, de los animales domésticos y de los alimentos", y

e) Nombre y dirección del fabricante, formulador.

IV.2 De ninguna manera procederá la empresa a vender productos con el registro en trámite o vencido, ni permitirá el reenvasado y distribución a granel del plaguicida.

IV.3 La clasificación toxicológica que toma como base para la coloración de la franja de 15 a un 25o/o del área total de la etiqueta es la siguiente:

IV. 3.1 Tabla 1. Clasificación toxicológica

Categoría	DL50-aguda oral (mg/kg)	DL 50-aguda dérmica (mg/kg)	CL 50-aguda por inhalación (ug/dm^3)	Coloración de la franja inferior de la etiqueta
I Extremadamente tóxicos	menos de 5	menos de 20	menos de 200	ROJO INTENSO
II Altamente tóxicos	de 5 a 50	de 20 a 200	de 200 a 2000	
III Medianemente tóxicos	más de 50 a 500	más de 200 a 2000	más de 2000 a 20000	AMARILLO INTENSO
IV Poco tóxicos	más de 500 a 5000	más de 2000 a 20000	más de 20000 a 200000	AZUL INTENSO
V Prácticamente no tóxicos	más de 5000	más de 20000	más de 200000	VERDE INTENSO

IV.4 Etiqueta oficial:

La distribución del mensaje que lleva la etiqueta debe basarse en los modelos que se presentan como anexos 15, 16, 17 y 18.

"ALTO, LEA LA ETIQUETA ANTES DE USAR EL PRODUCTO"

PRECAUCIONES Y ADVERTENCIAS DE USO
Aquí deberán incluirse todas aquellas precauciones y advertencias de uso relativas al Plaguicida, incluyendo el uso del equipo de protección personal (overoles, botas, etcétera).

MANEJO DEL PRODUCTO
(Almacenamiento y Transporte)

SINTOMAS DE INTOXICACION

PRIMEROS AUXILIOS
Medidas a tomar en caso de envenenamiento por vía: oral, inhalación, contacto con los ojos o con la piel

"En caso de intoxicación, lleve el paciente al médico y dele una copia de esta etiqueta"

TRATAMIENTO MEDICO Y ANTIDOTO

MEDIDAS PARA LA PROTECCION DE LA SALUD Y EL AMBIENTE

Garantía

NOMBRE COMERCIAL, FORMULACION
(Nombre común o genérico)

Clase de Plaguicida:
Composición Química:
Ingrediente Activo: o/o p/p
Ingrediente inerte: o/o p/p
Total 100 o/o p/p

Gramos ingrediente activo/kg.
Gramos ingrediente activo/lt
Contenido Neto:

PELIGRO  VENENO

"NO ALMACENAR EN CASA DE HABITACION"
"MANTENGASE ALEJADO DE LOS NIÑOS DE LOS ANIMALES DOMESTICOS Y DE LOS ALIMENTOS"
"DESTRUYA ESTE ENVASE DESPUES DE USAR EL PRODUCTO"

Logotipo de la casa

Nombre y Dirección completa del Fabricante-Formulador

INSTRUCCIONES DE USO

Equipo de protección adecuado al manipular el producto durante la operación de preparación de mezclas y carga del equipo de aplicación.

PREPARACION DE LA MEZCLA Y FORMA DE APLICACION

Cultivo (nombre común y científico)
Plaga (nombre común y científico)
Dosis en el sistema métrico decimal, poniendo entre paréntesis la dosis que se requiera en otro sistema.
Frecuencia de aplicación e intervalo entre la última aplicación y cosecha.

PERIODO DE REINGRESO, COMPATIBILIDAD, FITOTOXICIDAD

Países	No. Registro
Guatemala	
El Salvador	
Honduras	
Nicaragua	
Costa Rica	
Panamá	

No. Lote Fecha vencimiento
Importador
Dirección

CATEGORIAS I Y II, COLOR ROJO

ANEXO 15

"ALTO LEA LA ETIQUETA ANTES DE USAR EL PRODUCTO"

Aquí deberán incluirse todas aquellas precauciones y advertencias de uso relativas al Plaguicida, incluyendo el uso del equipo de protección personal (overoles, botas, etcétera).

MANEJO DEL PRODUCTO
(Almacenamiento y Transporte)

SINTOMAS DE INTOXICACION

PRIMEROS AUXILIOS
Medidas a tomar en caso de envenenamiento por vía: oral, inhalación, contacto con los ojos o con la piel

"En caso de intoxicación, lleve el paciente al médico y dele una copia de esta etiqueta"

TRATAMIENTO MEDICO Y ANTIDOTO

MEDIDAS PARA LA PROTECCION DE LA SALUD Y EL AMBIENTE

Garantía

NOMBRE COMERCIAL, FORMULACION
(Nombre común o genérico)

Clase de Plaguicida:
Composición Química:
Ingrediente Activo: o/o p/p
Ingrediente Inerte: o/o p/p
Total: 100 o/o p/p
Gramos ingrediente activo/kg
Gramos ingrediente activo/lt
Contenido Neto:

CUIDADO  VENENO

"NO ALMACENAR EN CASA DE HABITACION"

"MANTENGASE ALEJADO DE LOS NIÑOS, DE LOS ANIMALES DOMESTICOS Y DE LOS ALIMENTOS"

"DESTRUYA ESTE ENVASE DESPUES DE USAR EL PRODUCTO"

Logotipo de la casa

Nombre y Dirección completa del Fabricante-Formulador

INSTRUCCIONES DE USO

Equipo de protección adecuado al manipular el producto durante la operación de preparación de mezclas y carga del equipo de aplicación.

PREPARACION DE LA MEZCLA Y FORMA DE APLICACION

Cultivo (nombre común y científico).
Plaga (nombre común y científico).
Dosis en el sistema métrico decimal, poniendo entre paréntesis la dosis que se requiera en otro sistema.
Frecuencia de aplicación e intervalo entre la última aplicación y cosecha

PERIODO DE REINGRESO, COMPATIBILIDAD, FITOTOXICIDAD

Países	No. Registro
Guatemala	
El Salvador	
Honduras	
Nicaragua	
Costa Rica	
Panamá	

No. Lote Fecha vencimiento
Importador
Dirección

CATEGORIA III COLOR AMARILLO

ANEXO 16

"ALTO LEA LA ETIQUETA ANTES DE USAR EL PRODUCTO"

PRECAUCIONES Y ADVERTENCIAS DE USO

Aquí deberán incluirse todas aquellas precauciones y advertencias de uso relativas al Plaguicida, incluyendo el uso del equipo de protección personal (overoles, botas, etcétera).

MANEJO DEL PRODUCTO
(Almacenamiento y Transporte)

SINTOMAS DE INTOXICACION

PRIMEROS AUXILIOS
Medidas a tomar en caso de envenamiento por vía: oral, inhalación, contacto con los ojos o con la piel.

"En caso de intoxicación, lleve el paciente al médico y dele una copia de esta etiqueta"

TRATAMIENTO MEDICO Y ANTIDOTO

MEDIDAS PARA LA PROTECCION DE LA SALUD Y EL AMBIENTE

Garantía

NOMBRE COMERCIAL, FORMULACION
(Nombre común o genérico)

Clase de Plaguicida:
Composición Química:
Ingrediente Activo: o/o p/p
Ingrediente Inerte: o/o p/p
Total 100 o/o p/p
Gramos ingrediente activo/kg
Gramos ingrediente activo/lt
Contenido Neto:

PRECAUCION PELIGRO

"NO ALMACENAR EN CASA DE HABITACION"
"MANTENGASE ALEJADO DE LOS NIÑOS, DE LOS ANIMALES DOMESTICOS Y DE LOS ALIMENTOS"
"DESTRUYA ESTE ENVASE DESPUES DE USAR EL PRODUCTO"

Logotipo de la casa

Nombre y Dirección completa del Fabricante-Formulador

INSTRUCCIONES DE USO

Equipo de protección adecuado al manipular el producto durante la operación de preparación de mezclas y carga del equipo de aplicación

PREPARACION DE LA MEZCLA Y FORMA DE APLICACION

Cultivo (nombre común y científico)
Plaga (nombre común y científico)
Dosis en el sistema métrico decimal, poniendo entre paréntesis la dosis que se requiera en otro sistema.
Frecuencia de aplicación e intervalo entre la última aplicación y cosecha.

PERIODO DE REINGRESO, COMPATIBILIDAD, FITOTOXICIDAD

Países	No. Registro
Guatemala	
El Salvador	
Honduras	
Nicaragua	
Costa Rica	
Panamá	

No. Lote Fecha vencimiento
Importador
Dirección

CATEGORIA IV COLOR AZUL

ANEXO 17

"ALTO LEA LA ETIQUETA ANTES DE USAR EL PRODUCTO"

PRECAUCIONES Y ADVERTENCIAS DE USO

Aquí deberán incluirse todas aquellas precauciones y advertencias de uso relativas al Plaguicida, incluyendo el uso del equipo de protección personal (overoles, botas, etcétera)

MANEJO DEL PRODUCTO
(Almacenamiento y Transporte)

SINTOMAS DE INTOXICACION

PRIMEROS AUXILIOS
Medidas a tomar en caso de envenenamiento por vía oral, inhalación contacto con los ojos o con la piel

"En caso de intoxicación, lleve el paciente al médico y dele una copia de esta etiqueta"

TRATAMIENTO MEDICO Y ANTIDOTO

MEDIDAS PARA LA PROTECCION DE LA SALUD Y EL AMBIENTE

Garantía:

NOMBRE COMERCIAL, FORMULACION
(Nombre común o genérico)

Clase de Plaguicida:
Composición Química:
Ingrediente Activo: o/o p/p
Ingrediente inerte: o/o p/p
Total 100 o/o p/p
Gramos ingrediente activo/kg
Gramos ingrediente activo/lt
Contenido Neto:

P R E C A U C I O N

"NO ALMACENAR EN CASA DE HABITACION"

"MANTENGASE ALEJADO DE LOS NIÑOS, DE LOS ANIMALES DOMESTICOS Y DE LOS ALIMENTOS"
"DESTRUYA ESTE ENVASE DESPUES DE USAR EL PRODUCTO"

Logotipo de la casa

Nombre y Dirección completa del Fabricante-Formulador

INSTRUCCIONES DE USO

Equipo de protección adecuado al manipular el producto durante la operación de preparación de mezclas y carga del equipo de aplicación.

PREPARACION DE LA MEZCLA Y FORMA DE APLICACION

Cultivo (nombre común y científico)
Plaga (nombre común y científico)
Dosis en el sistema métrico decimal, poniendo entre paréntesis la dosis que se requiera en otro sistema
Frecuencia de aplicación e intervalo entre la última aplicación y cosecha.

PERIODO DE REINGRESO, COMPATIBILIDAD, FITOTOXICIDAD

Países	No. Registro
Guatemala	
El Salvador	
Honduras	
Nicaragua	
Costa Rica	
Panamá	

No. Lote Fecha vencimiento
Importador
Dirección

CATEGORIA V COLOR VERDE

ANEXO 18

Annex 5.

Copy of Letter from Ceiba Geigy Indicating Pesticides and Registrations Being Withdrawn in Reregistration

Agricultural Division
CIBA-GEIGY Corporation
P.O. Box 18300
Greensboro, North Carolina 27419
Telephone 919 292 7100

CIBA-GEIGY

August 3, 1989

Dear Cooperator:

SUBJECT: IMPACT OF REREGISTRATION ON THE CONTINUED AVAILABILITY OF CIBA-GEIGY PRODUCTS

Back in May, I hurriedly sent out a list of CIBA-GEIGY products and uses that have been discontinued as a result of the EPA's procedure for reregistration. Needless to say, I have received numerous phone calls from recipients who were seeking more information on when these reregistration actions take effect. I apologize for not providing this so, therefore, I am writing you again to be more explicit. The list of CIBA-GEIGY products and uses that have been discontinued is enclosed. Some revisions have been made to this list since it was last issued.

For chlorobenzilate (Acaraben®), terbutryn (Igran®), propazine (Milogard®), diprepetryn (Sancap®), and chloroxuron (Tenoran®) - CIBA-GEIGY has voluntarily requested that EPA cancel all registered uses for these products. The Agency will, at some point in the future, propose to withdraw the currently established residue tolerances for all uses of these products. Customarily, EPA permits end-users of products to continue to use the products for their intended use until the supply is exhausted. Therefore, any end-user who currently holds an inventory of the above-listed products may continue to use the inventory for the foreseeable future. It is advised that users expeditiously deplete their inventories since withdrawal of current tolerances would make residues on crops treated with these products illegal. We would expect that EPA would provide a notice of at least six months prior to official withdrawal of the tolerances for these products. With respect to chloroxuron, EPA has provided CIBA-GEIGY with a notice of cancellation which clearly states that end-users may continue to use inventories that they may hold in accordance with label directions included on the packaging. For the other products, EPA has yet to provide an official notice of cancellation but it is expected that the Agency will also provide for users to deplete inventories in accordance with label directions.

CIBA-GEIGY has also asked for voluntary cancellation of chlordimeform products. In accordance with the terms of cancellation for this product, all use of the product must cease by October 1, 1989, irrespective of whether an end-user holds inventory after that date.

Occasionally, CIBA-GEIGY and other registrants will delete certain uses from a product while retaining other uses. It is entirely permissible for an end-user to use a material for a discontinued use for the foreseeable future provided the package from which the inventory is obtained bears the appropriate end-use directions for the site in question. Otherwise, the use would be considered a violation of FIFRA. It is important that users realize that the Agency will be withdrawing residue tolerances for discontinued products and uses at some point in the future. It is difficult to project with any degree of certainty exactly when this will occur. It is particularly important to be aware of this point because once the residue tolerances have been withdrawn, any commodity that has been treated, even though it may have been treated in accordance with the label of a previously registered product, could be considered in violation if it contains a residue of the pesticide in question.

If you have further questions, please give me a call at (919) 292-7100, extension 2171.

Sincerely yours,

John F. Ellis, Ph.D.
Director
Biological Research

JFE/sh/0502

Enclosure

CIBA-GEIGY Products/Uses That Have Been Discontinued as the Result of EPA Reregistration

Active Ingredient	Crops Dropped	Reason Why†
atrazine	perennial ryegrass	1,2,4
	orchardgrass	1,2,4
	pineapples	1,4
	proso millet	1,4
	rangeland	1,2,4
	bermudagrass (24c registrations)	1,2
chlordimeform (all uses)	cotton	1,4
chlorobenzilate (all uses)	grapefruit	1,4
	oranges	1,4
	lemons	1,4
	limes	1,4
	tangelos	1,4
	tangerines	1,4
	kumquats	1,4
chloroxuron (all uses)	onions	1,4
	strawberries	1,4
	soybeans	1,4
diazinon	asparagus	1
	citrus fruits	1,2
	dandelions	1
	olives	1
	coffee	1
	filberts	1
	figs	1
	pecans	1
	dried beans	1,2
	watercress	1
	dried peas	1
	alfalfa	2
	cotton	1,2
	peanuts	1
	clover	2
	cowpeas	2
	sorghum	2
	tobacco	1
	trefoil	2
	wheat	2
	lespedeza	2
	range grass	2
	bermudagrass	2
	grass forage	2
	field corn*	1,2
	caneberries (ex. in CA, OR, WA)	1
	walnuts (ex. in CA)	1
	almonds (ex. in CA)	1

*All uses dropped except seed treatment and aerial use of D·z·n® diazinon 14G.

Active Ingredient	Crops Dropped	Reason Why†
dipropetryn (all uses)	cotton	1,4
metolachlor	pod crops for dry and succulent varieties - 25G formulation only	1
phosphamidon	broccoli	1
	cantaloupes	1
	cauliflower	1
	cucumbers	1
	grapefruit	1
	lemons	1
	oranges	1
	peppers	1
	sugarcane	1
	tangerines	1
	tomatoes	1
	watermelons	1
propazine (all uses)	sorghum	1,4
simazine	drainage ditch banks	1,4
	cooling towers	1,4
	forage bermudagrass	1,4
	alfalfa	1,4
	grasses grown for seed	1,4
	tree plantations for timber	1,4
terbutryn (all uses)	winter wheat	1,4
	winter barley	1,4
	sorghum	1,4

NOTE: Field residue trials will not support any greenhouse use of diazinon. All current uses will be discontinued because of reasons number 1 and 4.

†Code for reason a product or use has been cancelled:
1. Cost of data development for reregistration not justified by sales.
2. ADI constraints.
3. Liability concerns.
4. Capacity to do the work to meet the EPA deadline.

Issued 7/25/89

L502sh0803JE

IR-4 RED ALERT

REREGISTRATION UPDATE NUMBER 6 - AUGUST, 1989

IR-4 PROJECT · COOK COLLEGE · NEW BRUNSWICK · NEW JERSEY 08903
201/932-9575

THIS ISSUE CONTAINS:

I. SURVEY OF CROPS DROPPED FROM PESTICIDE LABELS

In order to gain a better understanding of the impact of reregistration on food or feed uses of pesticides, IR-4 and the National Agricultural Chemicals Association (NACA) have surveyed the agricultural chemical industry regarding what food or feed crop uses from EPA's "List A" chemicals would be dropped because of the burden of data requirements for reregistration. Both surveys were conducted independently; IR-4 conducted the survey through phone contact with official IR-4 industry contacts for the agricultural chemical companies, where as the NACA survey involved a direct mailing to its membership. The responses from both surveys are presented here. Please note that status of these chemicals and their uses are always subject to change.

The trade names given are supplied with the understanding that no discrimination is intended and no endorsement is implied. In some instances, the same chemical may be sold under different trade names.

Annex 6.

List of Endangered Animal Species Known in Guatemala

Table A. Endandered or Threatened Species of Animals and Plants *in* Guatemala

Latin Name	English Name	Spanish Name
Meleagris ocellata (or Agriocharis ocellata)	Ocellated Turkey	Pavo de El Petén
Podilymbus gigas	Giant Grebe	Poc, or Pato Zambullidor
oreophasis derbianus	Horned Cuan	Pavo de Cacho
Pharomacrus mocinno	Quetzal	Quetzal
Pelecanus occidentalls	Brown Pelican	Pelicano Pardo
Burhinus bistriatus	Thick Knees	Peretete
Amazona albifrons	White-fronted Parrot	Loro
Harpya harpya	Harpy Eagle	Aguila Harpa
Falco peregrinus anatum	American Peregrine Falcon	Halcón Peregrinó
Falco peregrinus tundriusa	Arctic Peregrine Falcon	Halcón Peregrinó
Phynhptta sp.		Cotorra
Ara macao		Guacamaya
Colinus virgianus		Codorniz
Gyrtomix sp.		Cordorniz
Mycteria americana	Wood Stork	Garzón Pulido
Sterna antillarum	Least Tern	---
Grus americana		Grulla
Compehilus imperiales		Carpintero
Penelopina nigra		Chachalaca Negra
myrmecophaza tridactyla	Giant Anteater	Oso Hormiguero
Enyhdra nutris		Nutria marina
myrmecophaga tridactyla	Giant Anteater	Oso Hormiguero
Tapirus bairdii	Tapir	Danta
Felis onca	Jaguar	Tigre, Jaguar
Felis pardalis	Ocelot	Tigrina
Felis weidii	Margay	Tigrillo
Felis concolor	Puma	León, Puma
Felis vagouaroundi	Jaguarundi	Once, León Miguero
Trichechus manatus	Manatee	Manati
Odocoileus virginianus	White-tailed Deer	Venado
Manazana americana	Brocket Deer	Cabrito
Tamandua tetradactyla	Tamandua	Oso Colmenero
Ateles Geoffroyi	Spider Monkey	Mico
Alouatta villosa	Howler Monkey	Mono Zaraguate
Alouatta pigraa	Black Howler Monkey	---
Lutra annectens	Otter	Perro de agua
Crocodylus moreletti	Morelet's Crocodile	Lagarto del Petén
Crocodylus actus	American Crocodile	Lagarto
Alligatoridae sp.		Caimán de Anteojos
Chelonia mydas agazzisi	Pacific Green Turtle	Tortuga Verde
Dermatamys mawiib	Central American River	---
Bufo sp.	Toad	Sapo
Iguana rincophala	Iguana	Iguana
Helodema horridum	Gila Monster	Monstruo de Guila

(continued)

Latin Name	English Name	Spanish Name
Boa constrictor		Mazacuata
Lycaste virginalis	White Monk Orchid	Monja Blanca
Cattleya skinneri	Orchid	Candelaria
Abies guatemalensis	Guatemalan Fir	Pinabete
Magnolia guatemalensis	Guatemalan Magnolia	Magnolia
Englelharotia pterocarpa	---	Palo Colorado
Numenius borealisa	Eskimo Curlew	
Caimán crocodilusa	Spectacled caimán	
Eretmochelys imbricata	Hawksbill Turtle	
Lepidochelys imbricatac	Olive Ridley	
Lepidochelys kempiib	Kemp's Ridley Sea Turtle	
Caretta carettaa	Loggerhead Sea Turtle	
Dormochelys coriaceac	Leatherback	
Dalbergia stevensonii	Rosewood	Rosul

Sources: Nations and Komer (1984) and Landivar (1987)

a Considered threatened rather than endangered by ICU Conservation Monitoring Centre but not necessarily by othe sources cited here.

b Based on "Agreement on the International Commerce o Endangered Wild Fauna and Flora," International Union fo Conservation of Nature and Natural Resources, IUC Conservation Monitoring Centre; information provided b Defensores de la Naturaleza, Guatemala; and informatio provided by Elma Diaz, Director Guatemala National Par System.

c Central Scientific Databases, The Nature Conservancy.

La seria escasez de datos cuantitativos afecta adversamente la realización de un análisis integral del estado de la fauna de Guatemala. A pesar de que los estudios sobre vida silvestre no son nuevos en el país, los rápidos cambios que se han sucedido últimamente han hecho obsoletos la mayor parte de los datos disponibles y se nota una particular falta de estudios cuantitativos recientes. En la bibliografía se incluye una lista de referencias seleccionadas sobre la flora y fauna de Guatemala.

Varias listas de especies que se cree están en mayor peligro de extinción, han sido elaboradas de tiempo en tiempo por diferentes especialistas. Una de ellas, los apéndices del CITES (ver tabla 2.2.8), constituye quizá la opinión más calificada sobre evaluaciones científicas de la situación.

Varios son los factores que se han combinado y que amenazan o ponen en peligro una parte significativa de la fauna guatemalteca. Entre ellos, el factor más importante es la destrucción del habitat. La remoción de la vegetación nativa para habilitar nuevas tierras al cultivo, el pastoreo y los usos del suelo, urbanos, industriales y de transporte, han diezmado las especies nativas, causando un amplio efecto, directa o indirectamente, en casi todas ellas.

La caceria, incluyendo las actividades de subsistencia, deportivas y comerciales, ha jugado un papel importante en la reducción de las poblaciones de ciertas especies, particularmente de felinos y lagartos.

Aunque prohibido por la ley, el tráfico de pieles continúa y se cree que una parte significativa del mismo fluye de El Petén hacia México y Belice.

La introducción de especies exóticas no ha constituido un problema generalizado en Guatemala para un gran número de especies, pero si ha jugado un papel importante en la extinción de especies nativas en sitios localizados. La introducción de la lobina al lago de Atitlán trajo como consecuencia la extinción de especies nativas de peces y parece ser un factor que contribuyó a las dificultades endémicas para que la población de patos de Atitlán se recupere. Estimaciones actuales sitúan a la población sobreviviente en sólo 55 individuos [1] (Guillermo Zepeda, comunicación personal).

1 Comunicación personal con Guillermo Zepeda.

Tabla 2.2.8

Especies de Guatemala que aparecen en los Apendices del CITES.

Nombre Científico	Nombre Común	Nombre en Inglés
Mammalia		
Primates		
Alouatta vollosa	Mono aullador	Howler monkey
Ateles geoffreyi	Mono araña	Spider monkey
Ursidae		
Enhydra nutris	Nutria marina	
Felidae		
Felis concolor	Puma	Puma
Felis pardalis	Tigrillo	
Felis wiedii	Tigrillo	
Panthera onca	Jaguar	Jaguar
Perssodactyla		
Tapirus bairdii	Danta	Tapir
Avifauna		
Psicormes		
Compehilus imperiales	Carpintero	
Harpia spp.	Aguila	Harpy eagle
Galliformes		

Oreophasis derbianus	Guan o Pavo de Cacho	
Penelopina nigra	Chachalaca negra	
Phasionidae		
Colinus virgianus	Codorniz	
Gyrtomix sp.	Codorniz	
Gruiformes		
Grus americana	Grulla	
Trogoniforme		
Pharomachrus moccino	Quetzal	Resplendent quetzal
Podicipediforme s		
Polilybus gigas	Pok o Pato zambullidor	Atitlan grebe
Psitaciformes		
Phynhptta sp.	Cotorra	
Ara macao	Guacamaya	
Amphibia		
Salienata		
Bufo spp.	Sapo	Toad
Reptilia		
Crocodrylia		
Crocodylus moreleti	Lagarto	Moreletti's crocodile
Crocodylus acutus	Lagarto	American crocodile
Alligatoridae sp.	Caimán de anteojos	
Rhunchocephalin		
Iguana rincophala	Iguana	Iguana
Heloderma horridum	Monstruo de Guila	Gila monster
Serpentes		
Boa constrictor	Masacuata	

FUENTE: MAGA 1983. Guatemala, tomado de Apéndices del CITES.

2.2.4 Recursos Marinos, Costeros y Otros Cuerpos de Agua

2.2.4.1 Descripción de Zonas Marinas, Costeras y Cuerpos de Agua Dulce.

El litoral del Océano Pacífico tiene 254.7 Kms. de largo. La plataforma continental (que llega hasta 200 metros de profundidad) tiene 14,700 Kms. cuadrados.
El litoral del Océano Atlántico tiene 148.1 Kms. de largo. La plataforma continental (hacia 200 metros de profundidad) en el Atlántico es de 2,100 Kms. cuadrados.
Tanto en el Pacífico como en el Atlántico existen esteros que se caracterizan por sus manglares. Estos no son "comunidades biológicas" de 5 especies de árboles, sino más bien "sucesiones" de las 5 especies.
Estas tienen requisitos ambientales diferentes. El mangle rojo *Rhizophora mangle* es especie pionera que se establece en las parte más expuestas a las aguas del mar. A manera que se va elevando el suelo alrededor de las raíces de estos árboles, la exposición a la salinidad y a la circulación del agua, crea condiciones propicias para el mangle negro *Avicennia nitida* y *Avicennia bicolor;* éste a su vez crea condiciones favorables para el mangle blanco *Laguncularia racemosa.* En última instancia y en donde apenas llega el agua de mar, excepto en la marea alta, suele darse el botoncillo *Conocarpus erectus.* Las maderas de los distintos tipos de mangle son empleados para usos generales, especialmente de viviendas.
Los esteros son utilizados principalmente para la pesca. La pesca artesanal es numerosa y en ella se extraen peces, moluscos y crustáceos. Una gran cantidad de fauna utiliza los manglares como lugar de vida completo, y otras los usan como refugio temporal, sea de índole reproductiva, de reposo, o de transición. Los

Annex. 7

Pesticide Poisonings in Guatemala 1980-1988

EDIFICIO ETISA, PLAZUELA ESPAÑA, ZONA 9
ASOCIACION NACIONAL DEL CAFE
GUATEMALA, C. A.

Ref.: OFICIO-AS
No.: 007-89/90

Guatemala, noviembre 3 de 1989

Doctor
Charles R. Ward
Asesor de Pequeños Productores
Asociación Nacional del Café
Presente

Estimado Doctor Ward:

De manera atenta me permito enviar adjunto fotocopias de - los Datos Estadísticos de Intoxicación por Insecticidas de las Memorias de Labores de los años 1985, 1986, 1987 y 1988, del Instituto Guatemalteco de Seguridad Social (I.G.S.S), para su conocimiento y análisis correspondientes.

Agradeciendo su atención, me suscribo de usted su atento - y seguro servidor.

Atentamente,

ASOCIACION NACIONAL DEL CAFE

Dr. Mario E. Mazariegos M.
Director Médico

Adj.: Lo indicado
cc.: AS.
'lpgm.

EDIFICIO ETISA - PLAZUELA ESPAÑA, ZONA 9 - CABLES: ANACAFE TELEX 5915
TELEFONOS 367487 - 367180 - 367427 - 367531 - 367969 - 366121

1.4.3 Control de Intoxicaciones por Insecticidas

En los centros de actividad económica dedicados al cultivo del algodón, café y tabaco, fundamentalmente, el Instituto mantuvo permanente vigilancia a efecto de controlar, prevenir e intervenir medicamente en casos de intoxicaciones por insecticidas. En los Cuadros siguientes se presentan datos sobre casos de intoxicados durante el año 1985 y en los cinco años anteriores.

CASOS DE INTOXICACIONES REGISTRADOS EN 1985

Departamento	Leves	Moderadas	Graves	Muertes	TOTAL
TOTAL	485	264	32	15	796
San Marcos	97	56	8	2	163
Escuintla	78	48	4	1	131
Quetzaltenango	71	42	0	2	115
Chimaltenango	60	15	2	1	78
El Progreso	46	27	1	0	78
Suchitepéquez	21	32	6	2	61
Santa Rosa	45	10	2	0	57
Alta Verapaz	22	10	6	5	43
Retalhuleu	20	5	1	0	26
Izabal	12	9	0	0	21
Baja Verapaz	7	0	1	1	9
Zacapa	0	7	0	0	7
Guatemala	3	1	0	0	4
Sacatepéquez	1	1	1	0	3
Jutiapa	2	1	0	0	3
El Quiché	0	0	0	1	1

En los Departamentos de Chiquimula, Huehuetenango, Jalapa, Petén, Sololá y Totonicapán no se presentó ningún caso de intoxicación.

CASOS DE INTOXICACIONES POR INSECTICIDAS
AÑOS 1980 - 1985

GRADO	1980	1981	1982	1983	1984	1985
TOTAL	1 160 / 652	787 / 484	613 / 412	768 / 468	636 / 429	796 / 485
Leves	406	254	165	265	168	264
Moderadas	96	46	33	39	34	32
Graves	6	3	3	2	5	15
Muertes						

1.3.3 Control de Intoxicaciones por Insecticidas

En los centros de actividad económica dedicados al cultivo del algodón, café y tabaco, fundamentalmente, el Instituto mantuvo permanente vigilancia a efecto de controlar, prevenir e intervenir medicamente en casos de intoxicaciones por insecticidas. En los Cuadros siguientes se presentan datos sobre casos de intoxicados durante el año 1986 y en los cinco años anteriores.

CASOS DE INTOXICACIONES REGISTRADOS EN 1986

Departamento	Leves	Moderadas	Graves	Muertes	TOTAL
Total	384	210	19	7	620
San Marcos	104	33	5	3	145
Quetzaltenango	51	47	5	3	106
Suchitepéquez	38	50	2	0	90
Santa Rosa	54	20	2	0	76
El Progreso	35	25	1	0	61
Retalhuleu	40	10	2	0	52
Escuintla	34	13	0	1	48
Alta Verapaz	4	8	1	0	13
Izabal	10	1	0	0	11
Chimaltenango	6	2	1	0	9
Baja Verapaz	4	0	0	0	4
Guatemala	1	1	0	0	2
Jutiapa	2	0	0	0	2
Zacapa	1	0	0	0	1

En los Departamentos de Chiquimula, El Quiché, Huehuetenango, Jalapa, Petén, Sacatepéquez, Sololá y Totonicapán, no se presentó ningún caso de intoxicación.

CASOS DE INTOXICACIONES POR INSECTICIDAS

AÑOS 1981 - 1986

GRADO	1981	1982	1983	1984	1985	1986
TOTAL	787	613	768	636	796	620
Leves	484	412	462	429	485	384
Moderadas	254	165	265	168	264	210
Graves	46	33	39	34	32	19
Muertes	3	3	2	5	15	7

1.3.3 Control de intoxicaciones por Insecticidas

En la actividad económica agrícola, el Instituto mantuvo permanente vigilancia a efecto de controlar, prevenir e intervenir medicamente en casos de intoxicaciones por insecticidas. En los Cuadros siguientes se presentan datos sobre casos de intoxicados durante el año 1967 y en los cinco años anteriores.

CASOS DE INTOXICACIONES REGISTRADOS EN 1967

Departamento	Leves	Moderados	Graves	Muertes	TOTAL
Total	546	280	76	10	912
Quetzaltenango	104	43	43	3	193
San Marcos	127	35	5	1	168
Escuintla	69	46	10	1	126
Suchitepéquez	45	59	2	4	110
Santa Rosa	48	23	7	0	78
Retalhuleu	54	15	0	0	69
El Progreso	33	14	0	0	47
Izabal	16	21	3	0	40
Sololá	7	9	0	1	17
Alta Verapaz	13	0	0	0	13
Baja Verapaz	8	4	0	0	12
Chimaltenango	8	2	0	0	10
Sacatepéquez	4	1	5	0	10
Guatemala	2	5	1	0	8
Huehuetenango	6	0	0	0	6
Zacapa	1	3	0	0	4
Chiquimula	1	0	0	0	1

En los Departamentos de El Quiché, Jalapa, Jutiapa, Petén y Totonicapán, no se presentó ningún caso de intoxicación

CASOS DE INTOXICACIONES POR INSECTICIDAS
AÑOS 1982 - 1987

GRADO	1982	1983	1984	1985	1986	1987
TOTAL	613	708	636	735	626	912
Leves	412	462	429	485	384	546
Moderadas	165	265	168	204	210	280
Graves	33	39	34	32	19	76
Muertos	3	2	5	14	7	10

El incremento de intoxicados en 1987 es consecuencia del mayor uso de plaguicidas en la actividad agrícola, influyendo especialmente el pequeño empresario de quienes no ha sido posible el control por no estar inscritos al Régimen.

1.3.4 Cuerpo de Salvamento

Para preservar vidas de personas afiliadas y no afiliadas que durante los fines de semana, días festivos y asuetos largos del año concurren a playas y balnearios del país, el Instituto ha instituido y mantiene puestos de salvavidas con personal debidamente entrenado para labor de salvamento en los Departamentos de Guatemala, Escuintla, Retalhuleu, Sololá, Santa Rosa, Suchitepéquez, San Marcos y Chiquimula. El número de personas rescatadas en los últimos cinco años, son las siguientes:

AÑOS	1983	1984	1985	1986	1987
TOTAL	1 600	1 591	1 455	1 362	1 291
Afiliados	749	601	572	551	522
No afiliados	851	990	887	831	769

1.3 Seguridad e Higiene en el Trabajo y Prevención de Accidentes en General

En observancia de planes concretos de trabajo y en el afán de extender la cobertura de prevención de accidentes en más áreas del interior de la República, el Instituto durante el año 1988 continuó desarrollando sus programas preventivos a nivel nacional, contando para el efecto con el personal técnico y administrattivo indispensable. Para tal fin se realizaron las acciones siguientes:

1.3.1 Cursos de Adiestramiento y Conferencias

Con el propósito de preservar el buen nivel de salud de la mano de obra, la permanencia de las fuentes de trabajo, la seguridad económica de las empresas afiliadas al Régimen de Seguridad Social y el bienestar del trabajador, se dio importancia al factor educativo en la prevención de protección personal a través de la Escuela de Capacitación en Seguridad e Higiene.

Con la asistencia de 43 774 personas, se impartieron 1 858 cursos, pláticas y proyecciones de películas. Se efectuaron 329 demostraciones de equipos de seguridad.

1.3.2 Supervisión e Inspección

Con el fin de alertar a las empresas de diversas actividades económicas, sobre condiciones reales de seguridad con que cuentan o debieran contar, se puso énfasis en la inspección, contando con personal debidamente capacitados, resumiéndose estas acciones en las siguientes cifras; 3 669 inspecciones 879 comprobaciones y 846 investigaciones de accidentes.

1.3.3 Control de Intoxicaciones por Insecticidas

En la actividad económica agrícola, el Instituto mantuvo permanente vigilancia a efecto de controlar, prevenir e intervenir medicamente en casos de intoxicaciones por insecticidas. Dichas acciones se efectuaron especialmente en la costa suroccidental del país, las que consistieron en inspecciones de seguridad e higiene en las fincas de mayor riesgo, reuniones con patronos y con autoridades civiles y militares en los lugares de mayor incidencia de intoxicaciones. Por otro lado a través de la Comisión Interministerial de Plaguicidas, se logró la impresión del afiche "Primeros Auxilios y Tratamiento Médico para Intoxicaciones Agudas Causadas por Plaguicidas", el cual se distribuyó por todas las unidades médicas de la Institución, así como del Ministerio de Salud Pública y Asistencia Social.

En los Cuadros siguientes se presentan datos sobre casos de intoxicaciones durante el año 1988 y en los cinco años anteriores:

CASOS DE INTOXICACIONES REGISTRADOS EN 1988

Departamento	Leves	Moderadas	Graves	Muertes	TOTAL
Total	359	214	33	12	618
Quetzaltenango	23	24	4	1	52
San Marcos	103	51	10	6	170
Escuintla	76	24	3	3	106
Suchitepéquez	39	51	1	0	91
Santa Rosa	46	28	4	0	78
Retalhuleu	29	24	7	1	61
Izabal	15	1	1	0	17
Sololá	0	0	0	1	1
Alta Verapaz	16	2	0	0	18
Baja Verapaz	4	0	0	0	4
Chimaltenango	4	1	3	0	8
Sacatepéquez	0	3	0	0	3
Huehuetenango	2	0	0	0	2
Zacapa	1	5	0	0	6
Chiquimula	1	0	0	0	1

En los Departamentos de Guatemala, El Progreso, El Quiché, Jalapa, Jutiapa, Petén y Totonicapán, no se presentó ningún caso de intoxicación.

CASOS DE INTOXICACIONES POR INSECTICIDAS
AÑOS 1984 - 1988

GRADO	1984	1985	1986	1987	1988
TOTAL	636	726	620	912	618
Leves	429	485	384	546	103
Moderadas	168	264	210	280	51
Graves	34	32	19	76	10
Muertes	5	15	7	10	6

CASOS DE INTOXICACIONES POR INSECTICIDAS

AÑOS 1984 - 1988

GRADO	1984	1985	1986	1987	1988
TOTAL	636	726	620	912	618
Leves	429	485	384	546	359
Moderadas	168	264	210	280	214
Graves	34	32	19	76	33
Muertes	5	15	7	10	12

Annex 8.

Coffee Production Costs for Guatemala

COSTOS DE PRODUCCION DE 3.500 BOLSAS DE ALMACIGO A DOBLE POSTURA

FACTOR DE PRODUCCION	UNIDAD	NUMERO UNIDADES	VALOR UNIDAD	VALOR TOTAL
1. SEMILLEROS				
a. Mano de obra				
-Preparación del suelo (Desinfestación y desinfección)	Metros^2	7	Q. 1.00	Q. 14.00
-Cuidados culturales (sombra, cobertura, riego)	Jornales	5	4.50	22.50
		SUBTOTAL		36.50
2. ALMACIGOS				
a. Preparación de tierra	Metros^2	6	4.50	27.00
-Llenado de bolsas	Jornales	35	1.50	52.50
-Acondicionamiento, desinfestación y desinfección	Jornales	2	4.50	9.00
-Trasplante y siembra de sombra	Jornales	6	4.50	27.00
-Labores culturales y riego	Jornales	10	4.50	45.00
-Fertilización (5)	Jornales	2	4.50	9.00
-Control fitosanitario	Jornales	4	4.50	18.00
		SUBTOTAL		187.50
b. Insumos				
-Bolsas 7 X 12	Millar	4	30.00	120.00
-Fertilizantes 20-20-0	Quintal	1	33.00	33.00
-PCNB	Libra	3	8.00	24.00
-Furadan 5%	Libra	2	7.00	14.00
-Otros fungicidas	Libra	10	15.00	150.00
-Fertilizante foliar	Libra	8	4.00	32.00
-Semilla	Libra	7	8.00	56.00
		SUBTOTAL		429.00
		TOTAL		616.50
		IMPREVISTOS		61.65
		GRAN TOTAL		Q. 678.15

PLAN DE ACTIVIDADES
COSTOS PARA ESTABLECIMIENTO DE CAFETALES 1 MANZANA

A C T I V I D A D	C O M O R E A L I Z A R L A	UNIDAD	NUMERO DE UNIDADES	COSTO POR UNIDADES	COSTO TOTAL
	PRIMER AÑO				
A. MANO DE OBRA					
-Arrancado de planta y limpieza del terreno	Con machete, piochas y azadones	Jornales	30	Q. 4.50	Q. 180.00
-Trazo y estaquillado	En curvas de contorno	Jornales	12	4.50	54.10
-Ahoyado	Se harán 3,500 hoyos de 0.4X0.4X0.4 mts.	Hoyos	3,700	0.10	370.00
-Acarreo plantas en bolsa		Jornales	16	4.50	72.00
-Siembra	Siembra y fertilización con 2 onzas de fertilizante	Jornales	50	4.50	225.00
-Establecimiento de sombra	Poniendo 3 tipos de sombra: temporal, semi-permanente y permanente	Jornales	8	4.50	36.00
-Control de maleza	4 limpias anuales	Jornales	64	4.50	288.00
-Fertilización	2 amplicaciones más: 1 dos meses depsués de la siembra con 2 onzas de 20-20-0 y una final con 2 onzas de Urea	Jornales	8	4.50	36.00
-Control fitosanitario	Tres aplicaciones	Jornales	9	4.50	40.50
	SUBTOTAL				1.301.50
B. INSUMOS					
-Fertilizante	Compra 20-20-0,. Urea y triple super fosfato	quintal	12	33.00	396.00
-Benlate	Aplicaciones foliares	kilo	1	82.00	82.00
-Ferban	Aplicaciones foliares	libra	8	10.00	80.00
-Abono foliar	Aplicaciones foliares	libra	8	3.00	24.00
-Adherente	Aplicaciones foliares	litro	1	12.00	12.00
-Implementos	Machetes, piochas y azadores				50.00
-Equipo	Se calcula 1/10 de su valor				40.00
	SUBTOTAL				684.00
	TOTAL				1.985.50
	IMPREVISTOS				198.55
	GRAN TOTAL				Q.2.184.05

PLAN DE ACTIVIDADES
COSTOS PARA ESTABLECIMIENTO DE CAFETALES 1 MANZANA

A C T I V I D A D	C O M O R E A L I Z A R L A	UNIDAD	NUMERO DE UNIDADES	COSTO POR UNIDADES	COSTO TOTAL
	SEGUNDO AÑO				
A. MANO DE OBRA					
-Limpias	4 limpias al año	Jornales	64	Q. 4.50	Q. 288.00
-Fertilización	3 fertilizaciones	Jornales	18	4.50	81.00
-Ahoyado resiembra	175 hoyos de resiembra	Hoyos	0.10	1.75	17.50
-Siembra de resiembra	Se realizan al inicio de las lluvias	Jornales	3	4.50	13.50
-Manejo de sombra	Se eliminará la sombra temporal	Jornales	3	4.50	13.50
-Control fitosanitario	3 aplicaciones	Jornales	9	4.50	40.50
-Cosecha	De acuerdo a la época	Quintal	27	5.00	135.00
-Beneficiado		Quintal	6	5.50	39.00
	SUBTOTAL				628.00
B. INSUMOS					
-Fertilizante	Según análisis de suelo	Quintal	18	33.00	594.00
-Oxicloruro de cobre		libra	18	4.00	72.00
-Adherente		litro	:	12.00	12.00
-Insecticida		litro	1	36.48	36.48
-Fertilización foliar		libras	12	4.00	48.00
-Equipo	1/10 de su valor				40.00
	SUBTOTAL				802.48
	TOTAL				1,430.48
	IMPREVISTOS				143.05
	GRAN TOTAL				Q.1,573.53

PLAN DE ACTIVIDADES
COSTOS PARA ESTABLECIMIENTO DE CAFETALES 1 MANZANA

A C T I V I D A D	C O M O R E A L I Z A R L A	UNIDAD	NUMERO DE UNIDADES	COSTO POR UNIDADES	COSTO TOTAL
	TERCER AÑO				
A. MANO DE OBRA					
-Limpias	3 manuales al año	Jornales	48	Q. 4.50	Q. 216.00
-Fertilización	3 aplicaciones	Jornales	18	4.50	81.00
-Manejo sombra	Formación de sombra semipermanente	Jornales	6	4.50	27.00
-Control fitosanitario	3 aplicaciones al año	Jornales	9	4.50	40.50
-Cosecha	De acuerdo a la época	Quintal	72	5.00	360.00
-Beneficiado		Quintal	16	6.50	104.00
	SUBTOTAL				828.50
B. INSUMOS					
-Fertilización	Según muestreo	Quintal	18	33.00	594.00
-Oxicloruro		Libras	18	4.00	[illegible]
-Insecticida		Litros	1	36.48	36.48
-Adherente		Litros	1	12.00	12.00
-Abono foliar		Libras	12	4.00	48.00
-Equipo	1/10 de su valor				40.00
	SUBTOTAL				802.48
	TOTAL				1,630.98
	IMPREVISTOS				163.10
	GRAN TOTAL				Q.1,794.08

PLAN DE ACTIVIDADES
COSTOS PARA ESTABLECIMIENTO DE CAFETALES 1 MANZANA

A C T I V I D A D	C O M O R E A L I Z A R L A	UNIDAD	NUMERO DE UNIDADES	COSTO POR UNIDADES	COSTO TOTAL
	CUARTO AÑO				
A. MANO DE OBRA					
-Limpias	3 al año	Jornales	48	Q. 4.50	Q. 216.00
-Fertilización	3 al año	Jornales	18	4.50	81.00
-Manejo de sombra	Al inicio de lluvias	Jornales	5	4.50	22.50
-Control fitosanitario	3 al año	Jornales	9	4.50	40.50
-Cosecha		Quintal	144	5.00	720.00
-Beneficiado		Quintal	32	6.50	208.00
	SUBTOTAL				1,288.00
B. INSUMOS					
-Fertilizante		Quintal	18	33.00	594.00
-Adherente		Libra	18	4.00	72.00
-Abono foliar		Litro	1	12.00	12.00
-Thiodan		Libra	12	4.00	48.00
-Otros insecticidas		Litro	1.5	20.00	30.00
-Equipo	1/10 de su valor	Litro	1	36.48	36.48
					40.00
	SUBTOTAL				832.48
	TOTAL				2.120.48
	IMPREVISTOS				212.05
	GRAN TOTAL				Q.2.332.53

PLAN DE ACTIVIDADES
COSTOS PARA ESTABLECIMIENTO DE CAFETALES I MANZANA

A C T I V I D A D	C O M O R E A L I Z A R L A	UNIDAD	NUMERO DE UNIDADES	COSTO POR UNIDADES	COSTO TOTAL
	QUINTO AÑO				
A. MANO DE OBRA					
-Limpias	3 al año	Jornales	48	Q. 4.50	Q. 216.00
-Fertilización	3 al año	Jornales	18	4.50	81.00
-Manejo sombra	Antes de inicio de lluvias	Jornales	5	4.50	22.50
-Control fitosanitario	3 al año	Jornales	9	4.50	40.50
-Cosecha		Quintal	112.50	5.00	562.50
-Beneficiado		Quintal	25	6.50	162.50
	SUBTOTAL				1,085.00
B. INSUMOS					
-Fertilizantes		Quintal	18	33.00	594.00
-Oxicloruro		Libra	18	4.00	72.00
-Adherente		Litro	1	12.00	12.00
-Thiodan		Litro	1.5	20.00	30.00
-Otros insecticidas		Litro	1	36.48	36.48
-Abono foliar		Libra	12	4.00	48.00
-Equipo	1/10 de su valor				40.00
	SUBTOTAL				832.48
	TOTAL				1,917.48
	IMPREVISTOS				191.75
	GRAN TOTAL				Q.2,109.23