Environmental Assessment
Natural Rubber Project
Departments of Putumayo and Caquetá
Colombia

Thomas Black Arbeláez, Luis Fernando Castro Hernandez, et al.
Andean Center for Economics in the Environment (CAEMA)

Contract Number 527-C-00-01-00091-00
Colombia Alternative Development Project

Chemonics International Inc.
1133 20th Street, NW
Washington, DC 20036
Telephone (202) 955-3300
Fax: (202) 955-7540

November 2003

ANDEAN CENTER FOR ECONOMICS IN THE ENVIRONMENT (CENTRO ANDINO PARA LA ECONOMÍA EN EL MEDIO AMBIENTE) – CAEMA

Environmental Assessment
Natural Rubber Project
Departments of Putumayo and Caquetá
Colombia

Bogotá, D.C., November 2003

TABLE OF CONTENTS

SECTION 1 SUMMARY

1.1 INTRODUCTION

Among the different components of the Colombia Alternative Development Project, one is the Management and Improvement of Natural Resources and the Environment. Working towards this goal USAID and the Government of Colombia are looking at ways to implement programs for alternative crop development that can adapt with little or minimum impact on the environment.

In order to assess the potential environmental impacts generated during the development of the project, Chemonics hired CAEMA to conduct an Environmental Assessment of the project for the Alternative Development of Natural Rubber farming in the Departments of Caquetá and Putumayo. The potential impacts will be counteracted by the Environmental Management Plan (EMP) presented in following chapters, whereby each identified negative effect has its appropriate measure designed and costed.

The Environmental Management Plan defines management actions to be undertaken by companies responsible for the operation of rubber projects in Caquetá and Putumayo, that should be carried out to assure compliance with environmental requirements. In addition to actions directly related to the EMP, this document includes other key elements for management and decision-making, such as: environmental control, follow-up and monitoring plan, - a proposal for the institutional strengthening for environmental management of ASOHECA and the FUNDACIÓN FUTURO AMBIENTAL (both the project's operators), - the executive summaries of documents containing the environmental diagnosis and impact assessment process, - a guide for using the document,- the schedule of activities and, the EMP budget.

1.2 OBJECTIVES

The main objective of this document is to analyse the physical, biotic and socio-economic aspects in the areas of influence of the project (direct and indirect), for the purpose of identifying and assessing the impact of its implementation and operation. The study will establish the relevant environmental management and monitoring measures that will guarantee the sustainable development of the project both during its process as well as after it is finalized with USAID funds. This study has the ultimate goal of supplying the people in charge of decision making with a complete exposition of the consequences of the implementation and management of the productive characteristics of farming rubber and their repercussions on the environment.

1.3 PROJECT DESCRIPTION

1.3.1 Location

The municipalities in which the project is active are under the same amazonic ecosystem, but divided in two administrative sections called Departments: Putumayo and Caquetá. In Putumayo the municipalities that will benefit from the project are Mocoa, Villa Garzón, Puerto Guzmán and Puerto Caicedo with a planned 1000 hectares to be planted. In Caquetá the municipalities benefiting are Solita, Valparaíso, Curillo, San José del Fragua y Albania with a planned 1500 hectares to be planted.

The agricultural production scheme is divided between single crop extensions and agroforestry arrangements that include pepper, plantains and wood species.

1.3.2 Project Activities

Nurseries

The size of the rubber plantations demand that a nursery be built both to produce the amounts of vegetal material required and the appropriate clones be introduced to the area. These clones already have a 10 year existence in the region. Nonetheless, these activities require controlling actions that allow for the best productive results without any harm to the environment.

Farming

Development of cultivation entails the following activities:

Tracing: Is achieved with the help of a cord or rope, marking the rows in the opposite direction of the slope if there are any.

Ahoyado or hole making: Is done with tools such as plainest, augers and shovels. The material (soil) that results from this activity is piled next to the hole to be reused in transplant after being mixed with organic matter, (gallinaza, or chicken manure) in a proportion of 2 kg per hole.

Once the plant material reaches a height from 80 to 90 centimeters it is taken to the parcel to be planted in its final site.

The crop begins production between the ages of 18 to 24 months depending on the weather, especially the temperature.

Harvesting begins when the tree is sliced to bleed the rubber it contains, allowing for dripping in containers that are later taken to the processing site to purify.

Demand of natural resources

Water Resources
Being the tropical rain forest where the crops will develop, an excess of water is frequent and the land requires adequate drains; no other water sources are required.

Vegetative Resource - Biomass

Rubber trees are endemic of the Amazon ecosystem and have historically been a productive part of both Department's incomes. The farming density presents itself as a forest of rubber trees, helping maintain the soil conditions and natural tropical environment.

Soil resources

Rubber is not very demanding in regard to soil as long as it is deep, adequately fertile and well drained. Very heavy soils with low permeability are undesirable because they facilitate fusiarosis, or the putrefaction of the root neck.

Current environmental description

Definition of the area of influence

The Indirect area of influence includes the areas with illegal crops that are the main objective of project in its social component. The indirect area encompasses the larger municipal boundaries, as a whole geo-administrative region. The Direct Influence Area is delimitated by the plantation boundaries and a 100 meter perimeter margin and including the waterways that receive the drainage.

Geology and geomorphology

The municipalities of the project are located in a Northeast-Southwest, (NE-SW), morphostructural unit along the Putumayo river valley which is surrounded by the deep tropical rainforest ecosystem. The entire region is formed by a nucleus of Precambric and Paleozoic rocks above which there is a dense Mezzo-Paleozoic sedimentary sequence originated in platform and continental marine environments (Cenozoic). Regarding geomorphology, the slopes range between 0% and 5% in flat areas and 5% to 15% in the more abrupt zones.

Climate

The area of the study has a predominantly humid and very humid tropical climate. The average annual temperature ranges between 35° C in the lowest areas and 25° C in the highest. Precipitation averages between 800 mm and 3,000 mm with two rainy seasons that extend from March through May and October to December, and two dry seasons in between. The average values of relative humidity vary between 65% in the dry seasons and 105% in the more rainy months.

Hydrology

The municipalities involved in the agricultural project are located within the great hydrological valley of the Putumayo river. The waterways and valleys close to the plantations are located mainly inland from rivers, since these at times do overflow and could cause hazardous situations. All the streams come from Andean mountain causeways with slopes equal or greater than 20%. In general, the waters of the analysed streams present no problems related to the presence of organic matter, nitrogen or phosphorus compounds.

Soils

According to lab tests done on several parcels of the project, the soils are generally loam sandy, pH between 5.6 and 6.5, of medium deficiency in organic matter, nitrogen, phosphorus, boron and the ion ammonium. They have medium contents of potassium, magnesium, copper and zinc, medium contents of sodium, calcium and magnesium, and high to excessive contents of iron and aluminum in some cases. The alluvial valleys receive nutrients from the overflows and decomposition of the tropical forest; however as the forest has been disappearing the nutrients have also decreased.

Biotic component

Bioclimatically, the area where Rubber is being cultivated corresponds to the formation humid to very humid tropical forest. The original native vegetation of these formations has been substantially altered by man for extensive stock rising, as well as an agriculture based on staple foods; illicit crops abound. The most common characteristics of the vegetation found in the area destined for the plantations are the predominance of pastures since tree and brush vegetative cover have been disappearing.

Due to the density of forest masses, the native fauna is important at a regional level, (near streams and rivers); it can go into the plantation area and remain there because of the depth of the tropical forest. However, human presence has considerably affected the sighting of wildlife.

Social component

Farmers are mostly of mestizo origin, resulting from the mixture between the white population and the indigenous ethnical groups. Education level is low among the farmers, with 16.3% of the surveyed population having finished primary education, 6.8% with a complete secondary schooling and 1% with access to technical schools. Access to health services have a low coverage, since only 28.60% is adhered to some healthcare entity.

Regarding domiciliary services, telephone coverage and quality are critical because people have no other communication systems. Sewerage options are minimal since, the survey indicates, 15.4% of homes have no installations, the main alternative is open ground. Electric power supply and access to potable water are less critical; 60% of homes have access to drinkingwater, the rest of the population has water but it is at risk of contamination because they use only boiling as a purification measure.

Housing conditions are characterized by the predominance of "bahareque" or pressed mud as a construction material, along with cement floors and zinc roofs. This problem becomes critical if more than one family inhabits the house.

The most important economic activity is agriculture, represented by small plots with corn, plantain, yucca and vegetables as a self-sustenance alternative. Raising poultry and pigs is also common.

Given that the direct area of influence does not portray to have significant environmental impacts, as shows the chapters that follow, and that the control of pesticides will be strict (i.e. PERSUAP recommendations in place), it is expected that the indirect area will not receive impacts that require environmental corrective measures. The direct area of influence will count with the Environmental Management, Follow-up and Administrative Plans to detain potential negative impacts.

1.3.3 Environmental Alternatives Analysis

There are three alternatives from the viewpoint of the environment and the possibilities offered by the project with respect to the proposed actions, which are:

That the alternative rubber development project not be carried out as a viable option for the substitution of illicit crops
That the project be implemented without an Environmental Management Plan
That the project be developed in parallel with an Environmental Management Plan

Each one of these alternatives implies a different future, environmentally characterized by specific circumstances, the most important of which are indicated below.

The basic alternatives require an assessment, for which it is possible to choose a scale using the following criteria:

- Character: Positive, (Beneficial), or Negative, (Adverse), according to the type of consequences that can be derived in absence of the measure.
- Incidence: It is related to the way in which an action of the EMP, developed or not, acts over the resource through the identified impact. It has been valued as High, Medium, or Low.
- Duration : It relates to the time between the application or not of the measure, and the moment in which the effects can appear on the resource, be them adverse or beneficial. This parameter has been valued for three types of periods: Long term, (if greater than three years), Medium term, (if it is between 1 and 3 years), and Low term, (if it is below 1 year).
- Scope : Determines if the action concerns the direct area of the project (local), or if it encompasses a larger or regional space (indirect).

The scale is defined to allow subjective grading according to the criteria of analysts, employees or management, and is based on the following table:

Scale for quantifying the conditions of the different alternatives analysed

CRITERIA FOR CLASSIFICATION	QUALITATIVE VALUATION	QUANTITATIVE VALUATION
Character of Impact	Positive	+
	Negative	-
Incidence	High	3.0
	Medium	2.0
	Low	1.0
Duration	Short	1.5
	Medium	1.0
	Large	0.5
Scope	Local	0.40
	Extensive	0.60

The gradings were made by specialists participating in the study through meetings where they established the scales for evaluating the future conditions of the project according to the different environmental resources affected in each one of the alternatives described. For each alternative, the assessment results from the addition of the qualifications of the different impacts, to obtain the corresponding measure of environmental quality (EC in Spanish), as follows:

(1) $$EC = C + I + D + S$$

Once the EC values are calculated for each alternative, the value of the future EC is computed by adding these qualifications with those obtained for the present condition of the project, as indicated by equations (2) and (3). In order to establish the relation between values of Environmental Qualification and Environmental Alteration levels, the same range of values of EA were used, which can be related both for positive and negative impacts by entering the amounts of EC as absolute values.

(2) ECfuture = ECpresent + ECwith EMP

(3) ECfuture = ECpresent + ECwithout EMP

According to Asoheca and based on a study it is conducting on its own initiative, by mid-2003 the eradication of just 380 hectares of coca, as part of the substitution project, had meant for the flora, fauna, soil, waters and human health, the elimination of the use of 4,500 kg of solid fertilizers and 9,100 liters of liquid fertilizers. 13,700 liters of category I and II insecticides, with high and medium toxicity, have been removed from the Amazon region. 4,500 kg of category III fungicides and 6,830 liters of category I and II herbicides will no longer be used. 41 tons of solid wastes (per crop), consisting of a mixture of coca leaves with gasoline, cement, sulfuric acid and sodium bicarbonate, equivalent to 15,654 tons/year will not be generated. These wastes generally end up in the reservoirs and bodies of water. Moreover, just this fraction of the project has enabled the removal from the illegal market and from the environment a total of 4,174 50kg bags of cement, approximately 280,000 gallons of gasoline and a similar figure for solvents and chemical precursors. Extrapolating these figures and comparing them against a total of 1,250 has: 750 has and 500 has to be substituted in Caquetá and Putumayo, respectively, we can infer an increase in these figures and benefits by up to 300%.

In any event, the project suggests new forms of intervention and relationships with the environment, which deserve to be strengthened, when they intervene positively and are managed through preventive, corrective or mitigative measures, in the case of negative impacts.

The predictive assessment for the two regions assessed, as well as the result of the environmental rating, reported a very small number of negative impacts with a very high (VH) rating. Most impacts assessed reported medium (M), low (L) and very low (VL) values.

The ENVIRONMENTAL ASPECTS and IMPACTS requiring special management in order to ensure a clean and environmentally-friendly rubber project, and in respect of which the Environmental Management Plan presents concrete alternatives.

Although the second alternative is possible, the third alternative is best, mainly for reasons of sustainability and viable legal actions that can be taken not only by project

officials, but the communities themselves, going astray from illegality and chemicals, back to legality and a cleaner more integrated management of the environment. The application of the EMP will rebound in better crops, higher incomes, healthier children and a safer more environmentally sound Amazon basin. This is why alternative 3 has been chosen.

1.4 IDENTIFICATION OF ENVIRONMENTAL IMPACTS

1.4.1 Methodology

The methodology followed for identifying environmental impacts is based on a matrix, (Leopold Type), which contains the altered environmental factors and correlates them with every phase of the project`s activities; this represents the impact identification matrix for the project. The impact could be adverse when the project activity alters the natural resource negatively, but it can be positive if it impacts the resource to its favour. For the Environmental Assessment it is necessary to grade impacts and obtain a numerical value that allows qualification and hence ranking of impacts, the criteria used to obtain such numbers were:

- Nature of the impact,
- Type of Impact,
- Duration,
- Scope,
- Tendency,
- Synergy,
- Probability of occurrence,
- Magnitude.

The following tables show the type of matrix constructed to obtain the grading results for each potential impact.

Table 1. Summary of rating and environmental significance of the elements in the department of the Putumayo

ENFAENAS	SOCIAL		SOIL		AIR		WATER		BIO DIVERSITY		TOTAL BY PHASE	
	ER	ES	ER	ES	ER	ES	ER	ES	ER	ES	ER	ES
Processing phase	8.6	VH	4.5	M	-	-	5.2	M	-	-	6.1	H
Plantation production phase	8.4	VH	5.0	M	6.5	H	4.6	M	4.8	M	5.9	M
Plant material production phase	5.7	M	2.3	L	2.2	L	1.5	VL	0.9	VL	2.5	L
Average	**7.6**	**H**	**3.9**	**L**	**4.3**	**M**	**3.8**	**L**	**2.9**	**L**	**4.8**	**M**

Table 2. Summary of the score and environmental importance of the elements in the department of Caquetá

ENFAENAS	SOCIAL		AIR		SOIL		WATER		BIO DIVERSITY		TOTAL BY PHASE	
	ER	ES	ER	ES	ER	ES	ER	ES	ER	ES		
PLANTATION PRODUCTION PHASE	8,6	VH	6,9	H	5,5	M	4,8	M	5,9	M	6,3	H
PROCESSING PHASE	5,0	M	-	-	3,4	M	4,0	L	-	-	4,1	M
PLANT MATERIAL PRODUCTION PHASE	5,6	M	2,0	L	2,2	L	1,4	VL	0,9	VL	2,4	L
Average	**6,4**	**H**	**4,5**	**M**	**3.7**	**L**	**3.4**	**L**	**3.4**	**L**	**4.3**	**M**

Both these tables present a set of results that will be highlighted in the following section.

1.4.2 Results

The result of the environmental identification and rating for the project in Caquetá, shows the plantation production phase as the environmental aspect (ENAS) of greatest incidence on the different environmental factors; then comes the non-industrial processing phase, followed by the nursery activities. The detailed assessment within each one of these components can be found in the extended matrixes contained below. The positive social impacts associated changes in the perceived well-being, improvement of cultural aspects, family dynamics, institutional presence, employment generation, education, health, food security and other socio-economic events.

The EA for Putumayo underscores the processing phase as the environmental aspect (ENAS) with greatest incidence on the various environmental factors. This situation occurs mainly on account of the impacts generated by the nonindustrial process, from the social point of view (generation of employment, health, education, social welfare, among others), most of them positive and of high environmental significance. Moreover, in this same phase, the generation of liquid and solid wastes on the soil and water elements was assessed as a negative impact of medium environmental significance. At a second level, with respect to the results of the environmental rating, the plantation production phase was assessed as of medium significance, given that, the social, water, and biodiversity elements present lower scores with respect to the processing phase. This is explained basically by the extension and great volume of specific activities related to the plantation production phase (site preparation, agrochemical management and cultural crop maintenance tasks)

With respect to the environmental factors capable of receiving impacts (ENFA's), the social element stands out on average as that with the highest positive environmental rating. Aspects such as the change in the welfare received, improvement of cultural aspects, family dynamics, institutional presence, employment generation, education,

health, securing of food and other socio-economic consequences. However, in the production and processing phases these are strongly affected, reason why the EMP directs its main attention there. The plant production phase stands out as that with the lowest rating, despite the volume of activities developed therein.

1.5 ENVIRONMENTAL ASSESSMENT MATRIX

1.5.1 Methodology

The environmental assessment is made considering the rubber project's conditions, together with the other ecological and environmental aspects in both Departments, under criteria of geographical location, climate, water resources, service infrastructure, productivity and land aptitude. The values related to quality and quantity of effects, are established by means of environmental quality parameters, and rated through environmental qualification indicators, (EQ).

1.5.2 Method for Calculation

The addition according to equation (1) applied to the impact of generation of gases due to operation of equipment, (2), landslides in sloping zones, (10), and provision of technical assistance, (40), due to project activities are quantified as in the following table:

Example of Quantification of Identified Impacts

IDENTIFIED IMPACTS		PROJECT WITH EMP								PROJECT WITHOUT EMP								ENVIRONMENTAL QUALIFICATION EC	
		INCIDENCE			DURATION			SCOPE		INCIDENCE			DURATION			SCOPE		WITH EMP	WITHOUT EMP
		3.0	2.0	1.0	0.5	1.0	1.5	0.4	0.6	3.0	2.0	1.0	0.5	1.0	1.5	0.4	0.6		
Generation of gases due to operation of equipment (1)	2			1.0		1.0		0.4				-1.0			-1.5	-0.4		2.4	-2.9
Landslides in sloping zones (2)	10		2.0			1.0		0.4			-2.0				-1.5	-0.4		3.4	-3.9
Provision of Technical Assistance (3)	40		2.0			1.0		0.4		-3.0					-1.5	-0.4		3.4	-4.9

1.5.3 Results

Table 3. Main environmental impacts in the rubber projects of Putumayo and Caquetá

ENVIRONMENTAL ASPECTS	POTENTIAL ENVIRONMENTAL IMPACTS
1- Discharge of industrial wastewater at the latex processing plant, projected for Caquetá	Water and soil contamination
2- Discharge of wastewater from the nonindustrial processing of latex in Caquetá and Putumayo	Water and soil contamination
3- Management, storage and application of agrochemicals	Health risks, soil and water contamination.
4- Solid waste generation	Soil and water contamination
5- Preparation of soils for planting	Loss of topsoil, water contamination
6- Beneficiary property selection policies	Destruction of certain secondary forest strips for rubber planting
7- Generation of excreta, household sewage and wastewater from the nonindustrial processing of latex	Risks of diseases related to the oral - fecal cycle
8- Utilization of the Amazonian foothills	Loss or changes in the quality of the flora and fauna

The EMP consists of the design and pre-dimensioning of a total of 36 actions to be conducted, broken down as follows: twenty-two (22) preventive measures, ten (10) mitigative measures and four (4) corrective measures.

The most serious impacts, which require special emphasis by the environmental management plan in both departments, are summarized as follows:

- -Soil and water courses affected by land preparation and leveling
- -Water contamination due to non-industrial and industrial processing of latex
- -Risk of soil and water contamination and [negative] human health effects due to the storage, handling and application of agrochemicals. Includes the handling of solid and liquid waste.
- -Deficient basic sanitation infrastructure
- -Distrust of the means used to market the products of associated crops such as plantain.

1.5.4 Final Results

The summary of the assessment is as follows:

AFFECTED ENVIRONMENTAL RESOURCE	PRESENT CONDITION	ALTERNATIVE WITH EMP	ALTERNATIVE WITHOUT EMP
Soil	-0.86	1.7	-4.0
Water	-2.76	0.2	-5.7
Air	-2.62	0.3	-5.7
Flora	-2.94	-0.1	-6.4
Fauna	-1.96	0.1	-5.1
Social	4.18	7.9	0.4

According to the previous table, the environmental resource that is most affected by the actions of the project without the EMP measures is flora (-6.4), and even with the measures in place, the resource is not totally recuperated, particularly considering the impacts generated by activities like cleaning of the land and construction of stakes. The resources that follow in alteration are water and air (-5.7), particularly due to the deterioration of water quality from seedling preparations, drainage and application of agrochemicals; in the soil due to application of chemicals the number rendered is (-4.0). Fauna has a total effect of (–5.1) mostly due to the risk of chemicals and disappearance of natural ecosystems, as well as the continuous movement of workers.

Impacts produced on the social component have the least grading when the actions in the EMP are not put to action, due to the very nature of the project, which seeks to mitigate a social problem with the substitution of illicit cultivation through an agricultural activity that allows for the subsistence of the community and an improvement in their living conditions, an objective that can easily been

reached even without the implementation of an EMP. All the same, it is evident that the benefits of the EMP (7.9) are in this aspect of greater impact, since they constitute a tool to ensure sustainability of natural resources and their continued exploitability towards the future.

An important impact, as shown above, is the potential for natural deterioration due to the use of agrochemicals, especially pesticides. Regulation 216 requires that a PERSUAP be carried out for each chemical used, or to possibly be used; as a follow through, an Integrated Pest Management Plan (IPM) was incorporated for each chemical, so that natural, non-chemical means of pest control can be viable alternatives for the farmers. Due to the fact that the pesticide analysis is a full chapter, a summary is presented below that defines some of the main objectives, however the IPM alternatives will not be discussed here, but can be found in the PERSUAP section of this study.

- Products not registered in the US and Colombia or in PIC[1] list. NOT TO BE USED UNDER ANY CIRCUMSTANCE: captafol, isazofol, methyl parathion and methamidophos.

- Products not yet registered in the US or Colombia. Although a microbial product, the first, and a plant extract, the second, they are NOT TO BE USED UNTIL REGISTERED in at least Colombia: *Baculovirus spodopterae* and *Swingla* (extracts).

- Products not registered in Colombia. NOT TO BE USED UNDER ANY CIRCUMSTANCE: endosulfan.

- Products not registered with USEPA. NOT TO BE USED UNDER ANY CIRCUMSTANCE: benzimidazole, hexaconazole, kasugamicine, monocrotophos, and ofurace.

- Products not registered w/USEPA. But registered in Colombia. APPROVED TO BE USED: extracts of *Glyricidia sepium*, because the resource (*Glyricidia*), the crop (vanilla) and the pest (*Cylsia*), are not present in the US; *Paecilomices liacinus*, because the (Rubber) and the pest (*Leptopharsa*) are not present in the US and the pesticide is a microbial insecticide with unlikely environmental or health impact; and *Trichogramma pretiosum* and *Verticillium lecanii*, are both microbial insecticides with unlikely environmental or health impact.

- Products are RUP with USEPA. NOT TO BE USED: aldicarb, cyalothrine (lambda) cyfluthrin, chlorothalonil, chlorpyrifos, copper oxychloride, cypermethrine, methomyl, paraquat, profenofos

- Products are RUP[2] with USEPA. USE ONLY CERTAIN FORMULATIONS to reduce health or environmental risk: carbofuran (pellets/tablet), and picloram (Tordon 101R).

[1] 'PIC List' is the Prior Informed Consent List of the Rotterdam Convention, led by UNEP and FAO, that applies to the international shipment of the most hazardous chemicals.
[2] RUP: Restricted Use Pesticide.

The timeline for the implementation of these recommendations is given below.

Summary of the Pesticides to Phase Out of CAD

To be Phased Out Immediately:			**To be Phased Out in 6-12 Months**		
Technical Name	Trade Name	Uses	Technical Name	Trade Name	Uses
Monocrotophos	Azodrin	Rubber	Benzimidazole	Benomyl+	Requested by operators
Methamidophos	Tamaron	Various crops	Captafol	Difolatan	Cassava
Aldicarb	Temik	Potato	Cyfluthrin	Bulldock	Requested by operators
Isazofos	Miral	Potato	Hexaconazole	Anvil	Requested by operators
Methyl-parathion	Methyl-parathion, etc.	Rice	Methomyl	Lannate	Requested by operators
Paraquat	Gramoxone	Various crops	Kasugamicine	Kasumin	Potato

To be phased out in 12-18 months			**To be phased out in 6-12 months**		
Technical Name	**Trade Name**	**Uses**	**Technical Name**	**Trade Name**	**Uses**
Carbofuran	Furadan	Cassava,Rubber, Plantain, Nurseries	Ofurace	Grolan	Requested by operators
Copper oxychloride	Agrotox	Cassava	Cyalothrine, lambda	Karate, Terminex	Potato
Chlorpyrifos	Lorsban	Plantain, Oil Palm, Cassava, Rubber, Forest Plantations	Cypermethrine	Saat Pop, Agroper, Cipermetrina	Rice
Profenofos	Curacron	Rubber	----------	----------	----------
Chlorothalonil	Bravo	Rubber	----------	----------	----------

For most of the impacts identified, described and rated the solution consists of preventive measures. A mitigation infrastructure required in only a few cases, such as the use of water and liquid discharges. All in all, a general plan must be set in place to undermine the negative impacts and boost the positive ones; this is the Environmental Management Plan proposed in its own section.

1.6 ENVIRONMENTAL MANAGEMENT PLAN

1.6.1 Environmental Guidelines

The Environmental Management Plan, EMP, contains programs and measures related to specific factors that may generate environmental effects, as well as mitigation measures to minimize the impacts, and strategies to carry out the monitoring of the activities. Each one of the measures is defined by: type, objectives, impacts to control, spatial coverage and location, designs, description of the measure(s), schedule, and costs.

The measures established within the EMP that must be executed throughout the development of the project, according to the results of the matrix assessment, are:

Table 4. Summary of EMP Action to be Undertaken for Both Departments

Guide-line	ACTION TO BE TAKEN
1P	Design specific and mandatory routes for the transport of materials, supplies and products such as latex and others associated with it.
2P	Define agrochemical management, storage and processing areas, using 100% of the solutions prepared, and organize them within an Integrated Pest and Disease Management (IPDM) plan.
3P	Study to characterize and classify solid and liquid discharges.
4P	Implementation and permanent monitoring of an Integrated Pest and Disease Management - IPDM - System.
11P	Education of personnel and beneficiary associates in techniques for the rational use of water.
12P	Education in solid waste management and final disposal techniques
13P	Study to minimize liquid and solid wastes from the nonindustrial latex processing phase and implementation of results
16P	Encourage biological corridors through the identification of strips allocated to the protection of water sources and demarcation of farms
17P	Conduct environmental education workshops with emphasis on the prevention of impacts of the plantation production phase on the flora and fauna
19P	Develop and implement contingency and industrial safety programs, in all project development and operation phases
20P	Take into account the management recommendations and instructions of the agrochemical production companies. Coordinate with IPDM
2M	Manage and technically dispose of liquid wastes from agrochemical preparation and management, as a program tied in with Integrated Pest and Disease Management IPDM
3M	Develop, spread, implement and monitor a contingency management program related to the use of agrochemicals, tied in with the IPDM
5M	Implement sanitation systems that allow for the management of solid wastes generated in beneficiary homes and nursery administrative areas.
6M	Treatment and final disposal of liquid wastes in beneficiary homes and nursery administrative areas.
8M	Implement appropriate techniques for the management and final disposal of plant wastes generated in the preparation of the land.
9M	Implement actions aimed at conserving areas of interest and influence of the plantations
10M	Treatment and final disposal of liquid wastes from the pilot plant

These are altogether complementary to each other, as soil resources will affect water runways, and inversely any impacts will rebound on the other elements. Each one of these measures is represented in the full body of the Environmental Assessment as a technical card (i.e. Guidelines), that identifies the magnitude of the measure required and the costs involved in its completion.

1.6.2 Environmental Monitoring and Follow-up Plan - EMFP

The Environmental Monitoring and Follow-up Plan -EMFP- is a part of the Environmental Management Plan –EMP- and constitutes a tool with detailed programs and mechanisms, from the

activity of impact identification all the way to those components that allow verification, vigilance and evaluation of the actions and activities of the project before, after and during its execution.

The EMFP will establish in a detailed manner the indicators and the places where the monitoring should take place, as well as the methodologies recommended in particular for sampling and verification, including periodicity of sampling, duration, type of assessment, forms of evaluation, costs and financing of the activities. The EMFP includes recommendations regarding the form for presenting periodic reports, with argumentation of the periodicity of reporting and establishes the extent of advances on aspects such as: physical and chemical monitoring of intervened water bodies, programs for revegetation and erosion control, biological control, solid waste and social welfare expansion.

1.6.3 Environmental Leadership Plan

Environmental policy provides the necessary planning information and has been designed by taking into account the results of the Environmental Assessment. For the execution of these measures it is necessary to create an organizational structure to allow direction, coordination and execution systems and to provide economic and physical resources, to generate procedures, communication flow and operational controls.

The follow-up phase corresponds to the verification of the effectiveness and efficiency of the environmental measures adopted. It is supported on actions like the monitoring of the characteristics of the operations and of the key activities that cause environmental impacts; the definition of responsibilities and instruments required to handle, investigate and correct nonconformities, keep the necessary environmental registers to probe the fulfilment of the objectives and goals and carry out environmental auditing in order to determine if the EMP has been correctly implemented and kept in accordance with the planned objectives.

For the implementation of the Environmental Administration System, it is suggested that an Environmental Management Unit is created, being responsible for watching over the environmental management measures executed and the EMFP, in accordance with the recommendations given in the present study.

1.6.4 Costs

The total cost of the EMP is COL$1,064,565,600.oo (US$369,643.oo) for the two locations where farming is to be carried out. Broken down by department, the EMP in Putumayo has a cost of $406,175,000.oo (US$159,785.oo) and in Caquetá, of $604,390,600.oo (US$209,858.oo). The exchange rate used was $2,880.oo. See costs by management guideline in Table 5.

The only measure proposed as optional is 14P: Encourage the cultivation and rational use of fuelwood forests and combustible solid wastes, as energy sources, which proposes the construction

of efficient stoves at a cost of $130,000,000.oo (US$45,139.oo) and in Caquetá of $227,760,000.oo (US$79,083.oo).

Table 5. Summary of costs by EMP action to be undertaken by department

Guide-line	ACTION TO BE TAKEN	TOTAL COST			
		PUTUMAYO		CAQUETÁ	
		Pesos	US$	Pesos	US$
1P	Design specific and mandatory routes for the transport of materials, supplies and products such as latex and others associated with it.	3,000,000	1,042	3,000,000	1,042
2P	Define agrochemical management, storage and processing areas, using 100% of the solutions prepared, and organize them within an Integrated Pest and Disease Management (IPDM) plan.	10,000,000	3,472	10,000,000	3,472
3P	Study to characterize and classify solid and liquid discharges.	25,000,000	8,681	25,000,000	8,681
4P	Implementation and permanent monitoring of an Integrated Pest and Disease Management - IPDM - System.	50,000,000	17,361	50,000,000	17,361
11P	Education of personnel and beneficiary associates in techniques for the rational use of water.	20,000,000	6,944	25,500,000	8,854
12P	Education in solid waste management and final disposal techniques	8,000,000	2,778	14,000,000	4,861
13P	Study to minimize liquid and solid wastes from the nonindustrial latex processing phase and implementation of results	17,000,000	5,903	17,000,000	5,903
16P	Encourage biological corridors through the identification of strips allocated to the protection of water sources and demarcation of farms	6,800,000	2,361	8,290,000	2,878
17P	Conduct environmental education workshops with emphasis on the prevention of impacts of the plantation production phase on the flora and fauna	7,800,000	2,708	13,660,000	4,743
19P	Develop and implement contingency and industrial safety programs, in all project development and operation phases	2,850,000	990	5,000,000	1,736
20P	Take into account the management recommendations and instructions of the agrochemical production companies. Coordinate with IPDM	2,850,000	990	5,000,000	1,736
2M	Manage and technically dispose of liquid wastes from agrochemical preparation and management, as a program tied in with Integrated Pest and Disease Management IPDM	2,850,000	990	5,000,000	1,736
3M	Develop, spread, implement and monitor a contingency management program related to the use of agrochemicals, tied in with the IPDM	2,850,000	990	5,000,000	1,736
5M	Implement sanitation systems that allow for the management of solid wastes generated in beneficiary homes and nursery administrative areas.	9,075,000	3,151	16,308,600	5,663
6M	Treatment and final disposal of liquid wastes in beneficiary homes and nursery administrative areas.	276,100,000	95,868	193,600,000	67,222
8M	Implement appropriate techniques for the management and final disposal of plant wastes generated in the preparation of the land.	8,000,000	2,778	14,016,000	4,867
9M	Implement actions aimed at conserving areas of interest and influence of the plantations	8,000,000	2,778	14,016,000	4,867
10M	Treatment and final disposal of liquid wastes from the pilot plant	-	-	180,000,000	62,500
TOTAL		***460,175,000***	***159,785***	***604,390,600***	***209,858***

Exchange rate: $2,880.oo

The above chapter presents an executive summary of the Environmental Assessment for the Natural Rubber project in the Departments of Caquetá and Putumayo, with all the components, summarized, to allow for a quick review of the methodology applied throughout, of the main environmental issues encountered, the measures proposed to diminish negative impacts and enhance positive ones. The body of the EA that follows is an amplification of the subjects touched upon above and does not substitute its reading, since explanations on specific subjects might be due to the reader.

SECTION 2 PURPOSE

2.1 GENERAL

The main objective of this study is to analyze the physical, biotic and socioeconomic aspects in the area of influence of the project for the purpose of identifying and assessing the impact of implementation and operation of the project "Natural Rubber", located in the Departments of Caquetá and Putumayo.

The study will establish the relevant environmental monitoring and management measures that will guarantee sustainable development of the project both during its beginning as well as after it is abandoned. The final goal of the activities is to supply project authorities in charge of decision making with full information of the consequences of implementation and management of the productive characteristics of the project and their repercussions on the environment.

The scope of the project includes the following aspects:

- Elaboration of an environmental assessment, including relevant specific aspects of the current operation, and projections for implementing the several crops.

- Elaboration of an environmental assessment, according to the methodology of the Leopold Matrix, which will identify the different impacts, valuate the degree of damage and propose adequate environmental management measures.

- Formulation and description of preventive, mitigating, corrective and/or compensatory measures required harmonize the physical, biotic and socioeconomic environment with the project. These measures will include aspects such as objectives, goals, expected results, design criteria, typical blueprints, human resources, execution timetable, budget and responsibilities.

The project Environmental Assessment follows the methodology used by the Consultant in similar studies in Colombia, and Chemonics and the Natural Resources and Enviromental Reg. 216 USAID guidelines. Initially, the Consultants reviewed the existing information and visited the area to obtain a first hand characterization of the present environmental conditions of the area of influence of the project, trying to involve the community as much as possible, by visiting their homes and inviting them to meetings with the local operative agencies and community organizations whom will benefit from the project.

The present Environmental assessment was accomplished within the terms of Regulation 216-c of USAID and Colombian environmental legislation. The study also contemplates the policies and

guidelines for development of the department of Caqueta and Putumayo, according to its Plan de Ordenamiento Territorial, (P.O.T.), which was frequently consulted during the study.

2.2 METHODOLOGY

The study was developed on the basis on the methodology accepted by the state environmental organizations and basically include the following aspects : identifying areas of direct or indirect influence; Technical description of the prospective project; characterization of the environmental base line on the physical, biotic, social, cultural and economic aspects; on site identification of the impacts generated by the project. Contact with the community was maintained during the fieldwork, through direct involvement with the project beneficiary population, and the participation of community organizations, which were included to maintain a high level of approval of project acceptance.

The work included field activities involving gathering of primary information and office activities involving processing and assessment of primary and secondary information related to the area of study. The information was used in the identification and impact Assessment phases of the project and in the formulation of environmental monitoring and follow up plans.

2.3 BACKGROUND AND SCOPE

The Colombian Alternative Development (CAD) project assists USAID and the Government of Colombia to achieve the goal of improving licit opportunities for small producers in coca and poppy growing areas, which will result, over time, in abandonment of illicit crop cultivation and refusal by small farmers to plant new areas in coca and poppy.

The Colombian Alternative Development (CAD) operates in four thematic areas: (a) Strengthened National and Local Institutions, (b) Expanded Rural Social Infrastructure, (c) Expanded Licit Economic Opportunities, and (d) Improved Natural Resources/Environmental Management.
On August 26, 1999 USAID/Colombia sent the AID/W Bureau the Initial Environmental Exam (IEE) for Alternate Development Strategic Objective No. 2 (SO2.) The discretionary decision made by the Bureau under LAC-IEE-99-38 on August 26, 1999 was a Negative Determination for activities in component A) (Institutional Strengthening) and a Postponement of activities in component B) and component C), since these activities – including rehabilitation of roads, reforestation and other measures adopted to protect water springs/water sources – had not yet been identified.

On June 1, 2000 USAID/Colombia sent the AID/W LAC Bureau the Addendum to LAC-IEE-99-38 to include the new and extended activities of the Alternate Development Strategic Objective. The discretionary decision made by the Bureau under LAC – IEE – 00 – 35 is a Positive Determination regarding activities that include agricultural programs – silvo-cultural [forestry]; crop diversification; raising cattle; reforestation; protection of springs and watersheds; construction of infrastructure, including but not limited to roads, water supply and sanitation systems, irrigation

works and construction; and other activities that may significantly impact the environment. This discretionary decision also establishes that the required Programmatic Environmental Assessment (PEA) must consider the direct impact of the activities themselves, as well as indirect and accumulated impact on affected areas.

Alternative development activities pursued by USAID/Colombia under Strategic Objective No. 2 (SO2), include two different projects related to the cultivation and processing of natural rubber in different areas in the country. According to the arbitration decision referred to above, these projects required an Environmental Assessment (EA) in order to comply with USAID environmental regulations.

These projects are:

Rubber in the Department of Caquetá
Rubber in the Department of Putumayo

The studies must comply with the laws and regulations of the United States of America. The EA must follow the requirements stipulated in the Foreign Aid Act (FAA) and its amendments and AID Regulation Part 216.

EA recommendations and acceptance may be issued by the Regional Environmental Advisor for South America (REA/SA) and the USAID Mission Environmental Officer (MEO), formal EA approval must be issued specifically (according to the requirements in Regulation 22 CFR Part 216 of the FAA and AID) by the Bureau Environmental Officer of the LAC (BEO) before activities not categorically excluded may be initiated.

The scope of the environmental assessment project includes the following aspects:

- Preparation of an environmental impact proposal and alternatives in comparative form.

- Elaboration of an environmental diagnosis and description of affected environment, which will include relevant specific aspects of the current operation, and projections for the implementation of the natural rubber project.

- Elaboration of environmental consequences assessment, according to the methodology of the Leopold Matrix, which will identify the different impacts, valuate the degree of damage and propose adequate environmental management measures.

- Formulation and description of preventive, mitigating, corrective and/or compensatory measures required coordination of the physical, biotic and socioeconomic environment with the natural rubber project. These measures will include aspects such as objectives, goals,

expected results, design criteria, typical blueprints, human resources, implementation timetables, budget and responsibilities.

- Elaboration of a biophysical and social monitoring and follow-up program, in agreement with the alterations occurred as a result of actions and processes developed during the operation of the natural rubber project.

SECTION 3 ALTERNATIVES INCLUDING THE PROPOSED ACTION

There are three alternatives from the viewpoint of the environment and the possibilities offered by the project sites with respect to the proposed action:

1. That the alternative rubber development project will not be carried out as a viable option for the substitution of illicit crops
2. That the project will be implemented without an Environmental Management Plan
3. That the project will be developed in parallel with an Environmental Management Plan

Each one of these alternatives implies a different future, environmentally characterized by specific circumstances, the most important of which are indicated below

3.1 FIRST OPTION:

That the alternative rubber development project not be carried out as a viable option for the substitution of illicit crops

Photo 1. Spraying of illicit crops.
Coca crops after being sprayed
Vereda San Diego, Municipality of Puerto Caicedo, San Diego Unit.
Source: CAEMA, Present study. 18/06/03

Photo 2. Spraying of illicit crops.
Coca crops after being sprayed
Vereda San Diego, Municipality of Puerto Caicedo, San Diego Unit.
Source: CAEMA, Present study. 18/06/03

Photo 3. Typical Lomerío landscape. Municipality of Albania, Caquetá
Date: 19/06/03. Source: CAEMA, Present study.

This is the alternative for the environment without the project, characterized and dominated by the same conditions that initially defined the problem, that is: 750 and 500 hectares in the Amazonian foothills of Caquetá and Putumayo, respectively, planted with coca, in lands that were snatched away from the normal development dynamics of the zone, or in many cases, made suitable for planting after a process of clear-cutting of the secondary forest.

This alternative, further complicated by intervention and domination by armed groups, leaves the Colombian government faced with the only alternative of establishing its presence in the area and applying strategies for the massive eradication of the coca crops, through aerial spraying.

As seen below in the description of option 3, despite the fact that the Colombian Government has been implementing environmental control and mitigation measures for the sprayed areas, the baseline conditions of the zone have already been affected, and must be repaired with other alternatives such as manual eradication and the offer of new honest work alternatives for the communities. Not carrying out the project severs the socioeconomic option par excellence and leaves the State with the sole alternative of establishing its presence and recovering the area and placing it under the control of the legitimate authorities.

3.2 SECOND OPTION:

That the project be implemented without an Environmental Management Plan

Photo 4. Felling of secondary forest to establish forest farming.
Note felling of forest in secondary succession state, for site preparation and establishment of plantations (rubber, plantain, pepper and timber)
Vereda San Diego, Municipality of Puerto Caicedo, San Diego Unit.
Source: Fundación Futuro Ambiental, 2003

Photo 5. Felling of forest in secondary succession state for site preparation.
Property of Mr. José María Jucanamejoy Chasoy.
Vereda Las Minas, Municipality of Villagarzón, Las Minas Unit.
Source: CAEMA, Present study. Date: 18/06/03

Photo 6. Poor condition of roads and its impact on the transport of materials.
Transport of plantain stumps, Municipality of Valparaíso, Caquetá
Date: 20/06/03. Source: CAEMA, Present study.

Photo 7. Site preparation during the plantation production phase
Evidence of intervention in mature forest areas
Municipality of Valparaíso, Caquetá
Date: 18/06/03. Source: CAEMA, Present study.

This alternative is based on the fact that rubber cultivation is historically, biologically and culturally part of the Amazon region. In the Brazilian strip it is estimated that nearly 400,000 people live from the cultivation and nonindustrial processing of latex.

Due to the type of development, which demands a certain level of technology and infrastructure, as well as the regulation of the funds to finance the project, combined with the requirements of Colombian environmental regulations and institutions, a basic environmental planning process is required. These conditions led to the preparation of the Environmental assessment, of which this analysis of alternatives forms part.

3.3 THIRD OPTION

That the project be developed in parallel with an Environmental Management Plan

With this alternative, the social component of the illicit crop eradication strategy is balanced and many of the environmental problems of the area are reversed up to 100%. It is worth showing, with figures, what it means to properly eradicate the coca plantations from this area:

The social component benefits considerably from the resurgence legal employment opportunities, which allow the community that directly or indirectly benefits from them to have more and better health, education, recreation and socialization.

Photo 8. Manual eradication of illicit crops.
Vereda La Pedregosa, Municipality of Puerto Caicedo, La Pedregosa Unit.
Source: Futuro Ambiental, 2002.

Photo 9.Vereda Río Blanco, Municipality of Villagarzón
Source: Futuro Ambiental, 2002.

Photo 10. Manual eradication of illicit crops.
Vereda La Pedregosa, Municipality of Puerto Caicedo, La Pedregosa Unit.
Source: Futuro Ambiental, 2002.

Photo 11. Agroforest system. Rubber, plantain, arazá, timber trees
Source: CAEMA, Present study., Municipality of Morelia, Caquetá

Photo 12. Manual weed control. Plating.
Source: CAEMA, Present study., Municipality of Morelia, Caquetá

According to Asoheca a study conducted on its own initiative, concludes that by mid-2003 the eradication of just 380 hectares of coca, as part of the substitution project, had meant for the flora, fauna, soil, waters and human health, 4,500 kg of solid fertilizers and 9,100 liters of liquid fertilizers would not have been apllied in the study zone and 13,700 liters of category I and II insecticides, with high and medium toxicity, have been removed from the Amazon region. 4,500 kg of category III fungicides and 6,830 liters of category I and II herbicides will no longer be used. As well as 41 tons of solid wastes (per crop), consisting of a mixture of coca leaves with gasoline, cement, sulfuric acid and sodium bicarbonate, equivalent to 15,654 tons/year would not be generated. This waste is generally dumped in reservoirs and watersheds. Moreover, just this fraction of the project has enabled the removal from the illegal market and from the environment of a total of 4,174 50kg bags of cement, approximately 280,000 gallons of gasoline and a similar amount of solvents and chemical precursors. Extrapolating these figures and comparing them against a total of 1,250 has: 750 has and 500 has to be substituted in Caquetá and Putumayo, respectively, we can infer an increase in these figures and benefits by up to 300%. Figure 1, page 78 of this study, shows the mentioned indicators in greater detail:

In any event, the project suggests new forms of intervention and relationships with the environment, which deserve to be strengthened, when they intervene positively and are managed through preventive, corrective or mitigation measures, in the case of negative impacts.

The predictive assessment of the two regions assessed, as well as the result of the environmental rating, reported a very small number of negative impacts with a very high (VH) rating. Most impacts assessed reported medium (M), low (L) and very low (VL) values.

The environmental aspects and impacts requiring special management in order to ensure a clean and environmentally-friendly rubber project, and in respect of which the Environmental Management Plan presents concrete alternatives, are: Summary Matrix of Environmental Aspects and Impacts, in this study.

For most impacts identified, described and rated, the solution is associated with preventive measures and in a few cases, such as those related to uses of the water and liquid discharges, a mitigation infrastructure will be required.

An indirect negative impact that could considerable affectation, has to do with the secondary access roads to the farms, which will be essential for marketing the latex and the associated products. Environmentally, this is a very poor infrastructure: there is no management of drainage works, banks or excavation material disposal sites, or their specifications are not in line with the quality, geotechnical and rainfall conditions of the area. This impact is detected more strongly in the department of Putumayo.

3.4 RECOMMENDED OPTION

The recommendation is to implement option three of the environmental assessment of alternatives as the most appropriate and in line with the sustainability conditions required for the rubber project and for the Amazonian foothill area

SECTION 4 AFFECTED ENVIRONMENT

Following is the executive summary of the first report, which was entitled "assessment", and presents the most important aspects of the first volume of the study related to the assessment of the Initial Reference Status.

The assessment forms part of the EA process[3] and particularly focuses on establishing the Baseline coditions, in order to be able to carry out, at the end, a comparative environmental assessment of the areas of influence of the project, so as to determine the conditions with and without the project. The success of the environmental assessment and the quality of the Environmental Management Plan, with its various components, depends to a large extent on carrying out the proposed alternative in the EA for the rubber project in the departments of Caquetá and Putumayo.

4.1 ASSESSMENT METHODOLOGY

The project desing begins with selecting the farms to be visited. Consultants and Chemonics' staff responsible for the supervision of the EA, worked together to identy 10% of the farms in the project zone, to be selected according to the following criteria: 1) Location through cartographic information of the municipalities, the rural districts (veredas) and the farms object of the project's attention. 2) Review farm suitability, based on cartography, land management plans and Government provisions, of the special management areas, Indian reservations, natural reserves and other components which might overlap the proposed planting areas. 3- Preparation of a checklist to rate the fragility conditions of the areas. 4) Joint rating of the farms visited and application of field evaluation surveys prepared by the ASOHECA[4], ASOCAP[5] and FUTURO AMBIENTAL evaluation group. 5) Preparation of a schedule to visit 10% of the farms selected in municipalities. Security conditions prevented the visit to all municipalities. Field-work activities were carried out over a period of two weeks by three field engineers and the support provided by project operator technicians in the two departments.

4.2 RESULTS

Rubber cultivation is not only one of the most traditional alternatives for soil use in tropical forests, but also one of the best sustainable alternatives available to communities in the region.. Rubber extraction and industrial processing are backed by age-old cultural practices, a harmless and traditional process:

[3] Environmental Impact Assessment
[4] Asociación de reforestadores y cultivadores de caucho del Caquetá
[5] Asociación de Caucheros del Putumayo

> The extraction of rubber gum is one way to use the tropical forests without destroying them. A diagonal cut through the bark of a live rubber tree allows a milky liquid called latex to drip into a collecting vessel. When the flow of latex stops, a second cut is made close to the first. The latex, which is 30% rubber, is processed to make rubber. The cuts and taps heal without killing the tree. (G.TYLER, 1992)[6]

The EA not only presents the accumulated impacts of the Baseline, but also evaluates the various phases of the project, along with the Environmental Rerequirements Matrix, based on ISO 14000/2000 enterprise audit and environmental management techniques.

Rubber planting is an environmental compensation strategy to the deal with environmental damages to the forest caused by the planting of illicit crops in the Colombian Amazon region, following agro-ecological patterns. None of the farms interfere with environmentally fragile areas, Indian reservations, national parks or regulated environmental management areas. No accumulated environmental disturbances, caused by natural phenomena such as avalanches, floods, gales, earth movements, etc., were identified. The major environmental damages in the two project areas are associated with anthropic activity, related to a single factor: the felling of the Amazon forest to plant coca leaves. All the serious effects are related to the introduction or eradication of this illicit crop.

4.3 CONCLUSIONS

The opportunity afforded by rubber and other tropical forest products to communities is undeniable:

> Nearly 300,000 rubber workers earn their living in the Amazon River basin by tapping latex from the rubber trees scattered throughout the region. They also harvest Brazil nuts, fruit and fibers from the forests, and cultivate small plots of land near their homes.
> A study conducted in 1988 by a team of scientists showed that the sustainable harvesting of non-timber products, such as nuts, fruit and latex for 50 years, would generate twice the income obtained by hectare through the production of timber and three times more than cattle farming. Although the felling for large-scale sale and the degradation of the tropical forests is a long-term economic and ecological disaster, such activity continues. (G.TYLER, 1992)[7]

The environmental characteridstics of the area designated for rubber planting, as a substitute for illicit crops, is summarized in the following Baseline conditions:

- Deforestation of vast zones and natural forest relicts to expand the areas cultivated with coca.

[6] G.TYLER MILLER. Ecología y medio ambiente. ED. Iberoamericana, México 1992
[7] ILLUSTRATIVE NOTE: El uso Sustentable de los Bosques Tropicales. Taken from ECOLOGÍA Y MEDIO AMBIENTE, G TYLER MILLER, JR. p. 286.

- Erosion of the soil, due to overexposure of the land and loss of the plant cover. The most serious situation occurs in the alternate routes that are being built in some rural areas and farms in Putumayo (this phase is not part of this project)
- Use of agrochemicals for eradication of coca. Between 4 and 5 kg (aerial application) of glyphosate are used in the area per hectare of coca.
- Deficient basic sanitary conditions in the farmhouses benefiting from rubber projects in both departments.
- Transhumance of the population, founded on an illicit economies, which does not allow people to settle down and build their own communities and legitimate social fabric.

4.4. RECOMMENDATIONS OF THE ASSESSMENT

- Based on the information provided by USAID/Chemonics, and contributions of consultants in charge of the EA, the group proceeded to quantify the impacts identified in the Baseline, as well as prevention mitigation and correction measures presented in the respective Environmental Management Plan will secure for the project the minimum sustainability conditions required for the area.

- Review the environmental management of alternate routes to the project zone, in the Putumayo area.

- Based on the requirements matrix included in the assessment, the project Operators in both departments must reactivate the environmental management cycle with CORPOAMAZONÍA.

4.5 PESTS AND PESTICIDE PROBLEMS IN RUBBER PLANTATIONS

4.5.1 Most Important Findings and General Recommendations

4.5.1.1 The Colombia Alternative Development (CAD) Program

The Colombia Alternative Development (CAD) program, funded by USAID in the context of the larger Plan Colombia, supports farmers, farmers' families and farming communities that have been so far involved in the production of illicit crops, such as coca and poppy, to voluntarily switch to licit crop production. Working with communities, community associations, and municipalities in the departments of Bolivar, Cauca, Caqueta, Huila, Nariño, Norte de Santander, Putumayo, and Tolima, the program is creating licit economic opportunities that generate income, improve the quality of life, protect the environment, and support ethnic and cultural values for peaceful coexistence. The program uses a bidding approach to call for applications from farmers' organizations and supporting basic staple crops ('*cultivos de pan cojer*') as well as 'industrial' crops targeted to internal or external markets, many of them with associated industrial processing and transformation.

So far, most crops supported by CAD have been of low input agricultural systems, ecologically appropriate, with an integrated, if not an ecological or organic, approach to crop production and pest management (see "Pests in rubber Farming and Management Guide" in table No. 11). This is the type of alternative development that, by protecting the health of Colombians and their environment not only maximises the chances of becoming sustainable in the long term but also, by diversifying the production system it reduces production and marketing risks for the farmers.

Recommendation No.1: CAD should continue with this eco- friendly approach to the promotion of alternative crops, leading into sustainable development, to the benefit of the Colombian environment and the health of participant farmers and their families, as well as of the consumers.

4.5.1.2 Spread of Insect Pests and Diseases

CAD is actually taking crops from traditional cropping areas to new ones in the Colombian territory. Although, the majority of these crops are not really foreign, to the country or to the regions where CAD is operating, they have been grown, if at all, only in very reduced areas.

Recommendation No.2: In order to prevent the dissemination of contaminated crop seed with pathogens, insect pests, and weed propagators, CAD should establish a strict plant sanitation-quarantine system based on international agreed and Instituto Colombiano Agropecuario (ICA) certification procedures and quarantines for the movement of plant materials into the country as well as from one region to another within Colombia.

4.5.1.3 Present Pesticide Use

There is no clear evidence of abuse or misuse of pesticides in presently supported CAD crops. Two issues of concern, however, need to be mentioned. The first is that of the mentality of the farmers that are being sought for participation in the alternative development program. Illicit crop farmers, such as those dealing with coca and poppy, have grown used to an abundance of inputs to produce these highly marketable and economically valuable crops. Due to the extremely high prices for coca and poppy, the economic and action thresholds for pest control, as traditionally used in Integrated Pest Management (IPM), are so low that they become a totally irrelevant tool for the rationalization of pesticide use. As such, pesticides as well as other agricultural production inputs have been used in large quantities, close to the abuse and misuse. This tendency to use pesticides as the main, or even the sole, tool for pest management is one of the major challenges to be surmounted by CAD in order to 'rationalize' pest management programs in the alternative development crops.

The distribution of pesticides in Colombia is done through large to medium size distributors located in Bogotá, Cali, Medellín, and many other major cities of the country all the way down to mid-to-small size pesticide dealers located closer to the final users. During the visits to distributors, at all

levels, we perceived (1) a full compliance of Colombia manufacturers and importers with international codes for labelling and packaging of pesticides; (2) an adequate sizing of packages of pesticides according to the final users; (3) a very good degree of cleanness and organisation in all the stores visited; (4) no evidence of re-packaging of pesticides; and (5) a relatively good level of knowledge about pesticides, their toxicity and labelling on the part of the store attendants. A problem, although not directly observed but heard of in the field, seems to be the illegal direct distribution of smuggled foreign pesticides, including products cancelled and prohibited in Colombia. Given the general insecurity situation of the rural areas where CAD operates, Colombian authorities are limited in their capacity to fully control this illegal traffic of pesticides.

In summary, due to an extremely favorable cost/benefit ratio on the use of pesticides in illicit crops, the CAD farmers have a mentality of overusing pesticides in crop production without resorting to a rigorous health or environmental analysis. Many of the products used are highly toxic and many are environmental hazards[8]. The well-controlled legal pesticide market is altered by an illegal trading of, mainly foreign, pesticides much more difficult to control. These are major challenges that both, the Government of Colombia (GOC) and CAD, face in their promotion of environmentally friendly and sustainable alternative development.

<u>Recommendation No.3</u>: CAD should follow a strategy that (a) supports project operators to make farmers, and their families, fully aware of the health hazards of pesticides; (b) supports project operators, civil society and government authorities to make farmers, their families, and the larger Colombian community aware of the environmental hazards, and societal costs, of pesticide abuse and misuse; and (c) provides the technical assistance to project operators for Safer Use of Pesticides (SUP) and Integrated Pest Management (IPM), based on the principles of economic injury and action levels and thresholds[9].

4.5.1.4 Pesticide Evaluation

The review of heart of palm pesticides, presently used by farmers, recommended by technical institutions and/or so far requested by project operators for their productive activities (can be seen below in the tables that follow). Most of these pesticides were cleared based on the review of the 12 points of *22 CFR 216.3(b)(1)*. However, some of them do not fully comply with USAID environmental requirements for development projects. Of the total, only 17 active ingredients were selected, to be further studied as possible pesticides to be used in the rubber crop pest management (see table No. 11). These pesticides were then subjected to the more complete 'risk analyses, discussed and shown in a table No. 14.

[8] More than 30 commercial pesticides are regularly used in Putumayo. Thirty percent of the local farmers use paraquat at least once a month and 14% regularly use metamidophos, among other products (US Embassy, 2001).

[9] IPM programmes may use economic injury thresholds, e.g. when the population of a pest is such that the damage it causes is economically 'significant', and/or action thresholds, e.g. the population density or the damage level when the control should be applied to prevent the pest to reach its economic injury level.

<u>Recommendation No.4</u>: Some of the pesticides being presently requested and or purchased by CAD operators are to be *phased out* following the subsequent timeline. (a) In order to allow time for the search of alternative products, preferably non-chemical, while still protecting the crops, the insecticides: carbofuran, chlorpyrifos, and profenofos, and the fungicides: chlorothalonil and copper oxychloride should be phased out in the medium term (1-1.5 years). (b) Due to higher than accepted health and environmental risks, and the availability of pest management alternatives to these molecules, the fungicides: benzimidazole, captafol, hexaconazole, kasugamicine and ofurace, and the insecticides: methomyl, cyfluthrin, cyalothrine (lambda) and cypermethrine should be phased out in the short term (0.5-1 year). (c) The highly toxic and easily replaceable insecticides: monocrotophos, metamidophos, aldicarb, isazophos, and methyl parathion and the herbicide: paraquat should be phase out immediately. (d) And finally, and additionally to this, no product listed in the prohibited pesticides category in the US or Colombia, should ever be used in this project.

4.5.1.5.Safer use practices

Colombia is one of the most advanced countries in Latin America in regard to pesticide registration, regulation and control, as well as in training in agronomy and associated disciplines. Colombia has very up to date registration procedures, applies international standards and codes for pesticide labelling and has a system to follow up and control pesticide manufacturers and distributors that is only limited by the insecurity situation that the country has been living during the past 25 years. The majority of Colombian technicians working in the areas of pest and pesticide management were found to have a solid knowledge and understanding of IPM and safer use of pesticide procedures. However, in spite of all these, there is still need and room for interventions on Safer Use of Pesticides (SUP). The majority of farmers in CAD areas of intervention do not use 'best practices' for SUP: less than 10% use some type of body protection when using these products and 70% of those directly exposed to pesticide spills do not do anything after the accident for clean up or decontamination (US Embassy, 2001).

<u>Recommendation No.5:</u> Considering the traditional attitudes and practices of the participant farmers with respect to pesticides, as well as the limited GOC presence in the isolated, and conflictive, areas where CAD is operating, it is recommended that a strong SUP program be implemented. The program should (a) be based on the pre-existing training offer already available in Colombia; (b) attempt to raise 'awareness' of the health and environmental hazards of pesticides as well as to teach 'good practices' on SUP; and (c) go hand in hand with training in 'ecological agriculture' and IPM, so SUP does not become a false panacea.

4.5.1.6.Pest management Approaches

The majority of the Colombian professional agronomists has been exposed to, trained in and has an understanding, if not a full knowledge of IPM. This has become, not only the 'official' approach to pest management at the state-government institutional level (ICA), but also it has taken root in para-statal (Corpoica) institutions, in charge of pest and pesticide R&D, as well as in private R&D

organisations. This is the case of grower associations, such as Cenipalma, Cenicafé, Cenicaña, and Fedecacao. Moreover, Colombia is the headquarters for the well reputed CIAT, a centre for tropical agricultural research that has conducted pioneer research on IPM of insect pests and diseases in various crops, foremost among them cassava. Relevant to this PERSUAP, we highlight the availability of IPM programmes for oil palm, cacao, plantain, sugar-cane, rice, and timber plantations.

As shown in the tables below, Colombia is well advanced in the production of bio-inputs for pest management, such as microbial pesticides, entomopathogen fungi, bacteria and viruses, as well as nematodes and parasitic wasps. These bio-inputs are produced and sold in the country by a variety of small, mainly national, industries (see tables below). The important issue, from an IPM perspective, is that these products become a readily available, much healthy an environmentally friendly option to the chemical pesticides. As per an expert entomologist and IPM practitioner, "Colombia is better positioned than the US for the supply of biopesticides to agriculture".[10]

<u>Recommendation No. 6:</u> CAD is encouraged to disseminate, among project operators, both of the below lists of bio-pesticides (Table 6) and enterprises producing bio-products (Table 7) in an effort to promote their use in substitution of the more toxic and environmentally hazardous chemical pesticides.

As per a Reg 216 requirement, and as stated previously, in order not to transmit the false idea that pesticides, used safely, could be the sole solution to pest problems, SUP should not be promoted in isolation but rather in the context of a larger, more comprehensive approach to pest management, that of Integrated Pest Management, or IPM. Colombia is well ahead in IPM research and development as well as in IPM training. Additionally to the pesticide analysis, a considerable amount of effort in the preparation of this PERSUAP has been allocated to the development of IPM matrices that summarise the available tactics to manage the major crops pests and provide the user with additional references to the subject as well as main contacts for technical support and their Management in this section. This is to the benefit of the CAD project operators that can find in these tables guidance for the avoidance of the most toxic pesticides as well as non-chemical options for pest management.

<u>Recommendation No.7</u>: In spite of the good technical level of the field technicians working within CAD and the CAD project operators, technical support in IPM should be strengthened. This may take the form of (a) crop specific field demonstrations on the use of non-chemical pest control methods; and (b) provision of support to the technical staff of the operators for training-of-trainers as well as for direct farmers training in crop-specific IPM programmes.

[10] Dr. Anthony Bellotti, Cassava IPM Leader, CIAT, personal communication.

Table 6: Main Biological Inputs Produced in Colombia*

Entomo-pathogen Fungi	Fungi Bio-fungicides	Parasitoids	Predators	Entomopatho-gen Bacteria	Entomopatho-gen Viruses
Beauveria bassiana	*Trichoderma harzianum*	*Trichogramma exigumm*	*Chrysoperla externa*	*Bacillus thuringiensis*	Nuclear Polyhydrosis Virus (NPV)
Metarhizium anisopliae	*T. lignorum*	*T. pretiosum*	-	-	*Baculovirus ello*
Paecilomyces fumosoroseus	*T. viridae*	*T. atopovirilia*	-	-	-
Nomuraea rilely	*Gliocadium spp.*	-	-	-	-
Paecilomyces lilacinus, minense	-	-	-	-	-
Verticillium lecanii	-	-	-	-	-

* Table courtesy of Dr. A. Bellotti, CIAT.

Table 7: Main Enterprises Producing Biological Inputs In Colombia*

Enterprise	Inputs = Organisms
Agricultura Biológica (Buga-Valle del Cauca)	Entomopathogen fungi, Parasitoids, Predators, Bio-fungicides
Agrobiol (Buga-Valle del Cauca)	Parasitoids
Bioecológicos (Palmira-Valle del Cauca)	Entomopathogen fungi, Parasitoids, Predators, Bio-fertilisers
Biocontrol (Palmira-Valle del Cauca)	Entomopathogen fungi
Productos Biológicos Perkins (Palmira-Valle del Cauca)	Entomopathogen fungi, Parasitoids, Predators
Productos Biológicos El Bolo (Palmira-Valle del Cauca)	Parasitoids
Laverlam (Cali-Valle del Cauca)	Entomopathogen fungi and viruses
Orius (Villavicencio-Meta)	Entomopathogen fungi
Biogarden (Bogotá-Cundinamarca)	Entomopathogen fungi
Biocaribe (Medellín-Antioquía)	Entomopathogen fungi
Live System Technology-LST (Bogotá-Cundinamarca)	Entomopathogen fungi, Bio-fungicides

* *Table courtesy of Dr. A. Bellotti, CIAT*

4.5.2. Background to the PERSUAP

4.5.2.1. CAD and environmental compliance

The CAD project, being implemented by Chemonics in Colombia, is in the process of establishing full compliance with USAID environmental regulations. Previous Initial Environmental Examinations (IEE) have been completed for the majority of the CAD activities, as per LAC-IEE-99-38 and LAC-IEE-00-35. A Programmatic Environmental Assessment (PEA) was completed for CAD and approved in June 2003. Among the activities required by USAID for CAD to regularise its environmental compliance was a full study of the pesticides used in the alternative crops being promoted. To this effect Chemonics International commissioned the present Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) focused on those crops that have been so far supported by the CAD programme.

4.5.2.2. The PERSUAP

This PERSUAP has been prepared to achieve the dual purpose of (a) complying with USAID environmental regulations, and (b) to provide the CAD project operators with practical tools for better and safer management of their crop pests. The PERSUAP not only analyses pest and pesticide issues in the crops so far supported by CAD but it also addresses the broader issues related to pest and pesticide management in CAD and in Colombia, such as CoG regulatory and institutional frameworks, the agro-ecology of the intervention areas, training and technical capacity strengthening, and provides guidelines for SUP and IPM as well as identifying offers for these type of programmes in Colombia. Future commodities, pests and pesticide products to be considered under the CAD program implemented by Chemonics, but not covered in the present document.
During the preparation of the PERSUAP visits were made to Colombia pesticide authorities (ICA), and to major Colombian, and some international, technical institutions with a possible offer to pest management technology and training, such as Cenipalma, Fedecacao, IICA, Corpoica, Centro de Excelencia en Fitoprotección (Aphis, USDA, IICA, ICA, USAID), CONIF; to universities (Nacional) and training centres (SENA); to the private sector (Bayer CropScience, ANDI, BioEcológicos, SEG, pesticide dealers); and environmental consultant companies (Tres Elementos, CAEMA). Trips were made to Norte de Santander (Cúcuta) and Putumayo (Puerto Asís) where meetings were held with CAD project operators' technical staff and some visits made for field observations.

4.5.3. Pesticide Evaluation Report and Safer Use Action Plan Analysis

4.5.3.1.Pesticide registration statuses in Colombia and with US-EPA: 22 CFR 216.3 (b)(1)(i)(a)

Close to 55 pesticide active ingredients were screened for their registration status with the Colombian authority, the Instituto Colombiano Agropecuario (ICA)[11], and with US Environmental

[11] For this, an updated "Chemical Pesticide, Bio-inputs and Generics" database was obtained courtesy of ICA authorities.

Protection Agency (USEPA)[12] This list of pesticides was compiled from that sent by CAD operators to Chemonics requesting purchase clearance, in June 2003, and other pesticides following the recommendations of Colombian state and private technical institutions[13].

<u>Recommendation No. 8</u>: The list of pesticides to be purchased by CAD operators should be screened by the CAD Natural Resources and Environment (NRE) team, based on the pesticide lists included in this PERSUAP. Pesticides not mentioned in this PERSUAP should be subjected to a screening process. Products not registered with Colombia-ICA and with US-EPA should not, in principle, be approved (see exceptions discussed below).

<u>Recommendation No.9:</u> The summary of the pesticide analysis with the associated recommendation is:

- **<u>Products not registered in the US and Colombia or in PIC[14] list</u>. NOT TO BE USED UNDER ANY CIRCUMSTANCE: captafol, isazofol, methyl parathion and methamidophos.**
- **<u>Products not yet registered in the US or Colombia</u>. Although a microbial product, the first, and a plant extract, the second, they are NOT TO BE USED UNTIL REGISTERED in at least Colombia: *Baculovirus spodopterae* and *Swingla* (extracts).**
- **<u>Products not registered in Colombia.</u> NOT TO BE USED UNDER ANY CIRCUMSTANCE: endosulfan.**
- **<u>Products not registered with USEPA</u>. NOT TO BE USED UNDER ANY CIRCUMSTANCE: benzimidazole, hexaconazole, kasugamicine, monocrotophos, and ofurace.**
- **<u>Products not registered w/USEPA.</u> But registered in Colombia. APPROVED TO BE USED: extracts of *Glyricidia sepium*, because the resource (*Glyricidia*), the crop (vanilla) and the pest (*Cylsia*), are not present in the US; *Paecilomices liacinus*, because the crop (heart of palm) and the pest (*Leptopharsa*) are not present in the US and the pesticide is a microbial insecticide with unlikely environmental or health impact; and *Trichogramma pretiosum* and *Verticillium lecanii*, are both microbial insecticides with unlikely environmental or health impact.**
- **<u>Products are RUP with USEPA.</u> NOT TO BE USED: aldicarb, cyalothrine (lambda) cyfluthrin, chlorothalonil, chlorpyrifos, copper oxychloride, cypermethrine, methomyl, paraquat, profenofos**
- **<u>Products are RUP[15] with USEPA.</u> USE ONLY CERTAIN FORMULATIONS to reduce health or environmental risk: carbofuran (pellets/tablet), and picloram (Tordon 101R).**

[12] For this, EPA databases were consulted at its web site.

[13] Sources for technical information were the official ICA or Corpoica, Colombia government recommendations, the growers associations or research centres, international research centres and literature references applicable to Colombian conditions, with solid technical and scientific background.

[14] 'PIC List' is the Prior Informed Consent List of the Rotterdam Convention, led by UNEP and FAO, that applies to the international shipment of the most hazardous chemicals.

[15] RUP: Restricted Use Pesticide.

The timeline for the implementation of these recommendations is given in Table 8.

Table 8 : Summary of the Pesticides to Phase Out of CAD

To be phased out immediately:			To be Phased Out in 6-12 Months		
Technical Name	**TRADE NAME**	**Uses**	**Technical Name**	**TRADE NAME**	**Uses**
Monocrotophos	Azodrin	Heart of palm	Benzimidazole	Benomyl+	Requested by operators
Methamidophos	Tamaron	Various crops	Captafol	Difolatan	Cassava
Aldicarb	Temik	Potato	Cyfluthrin	Bulldock	Requested by operators
Isazofos	Miral	Potato	Hexaconazole	Anvil	Requested by operators
Methyl-parathion	Methyl-parathion, etc.	Rice	Methomyl	Lannate	Requested by operators
Paraquat	Gramoxone	Various crops	Kasugamicine	Kasumin	Potato

To be phased out in 12-18 months			To be Phased Out In 6-12 Months		
Technical Name	**TRADE NAME**	**Uses**	**Technical Name**	**TRADE NAME**	**Uses**
Carbofuran	Furadan	Cassava,Rubber, Plantain, Nurseries	Ofurace	Grolan	Requested by operators
Copper oxychloride	Agrotox	Cassava	Cyalothrine, lambda	Karate, Terminex	Potato
Chlorpyrifos	Lorsban	Plantain, Oil Palm, Cassava, Rubber, Forest Plantations	Cypermethrine	Saat Pop, Agroper, Cipermetrina	Rice
Profenofos	Curacron	Rubber	----------	----------	----------
Chlorothalonil	Bravo	Rubber	----------	----------	----------

4.5.3.2. Basis for selecting the pesticides: 22 CFR 216.3 (b)(1)(i)(b)

The main reason for selecting these pesticides is that of availability, efficacy and cost. This is typically the case of products such as chlorpyrifos and carbofurán that, although both RUPs, they are some of the most effective, and cheapest, insecticides and nematicides, as well as preferred products for ant control.

A usually overlooked criterion in the selection of pesticides is that of the formulation. On one hand, a simple way to reduce exposure risk to certain pesticides, such as chlorpyrifos, is to switch to formulations, like granules or pellets, that are not subjected to dangerous spills and drift. The same may be applicable to the reduction of the environmental impact of certain pesticides, such as the herbicide picloram, that by using injections to the bushy weeds, as opposed to sprays, there is a reduction on the total volume used and on the area impacted. Care must be exercised, however, because a granular or pellet formulation, being more attractive to them, could be more toxic to birds.

So, the potential health and environmental impact of the various possible formulations from which to choose should always be considered, checked and analyzed when selecting a pesticide.

Recommendation No. 10*:* CAD should implement training and capacity development in SUP for the technical staff of the operators including the theme of pesticide selection. Variables such as product toxicity (using the colour-coded labels), potential environmental impact, and the formulation are to be used among the criteria for selecting pesticides, additionally to efficacy, availability and cost.

4.5.3.3. Pesticides in the context of integrated pest management programs: 22 CFR 216.3 (b)(1)(i)(c)

"Integrated pest management … is USAID policy because it is the most effective, economical, and safest approach to pest control. IPM attempts to control pests in an economically and environmentally rational manner; it emphasizes non-chemical tactics which cause minimal disruption of the ecosystem"[16]. Pesticides should be used as the last resource for pest management after all other options have proven ineffective. Genetic (plants tolerance or resistance), biological (natural enemies), ethological (naturally occurring chemical disrupters), cultural (production practices), and mechanical (physical removal) are all preferred tactics to be used before resorting to chemical control (pesticides).

The general introduction on IPM possibilities for heart of palm crop is shown in Table No.4; the list of various possible pest problems of the crop, the management options available, the specific pesticides for the pest and some of the potential problems with the control options discussed. Finally, they list some technical support offers at the level of institutions and individuals and sources of information such as literature references and web sites.

Recommendation No.11: No crop should be promoted without first establishing an IPM programme. CAD should install at least one crop specific IPM demonstration field in each of the intervention areas. To this effect CAD should work with the local UMATAS (Municipal Agronomic Technical Assistance Unit) and request the technical support of the institutions and individuals listed in the pest management offers.

4.5.3.4. Method of application: 22 CFR 216.3 (b)(1)(i)(d)

Although a few of the farmers may have access to stationary-pump spraying systems, somehow common in illicit crop growing areas, most of the pesticide application will happen through back pack sprayers. A common situation with these sprayers is that (a) they are not properly maintained and so they often leak with significant increases in the exposure of the applicator to pesticides, and/or (b) they are not properly set for the job with nozzles that are not the most appropriate for the particular type of pesticides (insecticides-fungicides or herbicides) being sprayed. Pesticide mixing

[16] *USAID/AFR Guidance: Preparing PERSUAPs for Pesticide Programmes in Africa.*

is also an issue since often farmers do not follow all the precautionary measures and the concentrated, undiluted, pesticide increases the risk of the exposure. Commonly, in some rural areas, women and children may dangerously participate or stay close to the mixing, spraying and cleaning of the pesticide spray equipment. Finally, cleaning and disposing of pesticide excesses and of the product container needs to follow strict norms in order to minimize human and environmental risks.

Recommendation No.12: CAD SUP program must include support for three essential components: (a) a comprehensive training program on "best practices" in SUP; (b) locally, climatically and technologically appropriate[17] protective clothing and equipment (gloves, masks, boots, etc.); and (c) maintenance and repair of spray equipment.

4.5.3.5. Possible toxicological hazards to humans or to the environment: 22 CFR 216.3 (b)(1)(i)(e)

A pesticide risk analysis was done on the close to 17 products that passed the first screening test (see Table No 14.). This analysis included a look at acute and chronic toxicity of the selected pesticides to humans, its eco-toxicity and potential for water contamination. As a result, recommendations were drawn as to the general and specific mitigation activities to be conducted in order to prevent and/or reduce the potential health and/or environmental impact of the various pesticides of the program. These mitigation activities are all encompassed within the comprehensive risk mitigation-SUP and IPM programs.

Recommendation No. 13: CAD should socialize and share with project operators the results of the risk analysis of the pesticides and assure the full implementation of the mitigation measures recommended.

4.5.3.6. The effectiveness of the pesticides: 22 CFR 216.3 (b)(1)(i)(f)

Recommendations for pesticide and other pest management tactics to be used in the various crops have been gathered and or double-checked with authoritative agricultural R&D institutions of Colombia. Additionally, literary references and relevant web sites were consulted. It is to point out that, in Colombia, CAD has an abundance of institutions that can provide technical information and support, as well as training in pest and pesticide management.

4.5.3.7. Compatibility of pesticides with target and non-target organisms: 22 CFR 216.3 (b)(1)(i)(g)

The pesticide risk analysis mentioned above, and described in this section, discuses the main risks the pesticides pose to non-target organisms in the environment, as well as some potential impact on

[17] This means adequate for the local climate (temperature and humidity) and possibly adapted from local materials (plastic bottle masks, plastic bags-gloves, etc.) instead of imported clothing materials.

target organisms, such as the likelihood of encouraging the development of pest resistance. Also mentioned in the table are some of the main direct mitigation measures to prevent and reduce the potential impact of the various pesticides to non-target organisms. The more general approaches to prevent and mitigate the health and environmental impacts of pest management activities, discussed elsewhere in this PERSUAP, are SUP and IPM.

4.5.3.8. Conditions under which the pesticide will be used: 22 CFR 216.3 (b)(1)(i)(h)

The majority of the Colombian territory is formed by plains located below 500 meters above sea level (masl). The country could be roughly divided into six great geographical regions. The Andean one, including three Andean mountain ranges and the "inter-Andean" valleys; two coastal regions, the Caribbean and the Pacific ones; the plains of Antoquia region; the Amazonian forests; and finally, an insular region.

The CAD project is being implemented in Southern Colombia, in the Departments of Putumayo, Huila, Cauca, Nariño, Caquetá, and in the North East Department of Norte de Santander. The commonality of all these territories is that they are all used for illicit crops, coca and poppy, cultivation.

Colombia's climate is tropical with patterns strongly influenced by the Andes. They are normally classified as: (a) hot for ca. 84% of the territory, reaching up to 1000 masl and with an average temperature of 24 º C; (b) temperate, at altitudes between 1000 and 2000 masl, with an average temperature of 17.5 º C; and (c) cold, with average temperature of 12 º C, and at altitudes of 2000-3000 masl.

Ecologically, Putumayo, Caquetá, Norte de Santander, and Huila have a predominant pre-mountainous humid forest (Bh-pm) with close to 1000-2000 mm/yr, 18-24˚C, to low mountainous forest (Bh-mb) 2000-2500 masl 12-18˚C. So these departments are in the hot climate area. Cauca, Nariño and Tolima have predominance of pre-mountainous to mountainous forests with a much more variable level of humidity and their climate is temperate to cold.

4.5.3.9. Availability and effectiveness of other pesticides and of non-chemical Controls: 22 CFR 216.3 (b)(1)(i)(i)

The use of pesticides in CAD projects will be inserted into comprehensive IPM programmes. The "Decision Making Tree for IPM & a Guideline for SUP", discussed above, should help in making decisions if and when to resort to pesticides. But the matrices showed in this section present other available pesticide options and other pest management tactics for the crop and pest in question. There are, however, some problems with certain recalcitrant pests, such as ants, that are ubiquitous and pose a serious threat to certain crops, such as young trees, rubber, oil palm and heart of palm. Ants are not easy to control, and tend to draw to some of the most toxic chemicals, such as carbofuran and chlorpyrifos. Non chemical options are being suggested and proposed in the pest and pest management matrices for some of the crops.

An example of a non-chemical approach to a recalcitrant pest: the case of ants

- Attractive baits
- Nest destruction early on their development
- Prevention of the emergence of winged ants with covers
- Applying cal to change pH and destroy the fungi that is used as a food by ants
- Seeding castor bean (*Ricinus communis*) in rotation or inter-cropped (inhibits ants)
- Plough-in green manure (organic matter attracts them away from crop)
- Irrigation
- Mulching with neem or *Melia azedirach* materials (inhibit ants)

4.5.3.10. The ability and capacity of Colombia to regulate and control pesticide use: 22 CFR 216.3 (b)(1)(i)(j)

As stated above, Colombia is one of the most advanced countries in Latin America with respect to pesticide registration, regulation, and control. Colombia has very modern registration procedures, applies international standards and codes for pesticide labelling and has a system to follow up and control pesticide manufacturers and distributors that is only limited by the insecurity situation that the country has been living in for the past 25 years. The Instituto Colombiano Agropecuario, ICA, in charge of pesticide regulation, has taken more than 30 actions to ban hazardous pesticides or groups of pesticides, among which DDT, methyl bromide, canfechlor, captafol, all organochlorides, and toxaphene. Moreover, ICA requires that all Class IA and IB pesticides sold in the country have a back up 'prescription' written by a professional agronomist. Undoubtedly, the widespread insecurity in the majority of the rural territory of the country, and more specifically in the areas where CAD is active, limits the enforcing capacity of the GOC institutions. Although, the degree and effectiveness of controls in these areas is somehow limited and less than desirable, during the preparation of this PERSUAP we had first hand evidence of on going inspections to pesticide dealers in the Department of Putumayo, one of the most affected by the conflict.

Colombia pesticide regulation fits within its larger environmental framework, as per law 99 of 1993, "Fundamentals of the Colombian Environmental Policy". This law created the Ministry of Environment and the National Environmental System and established the "Environmental Licenses" which were further regulated by decrees 1728 of 2002 and 1180 of 2003.

The modernization of Colombia legislation related to pesticides begins with a major law, No.09, approved by the National Congress in January 1979, regulating "hazardous substances, pesticides, and pyrotechnic articles". This is followed by decree No.1843, from 1991, that further "regulates the use and management of pesticides". This decree defined and clarified terms and elements for the registration of pesticides, such as "efficacy", "contamination", "fumigation", "residue limits", "risk"

and "toxicity", and officially adopted the four-classes WHO hazard classification of pesticides[18]. The same decree further regulated the manufacture and distribution of pesticides in the country.

More recently, Colombia has fully adopted the regional norms that derive from the actions taken by the 'Andean Community"(Comunidad Andina, CAN), to which Colombia is a signatory. The CAN, a result of the integration of Bolivia, Colombia, Ecuador, Peru and Venezuela, began activities in 1997 and in 1998, it passed the 'Andean Norm for the Registration and Control of Chemical Pesticides for Agricultural Use" (Decision 436). In it, the five Andean countries committed themselves to a normative towards a common system for registration, control and use of pesticides. CAN decision No.436 established, among other things, (a) the requirements for pesticide registration; (b) norms for labelling and packaging; (c) maximum residue tolerances; and (d) norms for product efficacy research. Later, by resolution 532, of August 2001, CAN adopted the 'Technical Manual for the Registration and Control of Chemical Pesticides for Agricultural Use", which was fully developed and published in June 2002, in Resolution 630. This very comprehensive manual, includes detailed instructions to register chemical pesticides, with all the information requirements on the technical as well as the formulated material, as they relate to efficacy, human and eco-toxicology, residues, labelling, packaging, risks and the environmental management plan. Finally, ICA, as the GOC institution mandated with the registration and control of pesticides, fully norms the application of the CAN decrees internally to Colombia, in its resolution No.00770 of March 2003.

Given this comprehensive and detailed pesticide regulation framework, again, the capacity of Colombia to regulate and control pesticides is only restricted by the general situation of the country, with somewhat weak institutional presence in certain isolated areas. This scenario, however, does not preclude, as we reported above, that ICA authorities are still enforcing some of the pesticide rules and regulations.

4.5.3.11. Provisions for Training in SUP and IPM: 22 CFR 216.3 (b)(1)(i)(k)

The CAD supported SUP training program should focus on risk reduction rather than on safe use of pesticides. In other words, instead of sending the message that pesticides could be used safely, the main goal of the training program should be to reduce the risk of farmers and their families by the careful analysis, and management, of the variables that affect the components of risk:

Risk = toxicity x exposure

This means that the "safer use", through risk reduction, begins before the "use" of the product, during its selection and preparation, and continues well after its use, in the field where the product is applied[19].

[18] The WHO classification: IA (extremely hazardous), IB (highly hazardous), II (moderately hazardous), III (slightly hazardous), and 'U' (improbable of presenting an acute risk in normal use). The LD_{50} used for chronic toxicity is either oral (O) o dermal (D). Colombia uses the same classification but classes are numbered I-IV.

The SUP training could be sub-contracted from Bayer CropScience or from Servicio Nacional de Aprendizaje-Asociación Nacional de Industriales (SENA-ANDI). The former, a chemical company, runs a programme called "Agrovida" that focuses on SUP for farmers or farmers families. Since women and children are in the higher vulnerability group, and women are often involved in the storage of pesticides as well as in cleaning farmer's clothes, they are an audience of extreme importance to be reached with messages of risk reduction. The second is a joint programme between a GoC agency, SENA, and the association of industry and it offers two options, a two-day user targeted training course and a 5-day training-of-trainers event. CAD should consider training a few 'trainers', from the operators' staff, in each one of the regions where it operates.

The contents of the training programme may need to be adjusted as per the various audiences but should include the themes listed in the training program attached, such as risk management, toxicology, labels, transporting, storage, mixing, spraying, cleaning, discarding, container management, applicators protection, etc.

<u>Recommendation No.14:</u> Training on SUP should (a) focus on risk reduction; (b) reach the various important audiences: pesticide dealers, farmers, farmer families (women and children), staff of CAD project operators (trainers); (c) use the already available training offers in Colombia, such as the 'Agrovida' programme, by Bayer CropScience, for farmers and their families (women and children), and/or that of SENA-ANDI joint training programme for farmers and trainers.

As stated previously, in order not to transmit the false idea that pesticides, used safely, could be the sole solution to pest problems, SUP should not be promoted in isolation but rather in the context of a larger, more comprehensive approach to pest management, that of Integrated Pest Management, or IPM. Moreover, training in ecological and organic agricultural concepts and practices may always help CAD project operators to better understand, and even search for and experiment with, non-chemical options for pest control

<u>Recommendation No.15</u>: CAD should promote a holistic agro-ecological approach, not only to pest management but also to crop production. Training, as well as technical support, offers in topics such as IPM, organic or ecological agriculture, are available in Colombia from various institutions. A list of the possible technical partners that CAD could resort to in the search for technical support follows.

[19] For more details see in section 5.3 the Power Point presentation "A Practical Guide: Reducing Pesticide Risk", in Spanish.

Table 9. Possible technical agreements for CAD

Institution	Crop	Theme
CIAT	Cassava, dry-beans, vanilla	Pest & crop management
Fedecacao	Cacao	Pest & crop management
Cenicaña	Sugar-cane	Pest & crop management
Cenipalma	Palm oil, heart of palm	Pest & crop management
Centro de Excelencia en Fitoprotección (CEF)	Tree tomato, lulo, maracuja, tomatoes, Amazonian fruits	Quarantine, pest management, pest risk analyses
Corpoica	Various	IPM in general; training
CONIF	Forest plantations, nurseries	Pest & crop management
IICA	Various	Ecological agriculture
IPGRI	Various	Quarantine & plant introductions
ICA	Various	Pesticides: registration & control; training
SENA	Various	IPM & organic agriculture; SUP; training
ANDI	Various	SUP training
Bayer CropScience	Various	SUP training: Agrovida
SGS / BioTrópico	Various	Certifications

4.5.3.12 Monitoring effectiveness and use of the pesticides: 22 CFR 216.3 (b)(1)(i)(l)

CAD is working with farmers associations and enterprises that have a relatively good level of organisation. Most have very well trained field technicians that are regularly monitoring the pest management problems and the effectiveness of pest management methods being used. Open and regular reporting lines exist within CAD project operators and Chemonics to communicate issues such as new pests' appearances as well as failures of the standard methods being used. Moreover, the Natural Resources and Environment group of Chemonics has the capacity for, and it is taking a lead role in, monitoring the most significant environment related variables of the project, including the effectiveness of pesticides.

4.5.4. Environmental Compliance

4.5.4.1. Monitoring

A set of indicators for compliance with the recommendations of this PERSUAP, grouped by major themes is being proposed and presented in the table below.

Table 10. Monitoring Plan for PERSUAP Recommendations

Monitoring Theme	Recommendation	Indicator/s	Special Requirements
Sustainable alternative development	1	♦ Poly-cropping promoted & adopted by farmers ♦ System approach to alternative development in place, promoted & being implemented	Re-asses promotion of crops versus systems
Phytosanitary system for movement of plant materials	2	♦ ICA certification in place for internal movement of plant materials ♦ Quarantine in place for foreign materials	Establish links with ICA
Safer Use of Pesticides: hazard awareness, pesticide phase out, pesticide screening, training programme, equipment support, risk analysis	3, 4, 5, 8, 9, 10, 12, 13	♦ Operators aware of colour band meaning in products & using info for selecting pesticides ♦ Operators pesticide request list regularly checked by CAD-NRE[20] team ♦ Trend for decreased 'red & yellow' band pesticides request lists ♦ No monocrotofos & paraquat by Dec '03 ♦ No methomyl & others by Aug 04 ♦ No chlorpyrifos, carbofuran & others by Aug 05 ♦ SUP KAP changed ♦ Parts & repairs offered for spray equipment	Training programmes contracted & courses offered. Financial resources from CAD allocated for training & equipment
Integrated Pest Management: training (IPM, Eco), bio-pesticides, field demos	6, 7, 11, 14	♦ Ecological agriculture & IPM training contracted, offered, finished & KAP[21] monitored ♦ IPM demo fields installed & monitored for all crops ♦ Operators aware of & using bio-pesticides ♦ Operators using a wide range of pest management practices (more than 3 per pest)	Training programmes contracted & courses offered. Financial resources allocated for IPM demos
Sustainability of Environmental Compliance	16	♦ Market-led environmental compliance through: organic agriculture, EurepGap, Illicit-to-Licit or other type of certification in place, or ♦ A third party system installed for auditing environmental compliance	Contacts made, bids open, resources allocated to initiate / catalyse both processes

4.5.4.2. Long term sustainability

Environmental compliance with Regulation 216, vis-à-vis pesticide issues could be assured through the auditing role of Chemonics NRE group. This group could possibly check the pesticide lists that CAD project operators regularly submit to Chemonics for approval and screen the pesticides appropriately. It may also field check project operators to inspect pesticide storage buildings, follow up some field operations and check on pesticide selection, mixing and use. [This has already been proposed in Recommendation No.8]. However, since this monitoring is based mainly on a 'policing' approach to compliance, its sustainability is somewhat questionable. Although, an important

[20] Natural Resources and the Environment
[21] KAP: Knowledge, Attitude and Practices.

'educational' component, on SU and IPM, has been included in this PERSUAP, farmers may 'comply' with environmental regulations only and as long as the policing pressure is maintained. And this will only happen as long as USAID and Chemonics continue with the funding and implementation of CAD. But it may end right after that …

A fundamentally similar approach, but one that promotes a more direct participation, and so appropriation of environmental compliance issues, by the Colombian civic society, is that of allocating the 'policing' role to a 'third party' local NGO, or consultant. The profile of this auditor may be similar to the NGOs or consultants that Chemonics NRE group has already contracted to do the environmental studies of CAD productive activities. The local, Colombian, NGOs and consultant companies visited have demonstrated the capacity and the interest to undertake such work. Based on the table above, and on the 16 recommendations of this PERSUAP, CAD could develop a more detailed monitoring plan, agreed to among USAID, Chemonics, and the CAD operators, and assign a third party agency its verification following a system of open bids, as it is normally done in CAD.

A more sustainable path to environmental compliance may be that of a 'market-led' mechanism. If the market rewards an environmentally sound, clean, ecological or whatever the label is, produce then farmers will have to comply with certain production norms in order to be able to access and receive that reward. Third party certification is the key to this and not necessarily has to take the form of purely 'organic' production. Some of the Colombian certifying agencies contacted, such as *Biotrópico,* are working on organic produce certification, with the support of IFOAM, but also certify other producers. Among the latter are the coffee growers associated in COSURCA, exporting 'fair trade' coffee to the US market, in a project funded by USAID and UNDP. Other enterprises, such as the Swiss SGS, are certifying aromatic plant producers for EurepGap norms as well as Colombian flower exporters. Finally, the fruit growers association ASPROME, based in Cali, is exporting 'organic marmalades' to Europe, certified by Naturland-IFOAM, from fruits produced in a project funded by GTZ, the German Government and the European Community. The certification system is so simple as to work out a detail set of agreed rules, and corresponding indicators to track them, between producers, donors, project implementers and the certifying agency. The rules could easily be those established as environmental compliance requirements in Regulation 216, tracked by indicators such as pesticides registered with Colombia-ICA and US-EPA, no RUP pesticides, no class IA and IB products, etc. Again, the table and the 16 recommendations could be used as the basis for a framework for certification of USAID environmental compliance.

<u>Recommendation No.16</u>: CAD is encouraged to seek a sustainable mechanism for pesticide environmental compliance. This could take the form of (a) a third party independent auditor of the use and management of pests and pesticides by project operators; and/or (b) a market lead environmental (vis-à-vis pesticides) compliance mechanism through a third party, independent, certification agency that assures 'organic', 'EurepGap', 'low-intensity pesticide usage', 'IPM-based', or Regulation 216-based … agricultural production.

4.5.5 Training and Best Agricultural Practices Plan (BPA).Pursuant to Recommendations in the Pesticide Evaluation Report and Safe Use Action Plan PERSUAP[22]

Insect pests[23] are one of the principal problems affecting agricultural production and crops, decreasing productivity and/or product quality, resulting in important economic losses. Moreover, improper management and abuse of pesticides utilized in pest control may also lead to severe economic losses and negative environmental impacts (air pollution, contamination of soil and water resources) as well as loss of biodiversity and other negative effects. The combination of the negative factors mentioned above also cause the worst of all affectations i.e., the health of agricultural workers, their families and even, the health of consumers of agricultural products, is threatened.

CAD complies fully with USAID's provisions, the grantee agency, established in USAID's regulation 216. CAD has already carried out detailed environmental assessments of productive agricultural and transformation activities that are being or will be supported by the project. Such studies are known as Environmental Assessments (EA) and include, normally, an environmental diagnosis of the project site, a study of potential impacts caused by project activities and an environmental management plan that proposes prevention and mitigation measures of possible environmental impacts caused by development activities.

Specifically, CAD just completed phase 1 of a detailed study no pesticides currently used in more than 20 productive projects, including alternative methods to replace the use of pesticides available in Colombia for agricultural pest management. CAD is presently implementing phase 2 of this study covering almost 40 additional crops. This study, called "Pesticide Evaluation Report and Safer Use Action Plan", or PERSUAP, follows closely the requirements stated in Regulation 216 of the United States Government applicable to each type of pesticide that may or will be used in CAD projects, planned or recommended, for crop pest management, as called for in 12 sections of Regulation 216, including:

1. Status of registration of pesticides in Colombia and with USEPA;
2. Basis for selection of pesticides for any particular application; why was such pesticide selected?
3. To which extent is pesticides part of Integral Pest Management systems?
4. Methods of application, including availability and use of appropriate equipment for application of pesticides and protective measures;
5. Acute long-range risks to humans and the environment, associated to proposed use of pesticides and available measures to reduce dangers thereof;
6. Efficacy of selected pesticides to meet expected results;
7. Compatibility of pesticides with natural ecosystems within their main objectives or other project objectives proposed;
8. Conditions under which pesticides will be used, including weather, flora, wildlife, geography, hydrology and soils;

[22] Draft No. 3, 29 October 2003

[23] The term Pest utilized through this document refers to its broad generic meaning, including insects, other arthropods and invertebrates, several pathogens, weeds and vertebrates.

9. Availability and effectiveness of other pesticides and/or non-chemical methods to control target pest(s);
10. Capability of operators and project implementers throughout Colombia to regulate or controlling distribution, storage, use and final disposal of pesticides;
11. Provisions for training of pesticide users and operators;
12. Provisions for effective monitoring, use and efficacy of pesticides.

The study mentioned above includes a list of (a) **banned pesticides**, prohibited in Colombia and in The United States (the donor country) or in both countries; (b) **products not approved,** or restricted in The United States, or products potentially harmful to human health or the environment in Colombia. A process of substitution of these products within a 0.5 – 1 year timeframe has been established; and (c) **approved products** that may be utilized in CAD projects. Beyond the strict control measures exerted by CAD on the use of pesticides in CAD projects, there is a commitment to promote the Best Agricultural Practice (BPA) production activities, including Integrated Pest Management (MIP) and Safe Use of Chemical Pesticides (USP), to contribute to sustainable alternative development. With this in mind, CAD developed a far-reaching training plan in support of BPA, MIP and USP.

Objectives

The Training Plan follows-up the application of PERSUAP recommendations. Its general objective is to develop technical capacity within CAD project operators, at the technical and production levels, to implement clean environmental production systems contributing to minimize hazardous risks on producers and consumers health. This plan was developed to assure that CAD not only complies with PERSUAP recommendations, but also will meet program indicators and goals listed in the Monitoring Plan, in regards to use of pesticides and agricultural pest management activities carried out by project operators.

Specifically, the Training Plan aims to develop particular and broad technical skills in (a) **safer use of pesticides in agriculture**, such as apropriate approaches: ecological, economical and social; (b) **integrated management of agricultural pests**, applying appropriate technological, economic and social systems approach; (c) **ecological or organic agricultural production**, if such approach is economically feasible within a production methodology context applicable to protection of the environment and human health. The proposal aims towards offering general training and specific training to technicians to strengthen their capability, thus enabling technicians to offer productive options to participant farmers, including social, economical and environmentally acceptable elements.

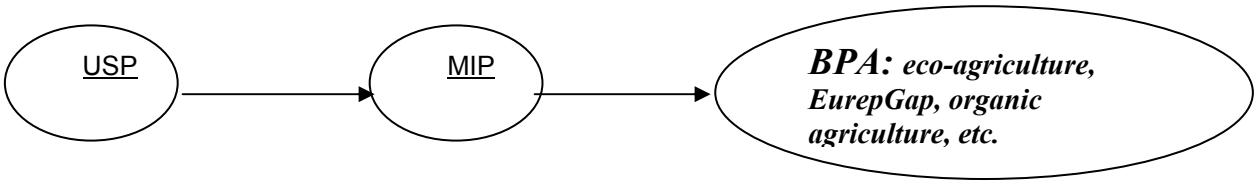

Table 11
Rubber Pests (*Hevea brasiliensis)* and Management Guidelines

Pest(s)	Control Methods	Pesticides[i]	Problems
Arthropods:			
Horn worm (*Erinnys ello*)	Biologic: (a) parasitoids, *Trichogramma* sp., and predators, *Chrysopa* sp. and (b) microorganisms, *Bacillus thuringiensis* and Baculovirus	*Trichogramma* sp. *Chrysopa* sp. *Bacillus thuringiensis*	Available through BioCaribe distributors.
	Mechanical: manual collection of larvae		
	Cultural: turn soil over, take out weeds, rotate crops.		
	Physical: black light trap		
	Chemical:	Carbofurán, clorpirifós	PUR. See recommendation
Army ant (*Atta* spp.)	Chemical: use insufflators to apply products into nests.	Clorpirifós	PUR. See recommendation
Termites (*Coptotermes* sp.)	Cultural: Destruct termite nests		
	Chemical: use insufflators to apply products into nests.	Carboxín, clorpirifós, profenofós, dimetoato	Clorpirifós and profenofós are PUR. See recommendation.
Diseases:			
South American leave blight (*Microcyclus ulei*)	Genetic: resistant clones or cup grafts		
	Chemical:	Benomyl, mancozeb	
Black scab (*Phyllachora huberi*)	Chemical:	Benomyl	
Air stain (*Thanatephorus cucumeris*)	Chemical:	Mancozeb, Copper base fungicides, triadimefón	Several applications during the rainy season.
Antracnosis (*Colletotrichum gloesporoides*)	Chemical:	Copper, sulfate and oxichlorides, clorotalonil	PUR. See recommendation
Mancha foliar (*Corynespora cassiicola*)	Chemical: sensible to several fungicides.		

[i] Pesticides mentioned in this Table are not necessarily recommended in CAD projects. Check recommendations in pesticide Tables.

Pest(s)	Control Methods	Pesticides[i]	Problems
Diseases:			
Foliar burning or black stripe in cutting panel (*Phytophthora palmivora*)	Chemical: in abundant and continuing rainy periods	Metalaxyl	
	Cultural: do not plant in humid areas, do not use susceptible clones. Choose short-foliar renewal clones, infected low branches pruning.		
Malezas:			
Malezas: several spp.	Mechanical: machete and scythe.		
	Chemical:	Glifosato	

Technical Assistance , Training and Contact Sources:

Nain Refferences and Bibliography:

1. Ramírez C., L. A. 1998. Selected rubber diseases (*Hevea*). Plant Protection Bulletin No.3. CONIF

[i] Pesticides mentioned in this Table are not necessarily recommended in CAD projects. Check recommendations in pesticide Tables.

Table No. 12
Basis for the selection of Rubber crop Pesticides
[Addresses Reg. 216 point (b)]

Pesticide		Uses		Basis for Selection
Technical Name or Active Ingredient	**Trade or Commercial Name in Colombia**	**Crop**	**Pest**	
Bacillus thuringiensis	Xentari, Ecotech-Pro, Turilav, Thuricide, Javelín, Batón, Dipel	Oil palm & rubber	*Loxotoma elegans* & *Erinnys ello*	Effectiveness; No health & environmental impacts
Benomyl	Benlate, Benomil, Benoagro	Rubber Cassava Plantain Heart of palm Nurseries	*Microcyclus ulei, Phyllachora, Sphaceloma manihoticola, Mycosphaerella fijiensis* & *M. musicola* *Ralstonia solanacearum* Damping off	Cost. Availability. Effectiveness. Wide spectrum of pathogens controlled.
Carbofuran	Furadan, Carbofed, Curater, Furalimor, Fursem, Carbofuran	Cassava Rubber Plantain Nurseries Pastures	White grubs (various species) *Erinnys ello* *Cosmopolites sordidos* Nematodes Mión	Cost. Availability. Effectiveness. Wide spectrum of insect pests controlled.
Carboxin	Vitavax	Heart of palms / Seed treatment	Seedling diseases	Cost. Availability. Effectiveness.
Chlorotalonil	Bravo, Bravonil, Centauro, Visado, Clorotalonil, Clortocaffaro, Clortosip, Control, Daconil, Diclan, Echo, Helmonil, Pugil, Ridonate	Rubber	*Colletotrichum gloesporoides*	Cost. Availability. Effectiveness.
Chlorpyrifos	Lorsban, Clorpirifós, Clorpiricol, Arriero	Plantain Oil Palm Cassava Rubber, Forest plantations	*Metamasius hemipterus,* defoliant. Sting bugs. *Strategus aloeus* Ants (*Atta* spp.) & stem cutters (various spp.) & white grubs. Erynnis ello.	Cost. Availability. Effectiveness. One of the very few products used for ant control. Wide spectrum of insect pests controlled

Pesticide		Uses		Basis for Selection
Technical Name or Active Ingredient	**Trade or Commercial Name in Colombia**	**Crop**	**Pest**	
Copper sulphate + cal (Bordeaux mixture)	Bordeaux mix	Heart of palm, oil palm, Rubber Vanilla Nurseries	*Pestalopsis sp. Colletotricum sp. Fusarium oxysporum & Phytophthora sp.* Damping off	Effectiveness. Limited health & environmental impacts. Easiness to prepare.
Copper oxychloride	Agrotox, Coper-pro, Coperflow, Cuprene, Oxiclor, Oxicloruro de Cu	Cassava	*Xanthomonas axonopodis pv.* Manihotis	Cost. Availability. Effectiveness.
Dimethoate	Sistemín, Sistoato, Trifosix, Agrixon, Agrometox, Di-metox, Perfektion, Roxion, Siscrop	Rubber	Termites	Cost. Availability. Effectiveness. One of the few products for termites.
Gliphosate	Roundup	Cacao Oil palm, Heart of palm, Rubber, Plantain, Forestry plantations	Cacao plants affected by *Rose-llinia pepo* Weeds in general	Effectiveness. Reduced health & environmental impacts. Cost. Availability.
Malathion	Inition, Cropthion, Fyfanon, Malathion, Algodonero	Cacao Rubber Cassava	Ants (*Atta* sp.), 'stings bugs'. Defoliants. Stem borers (*Coelosternus,Lagochirus*, *Chilomima*)	Cost. Availability. Effectiveness.
Mancozeb	Manzate, Curzate, Dithane	Plantain Oil palm Rubber Heart of palm	*Ralstonia solanacearum* (Moko or maduraviche) Stem rottening Round spot Southamerican disease*(Microcyclus ulei)*	Cost. Availability. Effectiveness.
Metalaxyl	Ridomil (only in mixes with mancozeb)	Cacao Cassava Rubber	*Phytophthora Phythophtora y Xanthomonas Phytophthora palmivora*	Cost. Availability. Effectiveness. Unique product for Phytophthora control.

Pesticide		Uses		Basis for Selection
Technical Name or Active Ingredient	**Trade or Commercial Name in Colombia**	**Crop**	**Pest**	
Profenofos	Curacrón, Lancero, Awake	Rubber	Termites (*Coptotermes* sp.)	Cost. Availability. Effectiveness. One of the few products for termites.
Triadimefom	Bayleton	Rubber	*Thanatephorus cucumeris*	Cost. Availability. Effectiveness.
Trichograma pretiosum	Trichogramma	Various	Various	Effectiveness. No health & environmental impacts

Table No. 13
Rubber crop Pesticides[i]
Registration, Problem Analysis & Preliminary Decision [Reg. 216 point (a)]

Pesticide			Crop/s	Pest / s	Type of problem, if any[ii]	Recommenda-tions & alternative/s
Technical Name[iii]	**Trade Name[iv]**	**Type & Tox Class[v]**				
Bacillus thuringiensis	Xentari, Ecotech-Pro, Turilav, Thuricide, Javelín, Batón, Dipel	Microbial insecti-cide: bacteria. WHO TC: not available; Colombia TC: U.	Oil palm, rubber, potato	*Loxotoma elegans* & *Erinnysello Tecia solanivora*		**Approved.**
BENOMYL	Benlate, Benomil, Benoagro	Fungicide.WHO TC: U; Colombia TC III.	Rubber Cassava Plantain Nurseries Heart of palm	*Microcyclus ulei, Phyllachora, Sphaceloma manihoticola, Mycosphaerella fijiensis* & *M. musicola Ralstonia solanacearum* Damping off *Colletotrichum* spp.	In the 'Bad Actor' list of PAN for possible carcinogenic & reproductive toxin.	**Approved.**

[i] Includes the pesticides being mentioned for the crops in question, requested by CAD project operators and/or recommended as part of pest management programmes for these crops.
[ii] Toxicological class, RUP, registration in the USA, registration in Colombia.
[iii] Toxicological class, RUP, registration in the USA, registration in Colombia
[iv] Name under which is sold in Colombia
[v] Type of action: fungicide, insecticide, herbicide, etc. As per WHO classification: IA (extremely hazardous), IB (highly hazardous), II (moderately hazardous), III (slightly hazardous), and U (improbable of presenting an acute risk in normal use). The LD_{50} used for chronic toxicity is either oral (O) o dermal (D). WHO TC is that of the active ingredient. Colombia TC is that of the formulated product available in the country.

Pesticide			Crop/s	Pest / s	Type of problem, if any	Recommenda-tions & alternative/s
Technical Name	**Trade Name**	**Type & Tox Class**				
Carbofuran	Furadan, Carbofed, Curater, Furalimor, Fursem, Carbofuran	Insecticide, nematicide. WHO TC IB; Colombia TC I	Cassava Rubber Plantain Nurseries Pastures Potato	White grubs (various species) *Erinnys ello* *Cosmopolites sordidos* Nematodes Mión *Premnotrypes* & others	RUP with USEPA (Except pellets /tablets). In 'Bad Actor' list of PAN: cholin-esterase inhibitor & acute toxicity. Organophosphate In IRED-04 list.	**Should not be used.** Excep pellets/tablets for 24 months maximum. Revise registration status in 2004.
Carboxin	Vitavax	Fungicide. WHO TC U; Colombia TC III	Heart of palms / Seed treatment	Seedling diseases	In 'Bad Actor' list of PAN for possi-ble reproductive toxin. In IRED-04 list.	**Approved.** But pending re-registration with USEPA in 2004.
Chlorothalonil (clorotalonil)	Bravo, Bravonil, Centauro, Clorotalonil, Clortocaffaro, Clortosip, Control, Daconil, Diclan, Echo, Helmonil, Pugil, Ridonate, Visado	Fungicide. WHO TC U; Colombia TC II	Rubber Dry beans Potato	*Colletotrichum gloesporoides* *Phythophthora* & rust	RUP with USEPA. In 'Bad Actor' lis of PAN for possi-ble carcinogenic & acute toxicity.	**Should not be used. Phase out in 24 months.**

Pesticide			Crop/s	Pest / s	Type of problem, if any	Recommenda-tions & alternative/s
Technical Name	**Trade Name**	**Type & Tox Class**				
Chlorpyrifos (Clorpirifós)	Lorsban, Clorpirifós, Clorpiricol, Arriero	Insecticide, nematicide. WHO TC II; Colombia TC III	Plantain Oil Palm Cassava Rubber, Forest plantations Potato	*Metamasius hemipterus,* defoliant. Sting bugs. *Strategus aloeus* Ants (*Atta* spp.) & stem cutters (varias spp.) & white grubs. Erynnis ello. *Premnotrypes* & *Tecia*	RUP with USEPA In the 'Bad Actor' list of PAN: cholinesterase inhibitor. Organophosphate.	**Should not be used. Stop using formulations EC & WP within 12 months. Elimi-nate all formu-lations within a max of 24 month.** For the time being & to reduce risk, use only granular formulation.
Copper sulphate + cal [Cobre, sulfato de + Cal (carbonato de calcio)]	Bordeaux mix	Cu sulphate: fungicide, algaecide, moluscicide. WHO TC II.	Heart of palm, oil palm Vanilla Nurseries	*Pestalopsis sp.* *Colletotricum sp.* *Fusarium oxysporum* & *Phytophthora sp.* Damping off	Bordeaux mix is not registered with USEPA but Cu sulphate & Ca carbonate yes, each separately.	**Approved.**
Copper oxychloride (cobre, oxicloruro)	Agrotox, coper-pro, coperflow, cuprene, oxiclor, oxicloruro de cu	Fungicide. Who tc iii; colombia tc iii.	Cassava	*Xanthomonas axonopodis pv.* Manihotis	Rup with usepa.	**Should not be used. Phase out in 24 months**
Dimethoate (dimetoato)	Sistemín, sistoato, trifosix, agrixon, agrometox, di-metox, perfektion, roxion, siscrop	Insecticide. Who tc ii; colombia tc ii	Rubber	Termites	In the 'bad actor' list of pan: cholinesterase inhibitor. Organophosphate in ired-03 list.	**Aproved**. But pending re-registration with usepa in 2003.

Pesticide			Crop/s	Pest / s	Type of problem, if any	Recommenda-tions & alternative/s
Technical Name	**Trade Name**	**Type & Tox Class**				
Gliphosate (glifosato)	Roundup	Herbicide. Who tc u; colombia tc iii ó iv	Cacao Oil palm, Heart of palm, rubber, plantain, forestry plantations	Cacao plants affected by *rosellinia pepo* Weeds in general		**Approved.**
Malathion	Inition, cropthion, fyfanon, malathion, algodonero	Insecticide. Who tc iii; colombia tc ii-iii	Cacao Plantain Cassava	Ants (*atta* sp.), 'stings bugs'. Defoliants. Stem borers (*coelosternus,lagochirus*, *chilomima*)	In ired-03 list. In 'bad actor' lis of pan for cholinesteras e inhibitor. Organophosphate.	**Approved.** But pending of re-registration with usepa in 2003.
Mancozeb	Manzate, Curzate, Dithane	Fungicide. WHO TC U; Colombia TC III	Plantain Oil palm & heart of palm Rubber Forestry Papa	*Ralstonia solanacearum* (Moko or maduraviche) Pudrición cogollo Mancha aerolada Mal suramericano *(Microcyclus ulei)* Oak rust. *Phythophtora*	In RED-04 list. In 'Bad Actor" lis of PAN for possible carcino-genic & repro-ductiv e toxin.	**Approved.** But pending re-registration with USEPA in 2004.
Metalaxyl (Metalaxil)	Ridomil (only in mixes with mancozeb)	Fungicide. WHO TC III; Colombia TC III	Cacao, Potato Cassava Rubber	*Phytophthora* *Phythophtora y Xanthomonas* *Phytophthora palmivora*	It was in re-registration with US-EPA.	**Approved.** Re-registration approved by USEPA in Sep 1994.

Pesticide			Crop/s	Pest / s	Type of problem, if any	Recommenda-tions & alternative/s
Technical Name	**Trade Name**	**Type & Tox Class**				
Profenofos	Curacrón, Lancero, Awake	Insecticide. WHO TC II; Colombia TC II ó III	Rubber Potato	Termites (*Coptotermes* sp.) Stem cutters & others	RUP with USEPA. In 'Bad Actor" list of PAN for choli-nesterase inhibitor. Organophosphate	**Should not be used. Phase out in 24 months.**
Triadimefon	Bayleton	Fungicide. WHO TC III; Colombia TC IV	Rubber, Forestry plantations	*Thanatephorus cucumeris, Prospodium*	In 'Bad Actor" list of PAN for repro-ductive toxin.	**Approved.**
Trichogramma pretiosum	Trichogramma	Biological antagonist of insects: parasitoid wasp. TC not available.	Various	Various	Registered in Colombia. Not yet with USEPA	**Approved**. Microbial product with unlikely environmental impact

Pesticide			Crop/s	Pest / s	Type of problem, if any	Recommenda-tions & alternative/s
Technical Name	**Trade Name**	**Type & Tox Class**				
Verticillum lecanii	Vertisol	Microbial insecti-cide: entomo-pathogen fungi. TC not available.	Heart of palm	Defoliants	Not registered with USEPA. Both crop & pest do not exist in the USA. Registered in Finland, UK & Holland.	**Approved.** Microbial product with unlikely environmental impact.

Table No. 14
Rubber Pesticides – Risk Analysis

Pesticide[i]	Acute Tox Class[ii]	Type	Chronic Toxicity	Eco-toxicity	Groundwater Contamination Potential	Mitigation of risks / Comments [iii]
Bacillus thurin-giensis	WHO: not availa-ble. Colom-bia: III	Micro-bial insecti-cide: bacteria	Unlikely to cause any effect. No indication of reproductive, teratogenic & carcinogenic effects. Possible some mutagenic effects in plants.	Bio-product with unlikely environmental impact. Not toxic to fish, birds & other animals.	No evidence for potential ground water contamination.	Repeated applications over extended periods may promote the development of resistance. Rotate products.
Benomyl	WHO: U; Colom-bia: III	Fungi-cide	Possible carcino-genic & inducer of developmental & reproductive toxin promoter. Suspected endocrine disrupter.	Moderately toxic to birds & highly toxic to fish	There is insufficient data regarding poten-tial ground water contamination.	Uses of benomyl should be controlled vis-à-vis possible environmental impacts on non-target spp.
Carbo-furan	WHO: IB; Colom-bia: I. High acute toxicity	Insecti-cide, nemati-cide	Organophosphate = cholinesterase inhibitor. Liquid formulations pose serious threat to applicators (RUP reason). Highly toxic by ingestion & inhalation & modera-tely by dermal exposure.	Granular formulations pose serious threat to birds & possible other animals (RUP reason). Highly toxic to birds & fish.	High water solubility & so potential for ground water contamination.	RUP. Carbofuran uses should be minimised & carefully controlled to prevent human & envi-ronmental contamination. In IRED-04. Revise registration status in 2004
Carboxin	WHO: U; Colom-bia: III	Fungi-cide	Posible reproductive toxin promoter. No other effects have been observed.	Non toxic to bees & birds but highly toxic to fish.	No evidence for potential ground water contamination has been found.	In IRED-04. Revise registration status in 2004. Care should be taken not to expose fish
Chlorota-lonil	WHO: U; Co-lombia: II.	Fungi-cide	Possible carcinogenic; unclear potential. No other effects except the fact that it is a strong eye & skin irritant	Non toxic to birds & bees. Highly toxic to fish, aquatic invertebrates & marine organisms.	Some potential but yet unclear.	RUP. Chlorothalonil should be used carefully & in supervised manner to prevent human health & environmental impacts

[i] Technical name or active ingredient

[ii] As per WHO classification: IA (extremely hazardous), IB (highly hazardous), II (moderately hazardous), III (slightly hazardous), and U (unlikely to present acute hazard in normal use). The LD_{50} used for acute toxicity is either oral (O) or dermal (D). Colombia uses the same scale but classes numbered I-IV.

[iii] General mitigation tactics to (a) reduce human exposure risk: protective clothing (mask, hat, glasses, long sleeves shirt, long pants, boots, gloves or plastic bags, washing clothing, no food, no drink, no smoking, no re-entry to fields, etc.) and (b) reduce environmental risks (mix exact amounts, no spray close to water bodies, to bee hives, to bird nesting areas, avoid windy days, etc.) are part of a more general SUP.

Pesticide	Acute Tox Class	Type	Chronic Toxicity	Eco-toxicity	Groundwater Contamination Potential	Mitigation of risks / Comments
Chlorpyri-fos	WHO: II; Colom-bia: III	Insecti-cide, nemati-cide	Organophosphate = cholinesterase inhibitor. No other adverse effects except those associated to central nervous system.	May be toxic to some plants, e.g. lettuce. Mod-very toxic to birds & very highly toxic to fish & aquatic organisms	Unlikely to leach & contaminate water.	RUP. There is a 24 hour minimum re-entry time for field treated with it. Applications should be carefully supervised to prevent human & environmental exposure.
Copper sulphate + cal (Bordeaux mixture)	WHO: II; Colom-bia: not availa-ble	Fungi-cide	No evidence for chronic effects in humans is available.	No evidence for adverse effects on the environment.	No evidence for potential for water contamination.	
Copper oxychlor-ide	WHO: III; Colomb ia: III	Fungi-cide	Acute effects include irritation of eyes & skin. Chronic toxicity includes hepatic cirrhosis & brain damage.	No evidence for adverse effects on the environment.	No evidence for potential for water contamination.	RUP To be used with caution because of its possible human health impacts.
Dimetho-ate	WHO: II; Colom-bia: II	Insecti-cide	Organophosphate = cholinesterase inhibitor. Possible carcinogenic & promoter of reproductive toxin.	Moderately to very highly toxic to birds, highly toxic to honeybees & moderately toxic to fish.	Highly soluble in water & poorly adsorbed in soils so it is a potential water contaminant.	In IRED-03. Revise registration status in 2003. Should be used very carefully to prevent water contamination & effects in bees & birds.

Pesticide	Acute Tox Class	Type	Chronic Toxicity	Eco-toxicity	Groundwater Contamination Potential	Mitigation of risks / Comments
Gliphosate	WHO U; Colom-bia: III-IV	Herbi-cide	No evidence of any carcinogenic, teratogenic, mutagenic effects.	Slightly toxic to birds, non toxic to fish & bees.	Unlikely due to soil adsorption.	
Malathion	WHO III; Colom-bia: II-III	Insecti-cide	Organophosphate = cholinesterase inhibitor. Possible carcinogenic & suspected endocrine disrupter	Highly toxic to honey bees, moderately toxic to birds & variable toxicity to fish	Possible contaminant. It has been detected in well & ground waters.	In IRED-03. Revise registration status in 2003. Malathion should be used with great care in order not to expose workers & prevent water contamination & effects on bees & birds
Mancozeb	WHO: U; Colom-bia: III	Fungi-cide	Possible carcinogenic, reproductive toxin promoter & endocrine disrupter	Moderately to highly toxic to fish, slightly toxic to birds & not toxic to bees	Not a possibility.	In IRED-04. Revise registration status in 2004. Use with care to minimise workers exposure.
Metalaxyl	WHO: III; Colom-bia: II	Fungi-cide	Carcinogeneicity still unknown. No other effects on humans.	Practically not toxic to birds, bees & fish	Potential water contaminant	Re-registration approved by USEPA in Sep. 94
Profenofos	WHO: II; Colom-bia: II-III	Insecti-cide.	Organophosphate = cholinesterase inhibitor	Highly toxic to fish	Potential ground water contaminant	RUP with USEPA . Application should be a reduced rate, protect applicators, do not apply near water bodies.

Pesticide	Acute Tox Class	Type	Chronic Toxicity	Eco-toxicity	Groundwater Contamination Potential	Mitigation of risks / Comments
Triadime-fom	WHO: III; Colom-bia: IV	Fungi-cide.	Possible carcinogenic, possible reproductive toxin promoter & suspected endocrine disrupter	Slightly toxic to birds & fish & not toxic to bees.	Potential for ground water contamination	Protect applicators & minimise exposure
Tricho-grama pretiosum	WHO & Colom-bia: not availa-ble.	Biolo-gical anta-gonist: parasi-tic wasp.	Unlikely to cause any effect. No indication of carcinogenic, teratogenic, reproductive or mutagenic effects.	Bio-product with unlikely environmental impact. No adverse effects in animals. Naturally occurring in soils.	Unlikely contaminant.	Not yet registered with USEPA.

Table No. 15
THE PROHIBITED ONES
Pesticides PIC, Prohibited, Restricted or Cancelled
In Colombia and/or in the USA

Pesticide[i]	PIC List[ii]	Registration status in[iii]	
		Colombia	United States
Aldrin	Yes	P (1974 in tobacco), c (1988)	No
BHC		P (1974 in tobacco), P (1978 in coffee), P (1993)	No
Methyl Bromide		P except for quarantine (1996)	RUP
Canphechlor		P (1978 in coffee), C (1988), P (2000)	No
Captafol	Yes	P & C (1989)	No
Chlorinated in tobacco		P (1974)	No
Chlordane		P (1974 in tobacco), C (1988), P (1993)	No
Chlordimeform		P (1987), C (1988)	No
DBCP (di-bromo-chloro-propane)		P (1982)	No
DDT		P (1974 in tobacco), P (1978 en café), P except in health (1986), P (1993)	No
Dicofol		P (1993)	Yes
Dieldrin		P (1974 in tobacco), C (1988), P (1993)	C
Dinoseb		P (1987)	C
Dodecachlor (Mirex)		P (1993)	C
2,4,5-T & 2,4,5-TP		C (1979)	C
Endosulfan		P except for coffee borer (1993 & 1997)	RUP
Endrin		P (1974 in tobacco), P (1985)	No
Ethylene di-bromine (EDB)		P (1985)	No
Fonofos		P (1992)	No
Fosfamin		C (1997)	RUP
Mercury Fungicides		C (1974)	No

[i] Technical name.
ii.The list of products for "**Previous International Consent**", or "**PIC**" (1998), of the United Nations Environment Programme (UNEP) and the Food and Agriculture Organisation (FAO). FAO leads in relation to pesticides. Allow importing countries to better know the potentially hazardous products that may be sent.
iii. "**P**" = "**Prohibited**" = "**Banned**" = the uses of the product are not permitted in the country, by explicit decision of the regulatory agency. "**R**" = "**Restricted**" = in the sense of the USEPA, it is a pesticide that can only be applied by a certified applicator. "**C**" = "**Cancelled**" = registration cancelled without a specific prohibition. No: not registered.

Pesticide	CIP List	Registration status in	
		Colombia	United States
Heptachloro		P (1974 in tobacco), C (1988) P (1993)	No
Isazofos		C (1996)	No
Leptofos (Phosvel)		C 1977	No
Lindane		P (1978 in coffee), C (1993), P except in health (1993), P (1997)	RUP
Maneb		C (1989), P (1993)	Yes
Metamidophos	Yes	Yes	Yes
Monocrotophos	Yes	Yes	Yes
Organochlorines in general		P (1974 in tobacco), P (1978 in coffee)	No
Paraquat		P aerial application (1989)	RUP
Parathion & methyl-parathion	Yes	R only for cotton & rice (1991)	RUP
Pentachlorophenol (PCP)		P (1993)	GUP & RUP (treatment of wood)
Posphamidon	Yes	No	No
Toxaphene		P (1975 in tobacco), p (2000)	No
Zineb		P (1993)	No

SECTION 5 ENVIRONMENTAL CONSEQUENCES

5.1 INTRODUCTION

The preceding volumes in this report contain an in-depth presentation of the development and results of the *Environmental Assessment* and the *Environmental Valuation* phase, as key and substantive EA components of the rubber project and its location in several municipalities in the Caquetá and Putumayo departments. Frequently mistaken assumptions found in EAs hold that if the impacts have been properly identified and evaluated, then the study has been properly completed --and that those in charge of decision-making will therefore be safely able to proceed with and decide on the environmental future of the project. All this meticulous work, such as what has been accomplished to date in the rubber project, will be of no value if not explicitly included in a proposals framework designed to eliminate, neutralize, reduce or offset the principal environmental impacts produced by the project, particularly during the implementation and operation phases.

This is perhaps the most specific report produced as part of the EA process. It includes a summary of the measures used by designers, implementers, operators and even interested parties to determine the minimum sustainability and environmental equilibrium conditions of the proposed action, which is the substitution of 1,250 hectares of coca plants by 2,500 hectares of rubber plants in agroforestry arrangements, together with temporary plantain, manioc and pepper crops, among others. The Environmental Management Plan (EMP), as this fourth report has been titled, is an in-depth view of topics and measures related to environmental prevention, mitigation and correction, for all impacts rated medium (M), high (H) or very high (VH) in the environmental assessment phase, which is contained in the preceding report. The text has been prepared so it may be included in a very didactic and effective manner, within the implementation and operation process of the rubber projects, in both Caquetá and Putumayo. Therefore, the central topics, that is, those related to the recommended technical measures for managing the impacts detected as important, are presented in the form of guidelines. Thus, the individuals who are directly responsible for implementing the measures, the technicians of the entities in charge of the project operation in Caquetá and Putumayo, respectively (ASOHECA and the FUNDACIÓN FUTURO AMBIENTAL), and even the peasants who will benefit from the farms themselves, can use them as field support, which will allow them to act more effectively on the respective problems.

The EMP [Environmental Management Plan – Plan de Manejo Ambiental (PMA)] includes the following relevant topics and chapters: first, the respective executive summaries of the two previous documents containing the assessment (Initial Reference Status) [Estado Inicial de Referencia] and the Environmental Impacts Assessment (EA) [Evaluación de Impactos Ambientales – EA]. The central chapter

includes the entire collection of guidelines [fichas] regarding environmental prevention, mitigation and correction; in this section the reader will find a master guideline with the general specifications of the actions to be performed. If the case or the environmental impact warrant, pre-dimensioning guidelines [fichas de predimensionamiento] are attached to further detail the recommended actions. Certain supplementary guidelines regarding specific technical, control and monitoring issues are also included. The guidelines chapter is followed by the Control, Follow Up and Monitoring Plan [Plan de Control, Seguimiento y Monitoreo]. Although many of these actions are specified in the guidelines, the inclusion of a chapter summarizing the most significant control, follow up and monitoring activities was considered appropriate. The study continues with a chapter titled "Institutionality and Environmental Management" ["Institucionalidad y gestión ambiental"] containing a proposal to structure and strengthen ASOHECA and FUTURO AMBIENTAL, the institutions in charge of implementing the proposed actions. This section includes, among others, a very useful supplementary guide on the management and control of environmental requirements for roads. Although not directly part of the project, this guide nevertheless comprises the roadways network that will make it possible for the products of the beneficiary farms to reach the market. The document continues with an alternatives assessment that evaluates project alternatives, and concludes with the budget and the respective schedule of activities.

An instruction guide on the use the document is part of the EMP. It was designed to assist the reader with the codes used in this study. Readers are encouraged to begin by reading this guide, as it will facilitate their understanding and the appropriate context and use of this document.

5.2 REFERENCE GUIDE - HOW TO USE THE EA DOCUMENT

The Environmental Impact Assessment is not meant as decoration for bookshelves and bookcases; it is a tool that can provide significant and continued service in terms of the environmental organization of the rubber projects financed by USAID in the Caquetá and Putumayo departments, as part of the national illicit crop substitution and eradication strategy. The following introduction is included to provide readers with a context for this study so they may make the best use of its contents.

The study develops three main topics in the following three separate documents:

1. Diagnosis – Contains the qualitative baseline assessment and establishes the initial reference status. The natural environment is evaluated in this initial document, excluding the proposed project. This same document also contains a detailed presentation of the proposed project. An executive summary of this document is contained in this section of the study.

2. Impact Assessment Process – The second volume contains the complete methodology used in the environmental assessment process. It starts out by identifying the impacts, continues with their description and then rates those impacts. Matrix, checklist and spreadsheets are tools used in impact valuation. The main result of this process is a list of environmental impacts that the group of experts thought should be taken into account in preparing the environmental management plan. An executive summary of this work is included in this document.

3. Environmental Management Plan (EMP) – This is the essence of the EA process as it includes all the measures used in environmental prevention, mitigation and correction. This third document also contains the following contributions and study results: the control, follow up and monitoring plan; the institutional strengthening proposal to support the implementation and operation of the Environmental Management Plan by ASOHECA and LA FUNDACIÓN FUTURO AMBIENTAL; an environmental assessment of decision-making alternatives by the funding agency; the EMP budget, and a schedule of activities. The EMP is based on impacts whose environmental significance (ES) [Importancia ambiental (IA)] was rated as Medium (M), High [Alta (A)] and Very High (VH) [Muy Alta (MA)] in the environmental assessment process described above.

The EMP has been prepared as a manual and consists mainly of 36 duly coded guidelines, as follows: 22 preventive measures (indicated by the letter P), 10 mitigation measures (indicated by the letter M) and 4 corrective measures (indicated by the letter C). Many of these guidelines are accompanied by other, duly coded guidelines that address technical dimensioning aspects or aspects related to control, follow up and monitoring measures. As an example, consider some codes and their meaning in the following table. Let's take guideline 6M, for example, which means certain mitigation measures (M), number 6, Table 16:

Table 16. Meaning of the Management Guideline Codes

REFERENCE GUIDELINE	MEANING
6M	Master guideline indicating actions to be performed to resolve the impacts related to the treatment and final disposal of liquid waste in the homes of beneficiaries and in nursery administrative areas.
6M -1	Guideline attached to master guideline 6M. It develops specific technical aspects regarding the design of waste water treatment systems.
6M -2	Attached guideline that supplements guidelines 6M and 6M-1. It supplements technical aspects related to control, follow up and monitoring
6M – 3	Support guideline. Regulations, legal provisions, graphs, illustrations or any other additional attachment are added to supplement the master or other guidelines.

The entire study is coded. From the very identification of the impacts in the respective matrixes, the intersection between Environmental Factors (ENFA) [Factores Ambientales (ENFA)] and Environmental Aspects (ENAS) [Aspectos Ambientales (ENAS)], which are organized in columns and rows, the impacts acquire and follow the denomination of the cell of the respective cross. For example, Z5, AE7, etc.

In order to rapidly find the guidelines, the recommendation for readers is to refer to the list of tables in this report. There they will find the respective codes and contents. If you are doing an electronic query, you must go to the respective line and use the search command (*Control*+*B*).

5.3 BACKGROUND

As already mentioned, the EMP document was designed as a manual. It therefore includes enough information to present in a pleasing and friendly way the preventive, mitigation and corrective measures required by environmental use / organization of the rubber project in the two indicated departments. Anyone interested in the details of the baseline or environmental assessment description processes must therefore refer to the respective volumes, since this document only contains the summaries of those documents.

5.4 SUMMARY OF THE ENVIRONMENTAL ASSESSMENT PROCESS

The executive summary of the volume containing the impact assessment phase is included here, with the same indications provided for the previous point. The impacts that were given a medium, high and very high rating in this phase became the basis for the development of the EMP.

Context of the Report and Methodological Approach

The EA of the Caquetá and Putumayo rubber projects has been prepared in four phases based on expected results: The first phase is a planning phase and its deliverable is the operating work plan approved by USAID/CHEMONICS in the initial report. The second phase is the diagnostic phase and it included the rating and qualification of the surroundings (baseline without the project); its deliverables were approved by the contractor in the second report. The third phase is called the impact assessment phase and is basically focused on impact identification, impact description and impact rating according to the predictive interdisciplinary assessment. This phase includes an assessment and presentation of results and is inspired by one the most tested and didactic methodologies known in the country for environmental evolution of alternate development projects. Based on the results obtained in these three phases, the final product will be developed and presented in the fourth report (final report) as the respective ENVIRONMENTAL MANAGEMENT PLAN. This will lead to the final design and detailed engineering of the rubber projects in the Caquetá and Putumayo departments. The EA report also includes three special chapters: 1- the methodology used to identify, describe and rate the impacts;. 2- the chapter dedicated to analysis and results, and 3- the conclusions and recommendations made by the EA.

A Project of Undeniable Positive Impact on Society and the Natural Environment in Putumayo, Caquetá and the Amazon Region

The social component is highly favored with the resurgence of legitimate work opportunities which allow the community that is to directly and indirectly benefit to improve its opportunities for health care, employment, education, recreation and socialization.

From the environmental standpoint the figures speak for themselves: According to Asoheca and to an independent study undertaken on its own initiative, the eradication of only 380 hectares of coca by mid 2003 as part of the substitution project, represented for plants, animals, soil, water and human health avoiding the use of 4,500 kg of solid fertilizer and 9,100 liters of liquid fertilizer. Approximately 13,700 liters of category I and II insecticides that are highly and moderately toxic are not used in the Amazon region. About 4,500 kg of category III fungicides and 6,830 liters of category I and II herbicides are not used. About 41 tons of solid waste (per harvest) containing a mixture of coca leaves and gasoline, cement, sulphuric acid and sodium bicarbonate, equal to 15,654 tons/year, are not generated. This waste generally ends up in the reservoirs and water systems. Just this portion of the project has made it possible to remove a total of 4,174 50-kg sacs of cement, approximately 280,000 gallons of gasoline and a similar amount of solvents and chemical precursors from the illegal market and from the environment. If these figures are extrapolated and compared with the total of 750 and 500 hectares scheduled for substitution in Caquetá and Putumayo, respectively, a 300% increase in these figures and in benefits may be inferred. Figure 1, page 78, shows the mentioned indicators in more detail.

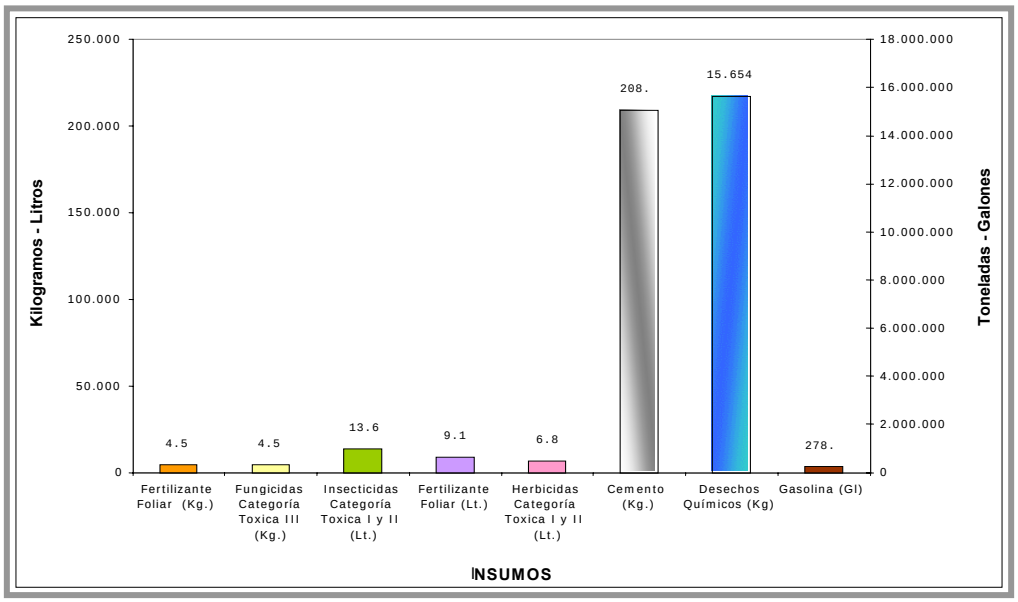

Figure 1. SOURCE: ASOHECA, 2003. Preliminary figures
Total inputs not used thanks to the eradication of coca crops

Impacts Requiring Special Handling to Ensure a Clean and Environmentally Friendly Rubber Project

The predictive assessment for the evaluated regions as well as the results of the environmental assessment produced a small number of negative impacts with a rating of Very High (VH). The majority of the impacts assessed had a Medium (M), Low (L) and Very Low (VL) rating.

The most serious impacts, which require special emphasis by the environmental management plan in both departments, are summarized as follows:

- -Soil and water courses affected by land preparation and leveling
- -Water contamination due to non-industrial and industrial processing of latex
- -Risk of soil and water contamination and [negative] human health effects due to the storage, handling and application of agrochemicals. Includes the handling of solid and liquid waste.
- -Deficient basic sanitation infrastructure
- -Distrust of the means used to market the products of associated crops such as plantain.

For most of the impacts identified, described and rated the solution consists of preventive measures. A mitigation infrastructure required in only a few cases, such as the use of water and liquid discharges.

A direct negative impact derived from another project currently underway in the region, though not financed by USAID but that does contribute to marketing of produce and which may produce significant effects in the future, is the construction of secondary roads used to access farms. These roads will be essential to the marketing of latex and related products. From the environmental standpoint this is a precarious infrastructure: drainage work, slopes / embankments and excavation debris disposal sites are either not done or their specifications fail to meet the required quality, geo-technics and rainfall requirements of the region. This impact is detected most strongly in the Putumayo Department. Environmental authorities of the region have been made aware.

5.5 OBJECTIVE OF THE ENVIRONMENTAL MANAGEMENT PLAN

Presenting the framework of actions required for handling, control, follow up, monitoring and management to ensure the territorial organization of the rubber project in the Caquetá and Putumayo departments.

5.6 SCOPE

The EMP document includes the following objectives within its scope:

- Preparation of handling actions (prevention, mitigation, correction or offestting) for impacts given a significant environmental rating (ER) [Calificación ambiental (Ca)] in the environmental assessment phase.

- Presenting the control, follow up and monitoring plan for aspects and natural resources affected by the implementation and development of the rubber project in its different phases and phases.

- Recommending a framework of basic institutional actions so the operator enterprises (ASOHECA and FFA) may define a minimum [level / degree of] institutional [soundness] that can guarantee the development of the environmental actions proposed.

- Identifying the costs of implementing the EMP, and

- Preparing an activities timeframe.

5.7 METHODOLOGY OF THE ENVIRONMENTAL MANAGEMENT PLAN

The preparation of the Environmental Management Plan starts out by identifying the impacts whose environmental assessment has an environmental rating (ER) of Medium (M), High (H) and Very High (VH) in the Caquetá and Putumayo locations.

The environmental aspects, understood as those actions that contribute to generate an impact, are grouped according to the environmental elements (water, soil, air, socioeconomic and biological), in order to proceed them to prepare the list of the actions to be carried out in order to manage the impacts generated (offset, prevent, mitigate or correct).

Said actions are listed, with a code which identifies: the natural element receiving the impact that is to be managed, the type of measure to be implemented (prevention - P, mitigation – M or correction - C) and a consecutive numbering, which shall be mentioned whenever there is reference to a specific management action.

Procuring a more friendly and didactic methodology, the EMP, is presented broken down by guidelines as follows: **the master guideline**, which includes the basic information of the management action: affected resource, type of measure, action to be taken, purpose of the action, code, associated environmental impacts, description of the measures to be implemented, target, dimensioning of the proposed action, costs of proposed action, control and follow-up and finally monitoring. **The guidelines attached to the master guideline,** which serve to support and develop the information associated with the dimensioning of the proposed actions. These must be completed only in certain cases. Cost guidelines were also prepared, in case the proposed actions require special works and investments. When special follow-up and monitoring actions are required, the master guideline indicates their location within the text.

5.8 ENVIRONMENTAL MANAGEMENT PLAN OF THE RUBBER PROJECTS IN THE DEPARTMENTS DE PUTUMAYO AND CAQUETÁ

5.8.1 Environmental Impacts of Importance for the Development of the EMP

Important Environmental Impacts of the Project in Putumayo

The EA in Putumayo underscores the processing phase as the environmental aspect (ENAS) with greatest incidence on the various environmental factors. This situation

occurs mainly on account of the impacts generated by the nonindustrial process from the social point of view (generation of employment, health, education, social welfare, among others), most of them positive and of high environmental significance. Moreover, in this same phase, the generation of liquid and solid wastes on the soil and water elements was assessed as a negative impact of medium environmental significance. At a second level, with respect to the results of the environmental rating, the plantation production phase was assessed as of medium significance, given that, the social, water, and biodiversity elements present lower scores with respect to the processing phase. This is explained basically by the extension and great volume of specific activities related to the plantation production phase (site preparation, agrochemical management, cultural crop maintenance tasks, etc.)

With respect to the Environmental Factors capable of receiving Impacts (ENFA's), the social element stands out on average as that with the highest environmental rating. Aspects such as the change in the welfare received, improvement of cultural aspects, family dynamics, institutional presence, employment generation, education, health, securing of food and other socioeconomic consequences , in production plantation and processing phases strongly affect this result. The plant production phase stands out as that with the lowest rating, despite the volume of activities developed therein.

Table 17 summarizes the rating and environmental significance of the environmental factors capable of receiving impacts with respect to the environmental aspects of the rubber project in Putumayo

Table 17. Summary of rating and environmental significance of the elements in the department of the Putumayo

ENFAENAS	SOCIAL		SOIL		AIR		WATER		BIO DIVERSITY		TOTAL BY PHASE	
	ER	ES	ER	ES	ER	ES	ER	ES	ER	ES	ER	ES
Processing phase	8.6	VH	4.5	M	-	-	5.2	M	-	-	6.1	H
Plantation production phase	8.4	VH	5.0	M	6.5	H	4.6	M	4.8	M	5.9	M
Plant material production phase	5.7	M	2.3	L	2.2	L	1.5	VL	0.9	VL	2.5	L
Average	**7.6**	**H**	**3.9**	**L**	**4.3**	**M**	**3.8**	**L**	**2.9**	**L**	**4.8**	**M**

In order to visualize the environmental impacts of greatest environmental significance in Putumayo according to the assessment, Table 18 below contains the Matrix with the identified and assessed impacts which make up the Environmental Management Plan.

Table 18. Impacts of environmental importance to the establishment of the Environmental Management Plan of the Rubber project in the department of Putumayo.

NATURAL ENVIRONMENT ELEMENTS		ENFAS ENVIRONMENTAL ASPECTS CAPABLE OF PRODUCING IMPACTS / ENFA ENVIRONMENTAL FACTORS CAPABLE OF RECEIVING IMPACTS	PLANTATION PRODUCTION PHASE									PROCESSING PHASE		
				Establishment				Cultural tasks					Nonindustrial processing	
			Housing and sanitary infrastructure	Stripping and site preparation	Transport of materials and inputs	Planting of rubber	Establishment of associated crops	Plating and weed control	Fertilization	Pest and disease control	Integral plantation production phase	Housing and sanitary infrastructure	Coagulation	Lamination
			X	Z	AB	AC	AD	AE	AH	AJ	AK	AL	AÑ	AO
SOIL	1	Physical alterations due to soil compaction			X									
	2	Contamination by discharges from washing of materials						X	X	X			X	X
	4	Contamination by improper management of agrochemicals (storage and/or use)	X						X	X				
	5	Erosion and loss of organic layer		X	X									
	7	Alteration of natural systems by change of use of the soil		X				X						
	8	Contamination by inadequate disposal of solid wastes (bags, containers, etc.) and /or materials	X				X		X	X				
	9	Establishment and development of vector agents and diseases	X									X		
WATER	10	Alteration of the quality by washing of containers and equipment with chemical products	X									X		
	11	Alteration of the quality and/or the hydrobiological resource due to liquid discharges	X						X	X			X	X
	12	Alteration by disposal of solid wastes in general	X				X					X		
	13	Damage to aquifers and/or water source areas	X									X	X	X
AIR	14	Alteration due to burnings or forest fires	X	X										
	15	Contamination due to product volatility												
BIODIVERSITY	18	Alteration of communities and natural flora and fauna populations		X		X								
	19	Inadequate exploitation and extraction of renewable natural resources		X										
SOCIAL	20	Damages in equipment and infrastructure which can cause accidents			X						X			

Important Environmental Impacts of the Project in Caquetá

The result of the environmental valuation and rating of the project in Caquetá, highlights the plantation production phase as the environmental aspect (ENAS) of greatest incidence on the different environmental factors with high environmental significance. This situation originates from the positive social impacts associated with the integral development of same. Aspects such as the change in the perceived well-being, improvement of cultural aspects, family dynamics, institutional presence, employment generation, education, health, securing of food and other socioeconomic consequences. Similarly, the negative impacts associated with cultural tasks during the establishment and maintenance of the plantations, site preparation, use of agrochemicals, development of activities at the homes of the users and others.

In the second place in the environmental rating with respect to the results, the nonindustrial processing phase presents a medium rating due, in general terms, to the magnitude of this type of utilization. In other words, it is estimated that 40% of the users will carry out traditional nonindustrial processing and most of these will have access to the industrial processing of rubber in the pilot plant that is in the installation and implementation process. The plant production phase stands out as that with the lowest rating, despite the volume of activities developed therein.

With respect to the Environmental Factors (ENFAs), capable of receiving Impacts the social element stands out on average as that with the highest environmental rating. This result is also strongly affected by aspects during the plantation production and processing phases. The air element presents a high rating related to the positive impacts from the capture of CO_2 originating in the plantation production phase.

Table 19 summarizes the rating and environmental significance of the environmental factors capable of receiving impacts with respect to the environmental aspects of the rubber project in Caquetá:

Table 19. Summary of the score and environmental importance of the elements in the department of Caquetá

ENFA / ENAS	SOCIAL		AIR		SOIL		WATER		BIO DIVERSITY		TOTAL BY PHASE	
	ER	ES	ER	ES	ER	ES	ER	ES	ER	ES		
PLANTATION PRODUCTION PHASE	8,6	VH	6,9	H	5,5	M	4,8	M	5,9	M	6,3	H
PROCESSING PHASE	5,0	M	-	-	3,4	M	4,0	L	-	-	4,1	M
PLANT MATERIAL PRODUCTION PHASE	5,6	M	2,0	L	2,2	L	1,4	VL	0,9	VL	2,4	L
Average	**6,4**	**H**	**4,5**	**M**	**3.7**	**L**	**3.4**	**L**	**3.4**	**L**	**4.3**	**M**

In order to visualize the environmental impacts of greatest significance in Caquetá according to the assessment, Table 20 below contains the Matrix with the identified and assessed impacts which make up the Environmental Management Plan.

Table 20. Impacts of environmental importance to the establishment of the Environmental Management Plan of the Rubber project in the department of Caquetá.

Natural Environment Elements	ENFA Environmental factors capable of receiving Impacts		ENAS Environmental aspects capable of producing Impacts	Plantation production phase										Processing phase		
					Establishment				Cultural tasks						Nonindustrial processing	
				Housing and sanitary infrastructure	Stripping and site preparation	Transport of materials and inputs	Planting of rubber	Establishment of associated crops	Plating and weed control	Prunings	Fertilization	Pest and disease control	Integral plantation production phase	Housing and sanitary infrastructure	Coagulation	Lamination
				X	Z	AB	AC	AD	AE	AG	AH	AJ	AK	AL	AÑ	AO
Soil	1	Physical alterations due to soil compaction				X										
	2	Contamination by discharges from washing of materials							X		X	X			X	X
	4	Contamination by improper management of agrochemicals (storage and/or use)	X								X	X				
	5	Erosion and loss of organic layer		X	X											
	7	Alteration of natural systems by change of use of the soil		X					X							
	8	Contamination by inadequate disposal of solid wastes (bags, containers, etc.) and /or materials	X					X	X		X	X				
	9	Establishment and development of vector agents and diseases	X											X		
Water	10	Alteration of the quality by washing of containers and equipment with chemical products	X											X		
	11	Alteration of the quality and/or the hydrobiological resource due to liquid discharges	X								X	X		X		
	12	Alteration by disposal of solid wastes in general	X					X								
	13	Damage to aquifers and/or water source areas	X													
Air	14	Alteration due to burnings or forest fires	X	X												
	15	Contamination due to product volatility									X	X				
Biodiversity	18	Alteration of communities and natural flora and fauna populations					X									
	19	Inadequate exploitation and extraction of renewable natural resources	X	X				X								
Social	20	Damages in equipment and infrastructure which can cause accidents											X			

5.8.2 Management of Impacts and Measures to be Taken

For each one of the environmental impacts identified in the assessment, the appropriate type or types of measure has been determined, namely, Prevention, Mitigation and/or Correction, and the actions to be taken, seeking to correct the impacts with a Medium (M), High (H) and Very High (VH) Environmental Significance (ES). Each action represents a management guideline. Table 21 below presents the environmental impacts, the types of measure, the actions to be taken and the list of management guidelines. The measures required for the environmental planning of the project will be of three types:

Preventive Measures (P): those activities, standards, instructions or infrastructure, designed to prevent the total or partial occurrence of a negative environmental impact.

Mitigation Measures (M): activities, procedures or infrastructure, which must be developed, operated and monitored, to ensure the mitigation of an impact.

Corrective Measure (C): actions designed to correct existing or contingent damages, caused to the natural resources.

For each particular measure, the management guidelines with their various dimensioning components and thematic support attachments will be developed.

5.8.2.1. Measures and Actions to be Taken in the Putumayo Project

The list of measures and actions to be taken for each environmental impact in the department of Putumayo is presented below in Table 21

Table 21. Environmental impacts, types of measures and actions to be taken in the Rubber project in Putumayo

CELL ENVIRONMENTAL IMPACT ACCORDING TO PROJECT PHASE	TYPE OF MEASURE	ACTION TO BE TAKEN	Guideline
AB1 Physical alterations due to soil compaction by effect of the transport of materials and inputs during the establishment of the plantation	Prevention	Design specific and mandatory routes for the transport of materials, supplies and products such as latex and others associated with it	**1P**
Z5 Erosion and loss of organic layer on account of stripping and site preparation during the plantation production phase	Prevention	Planning of work fronts for removal of the plant cover and upper soil horizon, conserving the protection strips for the water sources	**7P**
		Carry out land improvement tasks during dry periods and prevent exposure of the soils to the action of external agents for long periods of time	**8P**
		Avoid conducting activities in primary and secondary forest cover areas in an advanced development phase	**9P**
	Mitigation	Establish and maintain a good plant cover for natural regeneration in the plantations	**4M**
	Correction	Restore the plant cover in the regulatory water source protection areas in order to prevent the transport of solids and erosion of the banks	**1C**
Z5 Erosion and loss of organic layer on account of stripping and site preparation during the plantation production phase	Correction	Review the allotment policy for crop substitution, rejecting proposals that involve clearing of the secondary forest	**4C**
AE2 Contamination by discharges from washing of materials due to effect of plating and weed control in the plantation **AH2** Contamination by discharges from washing of materials due to effect of fertilization in the plantation **AJ2** Contamination by discharges from washing of materials due to effect of pest and disease control in the plantation **X4** Contamination by improper management of agrochemicals (storage and/or use) due to effect of housing and sanitary infrastructure of the beneficiaries of the plantation production phase **AH4** Contamination by improper management of agrochemicals (storage and/or use) due to the effect of fertilization of the plantation **AJ4** Contamination by improper management of agrochemicals (storage and/or use) due to the effect of pest and disease control of the plantation **X10** Alteration of the quality by washing of containers and equipment with chemical products due to effect of housing and sanitary infrastructure of the beneficiaries of the plantation production phase **AL10** Alteration of the quality (water and soil) by washing of containers and equipment with chemical products due to effect of housing of the beneficiaries	Prevention	Define agrochemical management, storage and processing areas, using 100% of the solutions prepared, and organize them within an Integrated Pest and Disease Management (IPDM) plan)	**2P**
		Study to characterize and classify solid and liquid discharges.	**3P**
		Implementation and permanent monitoring of an Integrated Pest and Disease Management - IPDM - System	**4P**
		Avoid the washing of soils, infiltration, runoff, so as not to alter the quality of the waters and soils.	**5P**
	Mitigation	Implement and systematically monitor liquid and solid waste minimization component, as an important component of the IPDM	**1M**

CELL ENVIRONMENTAL IMPACT ACCORDING TO PROJECT PHASE	TYPE OF MEASURE	ACTION TO BE TAKEN	Guideline
during the processing phase **AH11** Alteration of the quality and/or the hydrobiological resource by liquid discharges due to effect of fertilization during the plantation production phase **AJ11** Alteration of the quality and/or of the hydrobiological resource by liquid discharges due to effect of pest and disease control during the plantation production phase		Manage and technically dispose of liquid wastes from agrochemical preparation and management, as a program tied in with Integrated Pest and Disease Management IPDM	**2M**
		Develop, spread, implement and monitor a contingency management program related to the use of agrochemicals, tied in with the IPDM	**3M**
AÑ2 Contamination by discharges from washing of materials due to effect of coagulation during the processing phase **AO2** Contamination by discharges from washing of materials due to effect of the lamination process during the processing phase	Prevention	Define and prepare management sites for products and by-products from the nonindustrial processing of latex	**6P**
AB5 Erosion and loss of organic layer due to effect of transport of materials and inputs during the production phase	Prevention	Design specific and mandatory routes for the transport of materials, supplies and products such as latex and others associated with it.	**1P**
	Correction	Schedule critical point identification and maintenance activities	**2C**
Z7 Alteration of natural systems by change of use of the soil due to effect of stripping and site preparation during the plantation production phase	Prevention	Planning of work fronts for removal of the plant cover and upper soil horizon, conserving the protection strips for the water sources	**7P**
		Carry out land improvement tasks during dry periods and prevent exposure of the soils to the action of external agents for long periods of time	**8P**
		Avoid conducting activities in primary and secondary forest cover areas in an advanced development phase	**9P**
	Mitigation	Establish and maintain a good plant cover for natural regeneration in the plantations	**4M**
	Correction	Review the allotment policy for crop substitution, rejecting proposals that involve clearing of the secondary forest	**4C**
AE7 Alteration of natural systems by change of use of the soil due to effect of plating and weed control during the plantation production phase	Prevention	Train the personnel of the operator and associates (FUTURO AMBIENTAL - ASOHECA) in soil management and conservation techniques	**10P**
X9 Establishment and development of vector agents and diseases due to effect of housing and sanitary infrastructure of the beneficiaries of the plantation production phase	Mitigation	Implement sanitation systems that allow for the management of solid wastes generated in beneficiary homes and nursery administrative areas.	**5M**
AL9 Establishment and development of vector agents and diseases due to effect of housing of the beneficiaries during the processing phase	Correction	Clean river beds and sites used for gathering, temporary management or inadequate disposal of wastes	**3C**
X11 Alteration of the quality and/or of the hydrobiological resource by liquid discharges due to effect of the housing and sanitary infrastructure of the beneficiaries of the plantation production phase **X13** Damage to aquifers and/or water source areas due to effect of housing and sanitary infrastructure of the beneficiaries during the plantation	Prevention	Avoid conducting activities in primary and secondary forest cover areas in an advanced development phase	**9P**
		Education of personnel and beneficiary associates in techniques for the rational use of water.	**11P**
		Study to minimize liquid and solid wastes from the nonindustrial latex processing phase and implementation of results	**13P**

CELL ENVIRONMENTAL IMPACT ACCORDING TO PROJECT PHASE	TYPE OF MEASURE	ACTION TO BE TAKEN	Guideline
production phase **AL13** Damage to aquifers and/or water source areas due to effect of housing of the beneficiaries during the nonindustrial processing phase	Mitigation	Treatment and final disposal of liquid wastes in beneficiary homes and nursery administrative areas	**6M**
	Correction	Restore the plant cover in the regulatory water source protection areas in order to prevent the transport of solids and erosion of the banks	**1C**
X8 Contamination by inadequate disposal of solid wastes (bags, containers, etc.) and /or materials of the housing and sanitary infrastructure of the beneficiaries of the plantation production phase **AD8** Contamination by inadequate disposal of solid wastes (bags, containers, etc.) and /or materials due to effect of the establishment of the associated crops during the plantation production phase **AH8** Contamination by inadequate disposal of solid wastes (bags, containers, etc.) and /or materials due to effect of fertilization during the plantation production phase **AJ8** Contamination by inadequate disposal of solid wastes (bags, containers, etc.) and /or materials due to effect of pest and disease control during the plantation production phase **X12** Alteration by disposal of solid wastes in general due to effect of housing and sanitary infrastructure of the beneficiaries during the plantation production phase **AD12** Alteration by disposal of solid wastes in general due to effect of the establishment of associated crops during the plantation production phase **AL12** Alteration by disposal of solid wastes in general due to effect of housing of the beneficiaries during the processing phase	Prevention	Education in solid waste management and final disposal techniques	**12P**
		Study to minimize liquid and solid wastes from the nonindustrial latex processing phase and implementation of results	**13P**
	Mitigation	Implement sanitation systems that allow for the management of solid wastes generated in beneficiary homes and nursery administrative areas.	**5M**
	Correction	Clean river beds and sites used for gathering, temporary management or inadequate disposal of wastes	**3C**
AÑ11 Alteration of the quality and/or of the hydrobiological resource by liquid discharges due to effect of coagulation during the processing phase **AO11** Alteration of the quality and/or of the hydrobiological resource by liquid discharges due to effect of lamination during the processing phase **AÑ13** Damage to aquifers and/or water source areas due to effect of coagulation during the processing phase **AO13** Damage to aquifers and/or water source areas due to effect of lamination during the processing phase	Prevention	Study to minimize liquid and solid wastes from the nonindustrial latex processing phase and implementation of results	**13P**
X14 Alteration by burnings or forest fires due to effect of housing of the beneficiaries during the plantation production phase	Prevention	Encourage the growing and rational use of fuelwood forests and combustible solid wastes, as energy sources.	**14P**

CELL ENVIRONMENTAL IMPACT ACCORDING TO PROJECT PHASE	TYPE OF MEASURE	ACTION TO BE TAKEN	Guideline
X14 Alteration by burnings or forest fires due to effect of housing of the beneficiaries during the plantation production phase	Mitigation	Implement sanitation systems that allow for the management of solid wastes generated in beneficiary homes and nursery administrative areas.	**5M**
Z14 Alteration by burnings or forest fires due to effect of stripping and site preparation during the plantation production phase	Prevention	Prevent burning during land preparation activities and educate the operators and beneficiaries.	**15P**
	Mitigation	Implement appropriate techniques for the management and final disposal of plant wastes generated in the preparation of the land.	**8M**
Z18 Alteration of communities and natural flora and fauna populations due to effect of stripping and site preparation during the plantation production phase **AC18** Alteration of communities and natural flora and fauna populations due to effect of the planting of rubber during the planting phase **AD19** Inadequate exploitation and extraction of renewable natural resources due to effect of the establishment of the associated crops during the plantation production phase	Prevention	Encourage biological corridors through the identification of strips allocated to the protection of water sources and demarcation of farms	**16P**
		Conduct environmental education workshops with emphasis on the prevention of impacts of the plantation production phase on the flora and fauna	**17P**
	Mitigation	Implement actions aimed at the conservation of areas of interest and influence of the plantations	**9M**
Z19 Inadequate exploitation and extraction of renewable natural resources due to effect of stripping and site preparation during the plantation production phase	Prevention	Encourage biological corridors through the identification of strips allocated to the protection of water sources and demarcation of farms	**16P**
		Conduct environmental education workshops with emphasis on the prevention of impacts of the plantation production phase on the flora and fauna	**17P**
		Permit, to the extent allowed by phytosanitary control, the natural regeneration of stubble and other natural vegetation. Coordinate with IPDM	**18P**
		Avoid the use of cuttings extracted from the forest as tutors for the associated pepper trees, implementing the use of asexual reproduction species	**21P**
AB20 Damages in equipment and infrastructure which can cause accidents due to effect of the integral development of the nonindustrial processing phase **AK20** Damages in equipment and infrastructure which can cause accidents due to effect of the integral development of the planting phase	Prevention	Develop and implement contingency and industrial safety programs, in all project development and operation phases	**19P**
AH15 Contamination by product volatility due to effect of fertilization during plantation production phase	Prevention	Take into account the recommendations and management instructions of the agrochemical production companies. Coordinate with IPDM	**20P**
AJ15 Contamination by product volatility due to effect of pest and disease control during plantation production phase	Mitigation	Development, spread, implementation and monitoring of a contingency management program related to the use of agrochemicals, tied in with the IPDM	**3M**

Measures And Actions to be Taken in the Caquetá Project

The list of measures and actions to be taken for each environmental impact in the department of Caquetá is presented below in Table 22:

Table 22. Environmental impacts, types of measures and actions to be taken in the Rubber project in Caquetá

CELL ENVIRONMENTAL IMPACT ACCORDING TO PROJECT PHASE	TYPE OF MEASURE	ACTION TO BE TAKEN	Guideline
AB1 Physical alterations due to soil compaction by effect of the transport of materials and inputs during the establishment of the plantation	Prevention	Design specific and mandatory routes for the transport of materials, supplies and products such as latex and others associated with it	**1P**
AE2 Contamination by discharges from washing of materials due to effect of plating and weed control in the plantation **AH2** Contamination by discharges from washing of materials due to effect of fertilization in the plantation **AJ2** Contamination by discharges from washing of materials due to effect of pest and disease control in the plantation **X4** Contamination by improper management of agrochemicals (storage and/or use) due to effect of housing and sanitary infrastructure of the beneficiaries of the plantation production phase **AH4** Contamination by improper management of agrochemicals (storage and/or use) due to the effect of fertilization of the plantation **AJ4** Contamination by improper management of agrochemicals (storage and/or use) due to the effect of pest and disease control of the plantation **X10** Alteration of the quality by washing of containers and equipment with chemical products due to effect of housing and sanitary infrastructure of the beneficiaries of the plantation production phase **AL10** Alteration of the quality (water and soil) by washing of containers and equipment with chemical products due to effect of housing of the beneficiaries during the processing phase **AH11** Alteration of the quality and/or the hydrobiological resource by liquid discharges due to effect of fertilization during the plantation production phase **AJ11** Alteration of the quality and/or of the hydrobiological resource by liquid discharges due to effect of pest and disease control during the plantation production phase	Prevention	Define agrochemical management, storage and processing areas, using 100% of the solutions prepared, and organize them within an Integrated Pest and Disease Management (IPDM) plan)	**2P**
		Study to characterize and classify solid and liquid discharges.	**3P**
		Implementation and permanent monitoring of an Integrated Pest and Disease Management - IPDM - System.	**4P**
		Avoid the washing of soils, infiltration, runoff, so as not to alter the quality of the waters and soils.	**5P**
	Mitigation	Implement and systematically monitor liquid and solid waste minimization component, as an important component of the IPDM	**1M**
		Manage and technically dispose of liquid wastes from agrochemical preparation and management, as a program tied in with Integrated Pest and Disease Management IPDM	**2M**
		Develop, spread, implement and monitor a contingency management program related to the use of agrochemicals, tied in with the IPDM	**3M**

CELL ENVIRONMENTAL IMPACT ACCORDING TO PROJECT PHASE	TYPE OF MEASURE	ACTION TO BE TAKEN	Guideline
AÑ2 Contamination by discharges from washing of materials due to effect of coagulation during the processing phase **AO2** Contamination by discharges from washing of materials due to effect of the lamination process during the processing phase	Prevention	Define and prepare management sites for products and by-products from the nonindustrial processing of latex	**6P**
Z5 Erosion and loss of organic layer on account of stripping and site preparation during the plantation production phase	Prevention	Planning of work fronts for removal of the plant cover and upper soil horizon, conserving the protection strips for the water sources	**7P**
		Carry out land improvement tasks during dry periods and prevent exposure of the soils to the action of external agents for long periods of time	**8P**
		Avoid conducting activities in primary and secondary forest cover areas in an advanced development phase	**9P**
	Mitigation	Establish and maintain a good plant cover for natural regeneration in the plantations	**4M**
	Correction	Restore the plant cover in the regulatory water source protection areas in order to prevent the transport of solids and erosion of the banks	**1C**
		Review the allotment policy for crop substitution, rejecting proposals that involve clearing of the secondary forest	**4C**
AB5 Erosion and loss of organic layer due to effect of transport of materials and inputs during the production phase	Prevention	Design specific and mandatory routes for the transport of materials, supplies and products such as latex and others associated with it.	**1P**
	Correction	Schedule critical point identification and maintenance activities	**2C**
Z7 Alteration of natural systems by change of use of the soil due to effect of stripping and site preparation during the plantation production phase	Prevention	Planning of work fronts for removal of the plant cover and upper soil horizon, conserving the protection strips for the water sources	**7P**
		Carry out land improvement tasks during dry periods and prevent exposure of the soils to the action of external agents for long periods of time	**8P**
		Avoid conducting activities in primary and secondary forest cover areas in an advanced development phase	**9P**
	Mitigation	Establish and maintain a good plant cover for natural regeneration in the plantations	**4M**
	Correction	Review the allotment policy for crop substitution, rejecting proposals that involve clearing of the secondary forest	**4C**
AE7 Alteration of natural systems by change of use of the soil due to effect of plating and weed control during the plantation production phase	Prevention	Train the personnel of the operator and associates (FUTURO AMBIENTAL - ASOHECA) in soil management and conservation techniques	**10P**
X9 Establishment and development of vector agents and diseases due to effect of housing and sanitary infrastructure of the beneficiaries of the plantation production phase	Mitigation	Implement basic sanitation systems in beneficiary homes and nursery administration areas.	**5M**

CELL ENVIRONMENTAL IMPACT ACCORDING TO PROJECT PHASE	TYPE OF MEASURE	ACTION TO BE TAKEN	Guideline
AL9 Establishment and development of vector agents and diseases due to effect of housing of the beneficiaries during the processing phase	Correction	Clean river beds and sites used for gathering, temporary management or inadequate disposal of wastes	**3C**
X11 Alteration of the quality and/or of the hydrobiological resource by liquid discharges due to effect of the housing and sanitary infrastructure of the beneficiaries of the plantation production phase **X13** Damage to aquifers and/or water source areas due to effect of housing and sanitary infrastructure of the beneficiaries during the plantation production phase **AL13** Damage to aquifers and/or water source areas due to effect of housing of the beneficiaries during the nonindustrial processing phase	Prevention	Avoid conducting activities in primary and secondary forest cover areas in an advanced development phase	**9P**
		Education of personnel and beneficiary associates in techniques for the rational use of water.	**11P**
		Study to minimize liquid and solid wastes from the nonindustrial and industrial latex processing phase and implementation of results	**13P**
	Mitigation	Implement treatment and final disposal of liquid wastes in beneficiary homes and nursery administration areas	**6M**
	Correction	Restore the plant cover in the regulatory water source protection areas in order to prevent the transport of solids and erosion of the banks	**1C**
AÑ11 Alteration of the quality and/or of the hydrobiological resource by liquid discharges due to effect of coagulation during the processing phase **AO11** Alteration of the quality and/or of the hydrobiological resource by liquid discharges due to effect of lamination during the processing phase **AÑ13** Damage to aquifers and/or water source areas due to effect of coagulation during the processing phase **AO13** Damage to aquifers and/or water source areas due to effect of lamination during the processing phase	Prevention	Study to minimize liquid and solid wastes from the nonindustrial and industrial latex processing phase and implementation of results	**13P**
X8 Contamination by inadequate disposal of solid wastes (bags, containers, etc.) and /or materials of the housing and sanitary infrastructure of the beneficiaries of the plantation production phase **AD8** Contamination by inadequate disposal of solid wastes (bags, containers, etc.) and /or materials due to effect of the establishment of the associated crops	Prevention	Education in solid waste management and final disposal techniques	**12P**

CELL ENVIRONMENTAL IMPACT ACCORDING TO PROJECT PHASE	TYPE OF MEASURE	ACTION TO BE TAKEN	Guideline
during the plantation production phase **AH8** Contamination by inadequate disposal of solid wastes (bags, containers, etc.) and /or materials due to effect of fertilization during the plantation production phase **AJ8** Contamination by inadequate disposal of solid wastes (bags, containers, etc.) and /or materials due to effect of pest and disease control during the plantation production phase **X12** Alteration by disposal of solid wastes in general due to effect of housing and sanitary infrastructure of the beneficiaries during the plantation production phase **AD12** Alteration by disposal of solid wastes in general due to effect of the establishment of associated crops during the plantation production phase **AL12** Alteration by disposal of solid wastes in general due to effect of housing of the beneficiaries during the processing phase		Study to minimize liquid and solid wastes from the nonindustrial and industrial latex processing phase and implementation of results	**13P**
	Mitigation	Implement sanitation systems that allow for the management of solid wastes generated in beneficiary homes and nursery administrative areas.	**5M**
	Correction	Clean river beds and sites used for gathering, temporary management or inadequate disposal of wastes	**3C**
X14 Alteration by burnings or forest fires due to effect of housing of the beneficiaries during the plantation production phase	Prevention	Encourage the growing and rational use of fuelwood forests and combustible solid wastes, as energy sources.	**14P**
	Mitigation	Implement basic sanitation systems in beneficiary homes and nursery administration areas.	**5M**
Z14 Alteration by burnings or forest fires due to effect of stripping and site preparation during the plantation production phase	Prevention	Prevent burning during land preparation activities and educate the operators and beneficiaries.	**15P**
	Mitigation	Implement appropriate techniques for the management and final disposal of plant wastes generated in the preparation of the land.	**7M**
Z18 Alteration of communities and natural flora and fauna populations due to effect of stripping and site preparation during the plantation production phase **AC18** Alteration of communities and natural flora and fauna populations due to effect of the planting of rubber during the planting phase	Prevention	Encourage biological corridors through the identification of strips allocated to the protection of water sources and demarcation of farms	**16P**
		Conduct environmental education workshops with emphasis on the prevention of impacts of the plantation production phase on the flora and fauna	**17P**

CELL ENVIRONMENTAL IMPACT ACCORDING TO PROJECT PHASE	TYPE OF MEASURE	ACTION TO BE TAKEN	Guideline
AD19 Inadequate exploitation and extraction of renewable natural resources due to effect of the establishment of the associated crops during the plantation production phase	Mitigation	Implement actions aimed at the conservation of areas of interest and influence of the plantations	**9M**
Z19 Inadequate exploitation and extraction of renewable natural resources due to effect of stripping and site preparation during the plantation production phase	Prevention	Encourage biological corridors through the identification of strips allocated to the protection of water sources and demarcation of farms	**16P**
		Conduct environmental education workshops with emphasis on the prevention of impacts of the plantation production phase on the flora and fauna	**17P**
		Permit, to the extent allowed by phytosanitary control, the natural regeneration of stubble and other natural vegetation. Coordinate with IPDM	**18P**
AB20 Damages in equipment and infrastructure which can cause accidents due to effect of the integral development of the nonindustrial processing phase **AK20** Damages in equipment and infrastructure which can cause accidents due to effect of the integral development of the planting phase	Prevention	Develop and implement contingency and industrial safety programs, in all project development and operation phases	**19P**
AH15 Contamination by product volatility due to effect of fertilization during plantation production phase	Prevention	Take into account the recommendations and management instructions of the agrochemical production companies. Coordinate with IPDM	**20P**
AJ15 Contamination by product volatility due to effect of pest and disease control during plantation production phase	Mitigation	Development, spread, implementation and monitoring of a contingency management program related to the use of agrochemicals, tied in with the IPDM	**3M**

5.8.3 Coordinated Environmental Management Plan for Putumayo and Caquetá

From the assessment of the previous, we see that most proposed actions for management of the environmental impacts are identical in both projects. Therefore, it is practical and very functional to group these measures.

In all, thirty-six (36) actions have been proposed, 22 of which are preventive measures (P), 10 are mitigative measures (M) and 4 are corrective (C) measures

As a special case, two guidelines have been included for the development of management actions, the first, 22P: "Adopt the technical and legal criteria for road construction and improvement" is of the preventive type and is proposed as pre-dimensioning to be taken into account in road construction in both departments, especially in the case of Putumayo, in which there is some current road development. The second Guideline 10M: Treatment and final disposal of liquid wastes from the pilot plant. This guideline was developed particularly to be implemented in the department of Caquetá, given that the rubber coagulate industrial processing plant is currently in a pre-installation phase.

Table 23 below presents the list of Guidelines to be developed, the associated environmental impacts and the department in which they are to be developed:

Table 23. List of Types of measure, Management Guidelines and actions to be taken

Guide line No.	ACTION TO BE TAKEN	ASSOCIATED ENVIRONMENTAL IMPACTS	ENFA	DEPARTMENT	
				PUTUMAYO	CAQUETÁ
PREVENTIVE MEASURES					
1P	Design specific and mandatory routes for the transport of materials, supplies and products such as latex and others associated with it.	**AB1 and AB5**	SOIL	X	X
2P	Define agrochemical management, storage and processing areas, using 100% of the solutions prepared, and organize them within an Integrated Pest and Disease Management (IPDM) plan.	**AE2, AH2, AJ2, X4, AH4 and AJ4**	SOIL	X	X
		X10, AL10, AH11 and AJ11	WATER		
3P	Study to characterize and classify solid and liquid discharges.	**AE2, AH2, AJ2, X4, AH4 and AJ4**	SOIL	X	X
		X10, AL10, AH11 and AJ11	WATER		
4P	Implementation and permanent monitoring of an Integrated Pest and Disease Management - IPDM - System.	**AE2, AH2, AJ2, X4, AH4 and AJ4**	SOIL	X	X
		X10, AL10, AH11 and AJ11	WATER		
5P	Avoid the washing of soils, infiltration, runoff, so as not to alter the quality of the waters and soils.	**AE2, AH2, AJ2, X4, AH4 and AJ4**	SOIL	X	Z
		X10, AL10, AH11 and AJ11	WATER		
6P	Define and prepare management sites for products and by-products from the nonindustrial processing of latex	**AÑ2 and AO2**	SOIL	X	X
7P	Planning of work fronts for removal of the plant cover and upper soil horizon, conserving the protection strips for the water sources.	**Z5 and Z7**	SOIL	X	X
8P	Carry out land improvement tasks during dry periods and prevent exposure of the soils to the action of external agents for long periods of time	**Z5 and Z7**	SOIL	X	X
9P	Avoid conducting activities in primary and secondary forest cover areas in an advanced development phase	**Z5 and Z7**	SOIL	X	X
		X11, X13 and AL13	WATER		
10P	Train the personnel of the operator and associates (FUTURO AMBIENTAL - ASOHECA) in soil management and conservation techniques	**AE7**	SOIL	X	X
11P	Education of personnel and beneficiary associates in techniques for the rational use of water.	**X11, X13 and AL13**	WATER	X	X
12P	Education in solid waste management and final disposal techniques	**X8, AD8, AH8 and AJ8**	SOIL	X	X
		X12, AD12 and AL12	WATER		
13P	Study to minimize liquid and solid wastes from the nonindustrial latex processing phase and implementation of results	**X8, AD8, AH8 and AJ8**	SOIL	X	X
		X11, X12, X13, AD12, AL12, AL13, AÑ11, AO11, AÑ13 and AO13	WATER		
14P	Encourage the growing and rational use of fuelwood forests and combustible solid wastes, as energy sources.	**X14**	AIR	X	X
15P	Prevent burning during land preparation activities and educate the operators and beneficiaries.	**Z14**	AIR	X	X

Guide line No.	ACTION TO BE TAKEN	ASSOCIATED ENVIRONMENTAL IMPACTS	ENFA	DEPARTMENT	
				PUTUMAYO	CAQUETÁ
16P	Encourage biological corridors through the identification of strips allocated to the protection of water sources and demarcation of farms	**Z18, AC18, AD19 and Z19**	BIODIVERSITY	X	X
17P	Conduct environmental education workshops with emphasis on the prevention of impacts of the plantation production phase on the flora and fauna	**Z18, AC18 and AD19 and Z19**	BIODIVERSITY	X	X
18P	Permit, to the extent allowed by phytosanitary control, the natural regeneration of stubble and other natural vegetation. Coordinate with IPDM	**Z19**	BIODIVERSITY	X	X
19P	Develop and implement contingency and industrial safety programs, in all project development and operation phases	**AB20 YAK20**	SOCIAL	X	X
20P	Take into account the recommendations and management instructions of the agrochemical production companies. Coordinate with IPDM	**AH15 and AJ15**	AIR	X	X
21P	Avoid the use of cuttings extracted from the forest as tutors for the associated pepper trees, implementing the use of asexual reproduction species	**Z19**	BIODIVERSITY	X	
22P	Adopt the technical and legal criteria for road construction and improvement	**All those associated with road construction and improvement**	ALL	X	X
MITIGATION MEASURES					
1M	Implement and systematically monitor liquid and solid waste minimization component, as an important component of the IPDM	**AE2, AH2, AJ2, X4, AH4 and AJ4**	SOIL	X	X
		X10, AL10, AH11 and AJ11	WATER	X	X
2M	Manage and technically dispose of liquid wastes from agrochemical preparation and management, as a program tied in with Integrated Pest and Disease Management IPDM	**AE2, AH2, AJ2, X4, AH4 and AJ4**	SOIL	X	X
		X10, AL10, AH11 and AJ11	WATER	X	X
3M	Development, spread, implementation and monitoring of a contingency management program related to the use of agrochemicals, tied in with the IPDM	**AE2, AH2, AJ2, X4, AH4 and AJ4**	SOIL	X	X
		X10, AL10, AH11 and AJ11	WATER		
		AH15 and AJ15	AIR		
4M	Establish and maintain a good plant cover for natural regeneration in the plantations	**Z5 and Z7**	SOIL	X	X
5M	Implement sanitation systems that allow for the management of solid wastes generated in beneficiary homes and nursery administrative areas.	**X8, AD8, AH8, AJ8, X9 and AL9**	SOIL	X	X
		X12, AD12 and AL12	WATER		
		X14	AIR		
6M	Implement treatment and final disposal of liquid wastes in beneficiary homes and nursery administration areas.	**X11, X13 and AL13**	WATER	X	X
7M	Implement waste minimization and cleaner production plans	**X11, X13, AL13, AÑ11, AO11, AÑ13 and AO13**	WATER	X	X
8M	Implement appropriate techniques for the management and final disposal of plant wastes generated in the preparation of the land.	**Z14**	BIODIVERSITY	X	X
9M	Implement actions aimed at the conservation of areas of interest and influence of the plantations	**Z18, AC18 and AD19**	BIODIVERSITY	X	X
10M	Treatment and final disposal of liquid wastes from the pilot plant	**Associated to liquid discharges of the pilot plant in Caquetá**	WATER AND SOIL		X

Guideline No.	ACTION TO BE TAKEN	ASSOCIATED ENVIRONMENTAL IMPACTS	ENFA	DEPARTMENT	
				PUTUMAYO	CAQUETÁ
CORRECTION MEASURES					
1C	Restore the plant cover in the regulatory water source protection areas in order to prevent the transport of solids and erosion of the banks	**Z5**	SOIL	X	X
		X11, X13 and AL13	WATER		
2C	Schedule critical point identification and maintenance activities	**AB5**	SOIL	X	X
3C	Clean river beds and sites used for gathering, temporary management or inadequate disposal of wastes	**X8, AD8, AH8, AJ8, X9 and AL9**	SOIL	X	X
		X12, AD12 and AL12	WATER	X	X
4C	Review the allotment policy for crop substitution, rejecting proposals that involve clearing of the secondary forest	**Z5, Z7**	SOIL	X	X

The guidelines listed in the previous point are set out below. These are 36 Master Guidelines for the development of management actions with their respective Dimensioning Guidelines (numbered 1), Control, follow-up and monitoring guidelines (numbered 2) and Support guidelines (numbered 3).

List of guidelines which include training activities

All Management guidelines that involve training are listed below in table 24.

Table 24. List of Guidelines and Training Topics

Guideline	TRAINING TOPIC
6P	Train the beneficiaries in nonindustrial processing tasks and in the optimization of the use of water resources
7P	Conduct training activities to emphasize the importance of natural systems in the sustainability and competitiveness of environmental goods and services
10P	Sensitize workers and beneficiaries to the use of adequate methods to prevent soil loss.
11P	Education of personnel and beneficiary associates in techniques for the rational use of water
12P	Education in solid waste management and final disposal techniques
14P	Conduct awareness campaigns to encourage the utilization and proper management of fuelwood forests
15P	Educate the beneficiaries in the negative environmental consequences and impacts of "felling, land clearance and burning" activities, as well as in the importance of preserving the natural conditions of the soil
16P	Train the beneficiaries in order to promote biological corridors through the identification of strips allocated to the protection of water sources and the demarcation of farms
17P	Environmental education workshops with emphasis on the prevention of impacts of the plantation production phase on the flora and fauna
19P	Training to implement a contingency and industrial safety program in all development phases of the project
20P	Training in agrochemical identification, manipulation and application techniques
2M	Manage and technically dispose of liquid wastes from agrochemical preparation and management, as a program tied in with Integrated Pest and Disease Management IPDM
3M	Development, spread, implementation and monitoring of a contingency management program related to the use of agrochemicals, tied in with the IPDM
8M	Conduct theoretical-practical workshops in each unit to encourage the use and implementation of composting as an appropriate technique for the management and final disposal of plant waste generated in preparing the land.
9M	2. Conduct theoretical workshops accompanied by trips to the field in each unit to show the importance of the Amazon region, its forests and ecosystems for the settled communities, the region, the country and the world, in addition to stimulating interest in its conservation

5.8.4 Control, Follow-up and Monitoring Plan

Control Plan

The organization, headed by the operator entities, must identify the operations and activities associated with the significant ENVIRONMENTAL ASPECTS identified in the EA process, in accordance with its legal requirements, environmental policies , objectives and goals. Based on this exercise, ASOHECA and the FUNDACIÓN FUTURO AMBIENTAL must plan said operations and activities, including the maintenance tasks (particularly in the case of the processing plant in Caquetá), to ensure that the specific conditions are met. The operational controls are essentially procedures to ensure that operations or activities related to the nonindustrial and industrial production and processing of the latex are in line with the conditions specified in the relevant guidelines that make up the ENVIRONMENTAL MANAGEMENT PLAN and also fall within the required limits. The operational control procedures include specific performance criteria, in the case of maintenance equipment, environmental pollution control equipment or systems and some production processes, which must be managed within specific parameters, in order to reach the required or desired levels.

Since it is not necessary to control each and every process, below is a matrix which summarizes the entire environmental assessment process (EA), in ENVIRONMENTAL ASPECTS AND IMPACTS. The former, as indicated in the methodology recommended by the ISO 14000 standards, refer to processes related to the most relevant impacts on the environment, also referred to in this methodology as ENVIRONMENTAL-IMPACT. As a contribution of the EA, a future structuring of an Environmental Administration System is included in Table 25, the SUMMARY MATRIX OF ENVIRONMENTAL ASPECTS AND IMPACTS, for the rubber project in the departments of Caquetá and Putumayo.

Table 25. Summary matrix of Environmental Aspects and Impacts

ENVIRONMENTAL ASPECTS	POTENTIAL ENVIRONMENTAL IMPACTS
1-Discharge of industrial wastewater at the latex processing plant, projected for Caquetá	Contamination of water and soil
2- Discharge of wastewater from the nonindustrial processing of latex in Caquetá and Putumayo	Contamination of soil and water
3- Management, storage and application of agrochemicals	Health risks, contamination of soil and water.
4- Generation of solid wastes	Contamination of soil and water
5- Preparation of soils for planting	Loss of the topsoil, water contamination
6- Beneficiary property selection policies	Destruction of certain secondary forest strips for rubber planting
7- Basic sanitation and disposal of excreta	Risks of diseases related to the oral - fecal cycle
8- Development of the Amazonian foothills	Losses or changes in the quality of the flora and fauna

The Environmental Management Plan (EMP) has been structured in such a way that each guideline developing the prevention, control or mitigation actions specifies the most important control measures. Nevertheless, below are certain strategic control actions, which must be taken into account by the operators and personnel of each farm, in such a way that the EMP becomes an effective instrument for the balanced development of the project. The control measures and other related guidelines are presented based on the eight (8) ENVIRONMENTAL ASPECTS summarized in table 25. Table 26 contains a summary of the strategic control actions, broken down in the same order. It is important to indicate that Table 26 is not in itself the control plan, but a guide which expands the concepts and helps the reader find the guidelines that develop the specific environmental control actions in greater detail.

Table 26. Strategic control actions

ENVIRONMENTAL ASPECT	STRATEGIC CONTROL ACTIONS	SPECIFIC ACTIONS AND REFERENCE GUIDELINES
1-Discharge of industrial wastewater at the latex processing plant, projected for Caquetá	1- Application of the operating manual of the wastewater treatment system, which must be delivered by the designer.	Use as reference, Guideline 10M-1
2- Discharge of wastewater from the nonindustrial processing of latex in Caquetá and Putumayo	1- Application of the operating manual of the wastewater treatment system of the nonindustrial processing of latex, which must be delivered by the designer to each beneficiary or farm owner	See Guideline 6M
3- Management, storage and application of agrochemicals	1- Control the performance and results of the IPDM 2- Control the performance of the Waste Minimization Plan (optional) 3- Control the performance and results of the assessment of RISK FACTORS, associated with the management of pesticides. 4- Report volumes and frequencies of agrochemical surpluses delivered to the operators, for their management and proper final disposal. 5- Supervise compliance with the recommended measures for the management of special solid wastes.	See guidelines: 20P-1, 2P, 4P, 3M, 2M and 2M-1.
4- Solid waste generation	1- ASOHECA and FUTURO AMBIENTAL must carry out periodic verification rounds, in order to establish the solid waste management and final disposal systems for the homes.	See guidelines: 2M, 4P,5M-1, 7M-1 and 6M.

ENVIRONMENTAL ASPECT	STRATEGIC CONTROL ACTIONS	SPECIFIC ACTIONS AND REFERENCE GUIDELINES
	Records must be kept and the relevant analyses made 2- Supervise compliance with the recommended measures for the management of special solid wastes. Keep records and analyze the information.	
5- Preparation of soils for planting	1. The operators must review the property selection criteria in order to conserve the forest areas (Guideline 4C.) 2. The operators must establish coordinated work fronts in order to carry out soil preparation work. Plan together with the planting seasons. 3. Cartographically define the environmentally strategic areas that must not be altered with the works. Protection strips for water sources. 4. Define the proper techniques for stripping, avoiding burnings and/or using them under controlled conditions 5. Encourage plant regeneration and manage wastes so as to improve the conditions of the soil	See Guidelines 7P, 8P, 9P, 10P, 15P, 18P, 4M, 8M and 1C
6- Beneficiary property selection policies	1- AID/CHEMONICS, ASOHECA and FUTURO AMBIENTAL must structure a control instrument which ensures that the farms to be benefited with the alternative rubber development project have not felled the secondary forest, to apply for the benefits.	See Guideline 4C
7- Basic sanitation and disposal of excreta	During construction, it will be necessary to verify that the installation process is carried on in accordance with the technical drawings and specifications of the manufacturer of the systems. During the operation, maintenance tasks must be carried out on each of the components, as follows: Grease trap, septic tank and filter. To manage the manual fill it will be necessary to make sure that the waste deposited is strictly unusable, apart from the management and disposal of the cover material.	See Guidelines 5M and 6M
8- Development of the Amazonian foothills	Cartographically determine the niches of environmental importance to be conserved. Conduct environmental education campaigns designed to make the beneficiaries aware of the importance of the Amazonian ecosystems Implement the necessary physical actions to isolate priority areas	See Guidelines 1C, 11P, 16P, 17P

Follow-up plan

This is the name given to the plan designed for the permanent verification of compliance with local, national and international legal requirements, as well as with agreements with interested parties. In this case, it is recommended to verify compliance with the rules, limits and requirements, as estimated in each case in the ENVIRONMENTAL REQUIREMENTS MATRIX. See Table 27 Environmental requirements

Monitoring Plan

Monitoring refers to all actions related to the gathering of information, intended to verify the attainment of a goal, an environmental objective or an environmental limit established by the regulations.

- **Monitoring of point sources of liquid discharges**

The EA has permitted the identification, in order of importance, of three point sources of liquid discharges:

1)- Industrial liquid waste from the latex industrial processing plant

2)- Liquid waste from the nonindustrial processing of latex

3)- Domestic liquid waste (DLW).

The bases for the monitoring are shown below, for each case:

- **Monitoring of Industrial Liquid Waste from the latex industrial processing plant) (ILWLPP)**

The characteristics and frequencies of the discharges, necessarily establish two (2) monitoring routines:

1)- for compliance with the statutory requirements and

2)- to ensure a proper operation of the Wastewater Treatment System.

- **Monitoring de (ILWLPP) for compliance with environmental requirements:**

Decree 1594 of 1984 and Decree 901 of 1997 require the establishment and update of the DISCHARGE BASELINE. Table 29 presents an approximate parameter and frequency reference plan, designed for the monitoring required by the statutory regulations. In any event, ASOHECA and FUTURO AMBIENTAL, must agree annually with CORPOAMAZONÍA on the sampling parameters and frequencies.

Table 27. Monitoring of industrial liquid waste from the processing of latex, based on environmental requirements

PARAMETER	UNIT	SAMPLING SITE	FREQUENCY	OBSERVATIONS and STANDARDS
PH	UPH	All final discharge points, 10M upstream from the discharge, mixing area of the receiving body and 10M downstream	Once a year	Decree 1594 of 1984
Temperature	ºC	Same as above		
COD	mg/l			
BOD^5	mg/l		Semi-annual	Decree 901 of 1997
TSS	mg/l			
SS	mg/l		Once a year	Decree 1594 of 1984
GREASES AND OILS	mg/l			
NITROGEN	mg/l			
PHOSPHORUS	mg/l			
VOLUME OF FLOW	l/seg		Semi-annual	

- **Monitoring of (ILWLPP) for the operation of the Wastewater Treatment System the industrial processing of latex**

The most practical thing would be for whoever carries out the detail engineering of the plant to develop their own monitoring plan. In any event, the indicators, sites and frequencies to meet the operating specifications and system design efficiencies are presented here.

- **Monitoring of the startup of the wastewater treatment system:**

The proposed system, referenced in dimensioning guideline 6M-1, is a biological system which requires preliminary procedures pertaining to specialized sanitary engineering, in order to plant the microorganism inoculates and ensure their survival and successful development.

Below, in Table 28, is a monitoring plan for a methanogenic lagoon of the type proposed and explained in management action development guideline 6M-1

Table 28. Monitoring plan for the startup of a methanogenic (anaerobic) lagoon

PARAMETER / UNITS	SAMPLING SITE	FREQUENCY	OBSERVATIONS
PH (upH)	All lagoons and affluent to the first lagoon	Daily	The design conditions could modify this plan
Total alkalinity	All lagoons		
Bicarbonate alkalinity	All lagoons		
Alkalinity ratio (R)	All lagoons		
COD (mg/l)	All lagoons	2 /week	
Temperature (^oC)	Entrance to the first lagoon	daily	
Volume of flow (l/s)	Entrance to the first lagoon		

- **Monitoring of system operation**

Preliminary treatments

No special samplings are required at the desanders, screens and flow measurement structure, unless required by the detail engineering. Guideline 6M-2 indicates certain parameters which must be measured at the site such as pH, volume of flow and temperature, given that control of subsequent phases of the treatment system depends on these.

Stabilization lagoon control parameters

After the startup of the system, that is, when it is biologically acclimatized, a very serious and systematic monitoring routine will be required for the stabilization lagoons. Table 29 shows the parameters, sampling sites and frequencies.

Table 29. Stabilization lagoon control parameters

PARAMETER/UNIT	SAMPLING SITE	FREQUENCY	OBSERVATIONS
PH (upH)	Affluent and effluent of each lagoon	3 times/week	The final design can alter this monitoring routine
Temperature (^oC)	Affluent and effluent of each lagoon	Daily	
Total alkalinity (ALT)	Anaerobic lagoon effluent	1 time/week	
Bicarbonate alkalinity (ABV)	Anaerobic lagoon effluent	1 time/week	
Alkalinity ratio (R)	Anaerobic lagoon effluent	1 time/week	
	Optional lagoon effluent	3 times/week	
COD, mg/l	De-oiled tank (lagoon) effluent	1 time/month	
	Anaerobic lagoon effluent	1 time/week	
Total Solids (TS), mg/l	Anaerobic lagoon effluent	1 time/month	
Dissolved Solids (DS), mg/l	Optional lagoon effluent	1 time/month	
	Anaerobic lagoons	2 times /year	
PH, TS, Suspended Solids (SS), DS, FS, ALT, BOD_5 , COD, N-TOTAL, $N\text{-}NH_4$, P –TOTAL, S-TOTAL	Final effluent to the receiving body	2 times /year	The characterization must be complete and the analyses must be carried out at a laboratory recognized by the environmental authority

- **Monitoring of Liquid Waste from the preparation of agrochemicals**

The Management Plan in its prevention (14P-1) and mitigation (6M-1) action development guidelines recommends in this case avoiding this type of waste 100% due to its dangerousness and complex treatment. The company must train its field personnel very carefully, and in particular the persons in charge of preparing fertilizer and pest control solutions, to use the full amount of the product. Mixtures from the rinses must be used to prepare new solutions.

In case there is any waste, the beneficiaries must coordinate with ASOHECA and FUTURO AMBIENTAL to carry out a treatability study for this type of waste. This will be the only way to know the type of system to be designed and the monitoring plan to be implemented. The greater the control at the source and the minimization of effluents, the lower the treatment costs and the risks of contamination.

- **Monitoring of domestic liquid waste**

Domestic liquid waste, due to its universal characteristics and wide research regarding management and treatment alternatives, offers the possibility of accessing very important secondary information. If this information is used by skilled personnel, it will help avoid, or at least minimize, many of the treatability, design and particularly, effluent monitoring costs. The systems proposed in dimensioning guidelines 5M-1 and 5M-2 demand, more than monitoring procedures supported by samplings and laboratory analyses, controls in essential aspects such as:

1)- designs made by skilled personnel,
2)- adequate location of the pre-treatment and subsoil infiltration systems,
3)- construction and materials in keeping with the relevant designs,
4)- rigorous operation and maintenance based on the respective manuals (which must be delivered by the designer or by the supplier of the units). If these conditions are met, no samplings will be required, as the recommended infrastructure does not generate effluents and uses the natural capacity of the soil for the biological degradation (up to 100%) of pre-treated domestic liquid wastes.

- **Monitoring of point sources of atmospheric emissions**

The project does not generate significant pollution of this type in any of its phases, so no specific management actions were designed for this topic and, therefore, no special atmospheric monitoring procedures are required

- **Monitoring of bodies of water**

In order to be able to quantify and establish balances between the project discharges and the baseline, it is recommended to measure them at least once every two (2)

years, in the bodies of water. This information is very important, particularly in order to establish the historical behavior of the project and its relationship with the natural environment.

No special monitoring recommendations are made for the soil element, as the guidelines set out in the Follow-up plan indicate that it is not necessary to establish procedures of this type.

5.8.5 Schedule

Table 30 presents the schedule of activities to be carried out and their duration from the moment that they are approved and the company defines date zero for their implementation. The activities use the same codes and definitions of the EMP. Activities with higher priority have been shaded in a dark tone, while those that, although important, could be managed at a longer term by the company, have been indicated through a lighter shade. The times indicated include, in most cases, the hours dedicated to reviewing, final designs, work programming, construction, startup, operation. etc. A period of two and a half years has been taken as the time for mandatory works, that is, the mitigation, correction and prevention measures that respond to environmental requirements and targets established in Colombian Law, to be developed. It is understood that many of the proposed activities must exist throughout the duration of the project

Table 30. Schedule for the performance of EMP measures

Guideline	Action to be taken	YEAR 1												YEAR 2											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Apply the measures contained in the PERSUAP (*Pesticide Evaluation Report and Safer Use Action Plan*)																									
1P	Design specific and mandatory routes for the transport of materials, supplies and products such as latex and others associated with it.																								
2P	Define agrochemical management, storage and processing areas, using 100% of the solutions prepared, and organize them within an Integrated Pest and Disease Management (IPDM) plan.																								
3P	Study to characterize and classify solid and liquid discharges.																								
4P	Implementation and permanent monitoring of an Integrated Pest and Disease Management - IPDM - System.																								
5P	Avoid the washing of soils, infiltration, runoff, so as not to alter the quality of the waters and soils.																								
6P	Define and prepare management sites for products and by-products from the nonindustrial processing of																								

Guideline	Action to be taken	YEAR 1												YEAR 2											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	latex																								
7P	Planning of work fronts for removal of the plant cover and upper soil horizon, conserving the protection strips for the water sources.																								
8P	Carry out land improvement tasks during dry periods and prevent exposure of the soils to the action of external agents for long periods of time																								
9P	Avoid conducting activities in primary and secondary forest cover areas in an advanced development phase																								
10P	Train the personnel of the operator and associates (FUTURO AMBIENTAL - ASOHECA) in soil management and conservation techniques																								
11P	Education of personnel and beneficiary associates in techniques for the rational use of water.																								
12P	Education in solid waste management and final disposal techniques																								
13P	Study to minimize liquid and solid wastes from the nonindustrial latex processing phase and implementation of results																								
14P	Encourage the growing and rational use of fuelwood forests and combustible solid wastes, as energy sources.																								
15P	Prevent burning during land preparation activities and educate the operators and beneficiaries.																								
16P	Encourage biological corridors through the identification of strips allocated to the protection of water sources and demarcation of farms																								
17P	Conduct environmental education workshops with emphasis on the prevention of impacts of the plantation production phase on the flora and fauna																								
18P	Permit, to the extent allowed by phytosanitary control, the natural regeneration of stubble and other natural vegetation. Coordinate with IPDM																								
19P	Develop and implement contingency and industrial safety programs, in all project development and operation phases																								
20P	Take into account the recommendations and management instructions of the agrochemical production companies. Coordinate with IPDM																								
21P	Avoid the use of cuttings extracted																								

Guideline	Action to be taken	YEAR 1												YEAR 2											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	from the forest as tutors for the associated pepper trees, implementing the use of asexual reproduction species																								
22P	Adopt the technical and legal criteria for road construction and improvement																								
1M	Implement and systematically monitor liquid and solid waste minimization component, as an important component of the IPDM																								
2M	Manage and technically dispose of liquid wastes from agrochemical preparation and management, as a program tied in with Integrated Pest and Disease Management IPDM																								
3M	Develop, spread, implement and monitor a contingency management program related to the use of agrochemicals, tied in with the IPDM																								
4M	Establish and maintain a good plant cover for natural regeneration in the plantations																								
5M	Implement sanitation systems that allow for the management of solid wastes generated in beneficiary homes and nursery administrative areas.																								
6M	Implement treatment and final disposal of liquid wastes in beneficiary homes and nursery administration areas.																								
7M	Implement waste minimization and cleaner production plans																								
8M	Implement appropriate techniques for the management and final disposal of plant wastes generated in the preparation of the land.																								
9M	Implement actions aimed at the conservation of areas of interest and influence of the plantations																								
10M	Treatment and final disposal of liquid wastes from the pilot plant																								
1C	Restore the plant cover in the regulatory water source protection areas in order to prevent the transport of solids and erosion of the banks																								
2C	Schedule critical point identification and maintenance activities																								
3C	Clean river beds and sites used for gathering, temporary management or inadequate disposal of wastes																								
4C	Review the allotment policy for crop substitution, rejecting proposals that involve clearing of the secondary forest																								

5.8.6 Budget

The Environmental Management Plan (EMP) for Rubber projects in the departments of Putumayo and Caquetá is composed of thirty-four (34) management actions. The design, implementation and/or performance of these actions involves in some cases an investment of financial resources, but there are other cases in which the actions can be carried out with the capacity, the organization and the operating resources of the project itself and/or its operators, and therefore, do not require additional investments of financial resources. A total of eighteen (18) actions involving additional financial investments and sixteen (16) that could be developed with resources identified and existing in the same institutional capacity of the projects are identified.

Among these groups of measures, two types can be identified according to the priority and rigor of the proposed actions, given that, in many cases, their implementation may depend on the direct relationship between the impact and risks to human health and the environment in general; or also depends on legal requirements. There could also be cases where the proposed measure results in lower final waste disposal costs or fees. In this case, implementation is dependent upon a strictly financial decision and therefore the operator must decide when the action is to be implemented.

Based on these considerations, a budget has been prepared, consisting of four groups, namely:

- Actions involving a rigorous financial investment, with high priority and requiring immediate implementation.
- Actions involving a rigorous financial investment, with low priority and optional and gradual implementation.
- Actions that do not involve a rigorous financial investment, with high priority and requiring immediate implementation.
- Actions that do not involve a rigorous financial investment, with low priority and optional and gradual implementation.

Finally, two additional measures to be considered have been included: the first one has to do with the development of the measures proposed by the PERSUAP (*Pesticide Evaluation Report and Safer Use Action Plan*), attached to this document. Also included is the cost of preventive measure 14P, which is optional and its implementation is left to the discretion of each operator. Finally, the total cost of the proposed measures is shown.

Actions involving a rigorous financial investment

- **High-priority and immediate implementation actions**

The high-priority management actions requiring new and/or additional investment and recommended for immediate implementation are presented below in Table 31:

Table 31. Cost of high-priority and immediate implementation actions

Guideline	ACTION TO BE TAKEN	DESCRIPTION OF THE COSTS					TOTAL COST			
							PUTUMAYO		CAQUETÁ	
		Designs	Materials and equipment	Personnel	Unit cost	Training workshops	Pesos	US$	Pesos	US$
PERSUAP (*Pesticide Evaluation Report and Safer Use Action Plan*)										
1P	Design specific and mandatory routes for the transport of materials, supplies and products such as latex and others associated with it.	3,000,000					3,000,000	1,042	3,000,000	1,042
4P	Implementation and permanent monitoring of an Integrated Pest and Disease Management - IPDM - System.	20,000,000	20,000,000	10,000,000			50,000,000	17,361	50,000,000	17,361
12P	Education in solid waste management and final disposal techniques					8,000,000	8,000,000	2,778	-	-
						14,000,000	-	-	14,000,000	4,861
2M	Manage and technically dispose of liquid wastes from agrochemical preparation and management, as a program tied in with Integrated Pest and Disease Management IPDM					2,850,000	2,850,000	990	-	-
						5,000,000	-	-	5,000,000	1,736
3M	Development, spread, implementation and monitoring of a contingency management program related to the use of agrochemicals, tied in with the IPDM					2,850,000	2,850,000	990	-	-
						5,000,000	-	-	5,000,000	1,736
5M	Implement sanitation systems that allow for the management of solid wastes generated in beneficiary homes and nursery administrative areas.		7,575,000			1,500,000	9,075,000	3,151	-	-
			13,308,600			3,000,000	-	-	16,308,600	5,663
6M	Treatment and final disposal of liquid wastes in beneficiary homes and nursery administrative areas in the department of Putumayo. Includes **250 systems and one nursery**				1,100,000		276,100,000	95,868	-	-
	Treatment and final disposal of liquid wastes in beneficiary homes and nursery administrative areas in the department of Caquetá. Includes **175 systems and one nursery**				1,100,000		-	-	193,600,001	67,222
10M	Treatment and final disposal of liquid wastes from the pilot plant						-	-	-	-
		30,000,000			150,000,000	-	-	-	180,000,000	62,500
TOTAL							***351,875,000***	***122,180***	***446,908,601***	***162,121***

Exchange rate: $2,880.oo

- **Low-priority and optional and gradual implementation actions**

The low-priority management actions requiring new and/or additional investment and recommended for optional implementation, at the discretion of each operator, are presented below in Table 32:

Table 32. Cost of low-priority and optional and gradual implementation actions

Guideline	ACTION TO BE TAKEN	DESCRIPTION OF THE COSTS					TOTAL COST PUTUMAYO		CAQUETÁ	
		Designs	Materials and equipment	Personnel	Unit cost	Training workshops	Pesos	US$	Pesos	US$
2P	Define agrochemical management, storage and processing areas, using 100% of the solutions prepared, and organize them within an Integrated Pest and Disease Management (IPDM) plan.	5,000,000					10,000,000	3,472	10,000,000	3,472
3P	Study to characterize and classify solid and liquid discharges.			25,000,000			25,000,000	8,681	25,000,000	8,.681
11P	Education of personnel and beneficiary associates in techniques for the rational use of water.	10,000,000	8,000,000			2,000,000	20,000,000	6,944	-	-
		10,000,000	12,000,000			3,500,000	-	-	25,500,000	8,854
13P	Study to minimize liquid and solid wastes from the nonindustrial latex processing phase and implementation of results	5,000,000	5,000,000	7,000,000			17,000,000	5,903	17,000,000	5,903
16P	Encourage biological corridors through the identification of strips allocated to the protection of water sources and demarcation of farms	5,000,000				1,800,000	6,800,000	2,361	-	-
		5,000,000				3,290,000		-	8,290,000	2,878
17P	Conduct environmental education workshops with emphasis on the prevention of impacts of the plantation production phase on the flora and fauna					7,800,000	7,800,000	2,708	-	-
						13,660,000	-	-	13,660,000	4,743
19P	Develop and implement contingency and industrial safety programs, in all project development and operation phases					2,850,000	2,850,000	990	-	-
						5,000,000	-	-	5,000,000	1,736
20P	Take into account the recommendations and management instructions of the agrochemical production companies. Coordinate with IPDM					2,850,000	2,850,000	990	-	-
						5,000,000	-	-	5,000,000	1,736
8M	Implement appropriate techniques for the management and final disposal of plant wastes generated in the preparation of the land.					8,000,000	8,000,000	2,778	-	-
						14,016,000	-	-	14,016,000	4,867
9M	Implement actions aimed at the conservation of areas of interest					8,000,000	8,000,000	2,778	-	-

Guideline	ACTION TO BE TAKEN	DESCRIPTION OF THE COSTS					TOTAL COST PUTUMAYO		CAQUETÁ	
		Designs	Materials and equipment	Personnel	Unit cost	Training workshops	Pesos	US$	Pesos	US$
	and influence of the plantations					14,016,000	-	-	14,016,000	4,867
TOTAL							***108,300,000***	***37,605***	***137,482,000***	***47,737***

Exchange rate: $2,880.oo

- **Voluntary action**

The cost of measure 14P submitted for consideration by the operators for its implementation, is shown in Table 33, below:

Table 33. Cost of the optional management measure

Guideline	ACTION TO BE TAKEN	DESCRIPTION OF THE COSTS		TOTAL COST PUTUMAYO		CAQUETÁ	
		Cost stoves	Training workshops	Pesos	US$	Pesos	US$
14P	Encourage the cultivation and rational use of fuelwood forests and combustible solid wastes, as energy sources in the department of Putumayo. Includes installation of 250 stoves	125,000,000	5,000,000	130,000,000	45,139	-	-
	Encourage the cultivation and rational use of fuelwood forests and combustible solid wastes, as energy sources in the department of Putumayo. Includes installation of 438 stoves	219,000,000	8,760,000	-	-	227,760,000	79,583
TOTAL				***130,000,000***	***45,139***	***227,760,000***	***79,583***

Exchange rate: $2,880.oo

Actions that do Not Involve Additional Financial Investment

This section lists those actions that can be developed with the capacity, organization and operating resources of the projects themselves.

- **High-priority and immediate implementation actions**

Priority management actions that do not require additional investment, are of high priority and recommended for immediate implementation are presented below in Table 34:

Table 34. High-priority and immediate implementation actions

Guideline	ACTION TO BE TAKEN
6P	Define and prepare management sites for products and by-products from the nonindustrial processing of latex
7P	Planning of work fronts for removal of the plant cover and upper soil horizon, conserving the protection strips for the water sources.
8P	Carry out land improvement tasks during dry periods and prevent exposure of the soils to the action of external agents for long periods of time
9P	Avoid conducting activities in primary and secondary forest cover areas in an advanced development phase
10P	Train the personnel of the operator and associates (FUTURO AMBIENTAL - ASOHECA) in soil management and conservation techniques
15P	Prevent burning during land preparation activities and educate the operators and beneficiaries.
22P	Adopt the technical and legal criteria for road construction and improvement
1C	Restore the plant cover in the regulatory water source protection areas in order to prevent the transport of solids and erosion of the banks
2C	Schedule critical point identification and maintenance activities
3C	Clean river beds and sites used for gathering, temporary management or inadequate disposal of wastes
4C	Review the allotment policy for crop substitution, rejecting proposals that involve clearing of the secondary forest

- **Low-Priority and Optional and Gradual Implementation Actions**

Low-priority management actions which might not require an additional financial investment and recommended for optional and gradual implementation at the discretion of each operator are shown below in Table 35:

Table 35. Actions that do not require high priority and immediate implementation

Guideline	ACTION TO BE TAKEN
5P	Avoid the washing of soils, infiltration, runoff, so as not to alter the quality of the waters and soils.
18P	Permit, to the extent allowed by phytosanitary control, the natural regeneration of stubble and other natural vegetation. Coordinate with IPDM
21P	Avoid the use of cuttings extracted from the forest as tutors for the associated pepper trees, implementing the use of asexual reproduction species
1M	Implement and systematically monitor liquid and solid waste minimization component, as an important component of the IPDM
4M	Establish and maintain a good plant cover for natural regeneration in the plantations
7M	Implement waste minimization and cleaner production plans

Total Cost of the EMP

The total costs of the EMP is C$1,064,565,600.oo (US$369,643.oo) for the two locations where rubber plantations will be planted. The cost of the Putumayo is C$406,175,000.oo (US$159,785.oo) and the Caquetá EMP costs $604,390,600.oo (US$209, 858.oo). The exchange rate used was $2,880.oo. See cost breakdown in management guideline in Table 36..

Table 36. Total budget of the rubber EMP by department

TOTAL COST			
PUTUMAYO		CAQUETÁ	
Pesos	US$	Pesos	US$
460,175,000	159,785	604,390,601	209,858

Exchange rate: $2,880.oo

The only measure proposed as optional is 14P: Encourage the growing and rational use of firewood forests and combustible solid wastes, as energy sources. Which proposes the construction of efficient stoves at a cost of C$130,000,000.oo (US$45,139.oo) and in Caquetá of C$227,760,000.oo (US$79,083.oo).

5.9 INSTITUTIONAL STRENGTHENING FOR ENVIRONMENTAL MANAGEMENT

Environmental management in the company does not end with the preparation of the Environmental Management Plan; on the contrary, the activities proposed by it are so many and so diverse, that it is necessary to design a basic institutional structure, which guarantees the efficient performance of two fundamental strategies: 1- environmental management inside the company, and 2- environmental management outside the company. These two strategies are based, for their development, on two special institutional activities, namely: the structuring of an Environmental Administration System at ASOHECA and FUTURO AMBIENTAL, and the preparation of a plan to carry out the environmental legal regulation activities, indicated in the Environmental Requirements Matrix, which establishes the interinstitutional environmental relations framework for the operator companies of the project.

5.9.1. Bases for implementation of an Environmental Administration System at ASOHECA and the FUNDACIÓN FUTURO AMBIENTAL

An Environmental Administration System –EAS is a set of environmental rules, activities, instruments, procedures and principles, used by an institution in order to attain its environmental objectives and goals. Its purest definition is written in the implementation guidelines for environmental management systems, developed in support of the ISO 14001

Standard[37]. It should be clarified that the EAS, is not proposed in this case with the purpose of complying with environmental requirements established in the standard but, as an autonomous reference for the operator companies, in order to facilitate the administration and execution of the Environmental Management Plan presented as a substantial part of the Environmental assessment -EA, for the rubber alternative development projects in Caquetá and Putumayo.

Purpose

To present the Basic Plan of activities to be carried out for the implementation of an Environmental Administration System, during the operation of the different phases of the rubber project, at the beneficiary locations in Caquetá and Putumayo.

Development

- **Basic General Information**

The guide presented below, is based on the recommendations of the NTC ISO 14001 Standard. If the company considers the implementation of each of these requirements feasible, it may access a certification process, although the priority is the proper implementation and administration of the proposed Environmental Management Plan.

- **Procedure for Implementation of an EAS**

Table 37 below describes the guidelines to be followed by both ASOHECA and the FUNDACIÓN FUTURO AMBIENTAL (FFA), for the implementation of an EAS.

[37] NTC ISO 14001 Standard and NTC 14004 Standard.

Table 37. Procedure for Implementation of an EAS

STEP	ACTIVITY	OBSERVATIONS AND RECOMMENDATIONS
1.	Define Senior Management commitment.	Senior Management must appoint a person in charge of environmental matters in the Company.
2.	Prepare the INITIAL ENVIRONMENTAL REVIEW – IER. The most important activities under this item are:	This is a responsibility of Management, with the support of the person in charge of environmental management, at both ASOHECA and the FFA. This job is practically done with the EMP.
2.1.	Identification of the legislative and regulatory requirements.	Included in the EA study. See Environmental Requirements Matrix and Environmental Management Guide
2.2.	Identify the environmental aspects of your activities, products or services, in order to determine which have or could have significant environmental impacts.	This task has been fully developed in the EA
2.3.	Performance evaluation against the relevant criteria, external standards, regulations, codes of practice and establishment of principles and guidelines.	The evaluation must be made when the decision to implement the EAS is taken. The company has not carried out any work or activity, so both ASOHECA and FFA must start from zero and adopt the EMP 100%.
2.4.	Identification of existing environmental policies and procedures.	New activity. The environmental policy for ASOHECA and FFA must be defined, based on the USAID/CHEMONICS policies.
2.5.	Feedback on the investigation of work accidents or incidents.	New activity.
2.6.	Points of view of the interested parties (community, clients, employees, etc.).	New activity. Establish a consultation system with the users, neighbors and other people indirectly related to the project.
2.7.	Functions or activities of other Organizational Systems which might promote or prevent satisfactory results from the environmental point of view.	New activity. This point can be resolved with an inventory of aspects which might potentially inhibit the success of the EMP.
2.8.	Document the conclusions and opportunities for improvement identified.	The guidelines developed within the EMP are assumed as the basic support for this activity.
3.	Define an environmental objective, establish the targets, prepare a plan to be accomplished and allocate a budget.	It is initially recommended to assume the limits established in the Colombian standards and summarized in the Environmental Requirements Matrix.
4.	Establish a program.	ASOHECA and FFA must define the persons responsible, their tasks, the times of performance and resources, based on the environmental management actions that make up the EMP.
5.	Implement the EAS.	The system must be documented, communicated and financed. Management representatives must be formally appointed. An official installation, including personnel from the farms in the two departments, is recommended.
6.	Conduct employee training.	Prepare an instruction and training needs plan. Evaluate the capability of your employees to carry out the EAS tasks.
7.	Define the communication channels.	Design, implement and evaluate the communication strategy, both internal and external.

STEP	ACTIVITY	OBSERVATIONS AND RECOMMENDATIONS
8.	Document the EAS. At least the following activities:	
8.1.	Environmental policy.	Remember that the policies are a summary of the environmental principals and foundations perceived and assumed by ASOHECA and the FFA.
8.2.	Environmental aspects	All activities that generate environmental impacts
8.3.	Legal requirements.	Developed in the EMP and the EA.
8.4.	Environmental objectives	The following is proposed for the beneficiary farms at both locations: "comply with the standards and requirements established by Colombian rules and regulations, for the orderly performance of the rubber activities". In any event, what is important is for the intention to materialize in measurable and attainable objectives.
8.5.	Environmental targets.	Must be defined based on the company's ENASrations. See previous note for environmental objectives.
8.6.	Environmental administration program(s).	Activities to attain the environmental objectives and targets defined. Involves taking the EMP responsibilities to the various units, according to the organization structure of ASOHECA and FFA.
8.7.	Structure and responsibility	It is mandatory to deliver responsibilities by units and farms in each region
8.8.	Training.	Define a training plan. Otherwise, both operators will be forced to spend considerable resources in external environmental advice and consultancy.
8.9.	Communications.	The distances between the managements of ASOHECA and FFA make a good communication system even more necessary and rigorous.
8.10.	Document control.	The mistake of having too many documents should not be made, but it is necessary to have a minimum number of these and an excellent control system.
8.11.	Operation control.	In this case, it is recommended to limit control to the operations related to ENVIRONMENTAL ASPECTS, as these are directly associated with impact generation.
8.12.	Emergency procedures.	It is recommended to study the guidelines related to agrochemical management.
8.13.	Monitoring and measurement	Undertake the Control, Follow-up and Monitoring Plan in full.
8.14.	Non-conformities, corrective actions and preventive actions.	The non-conformities are detected in periodic reviews of the EMP, ordered by the management of ASOHECA and FFA. Consist of tasks not carried out, or developed in an unsatisfactory manner, as they do not lead to the attainment of the environmental objectives and targets.
8.15.	Record control.	Records are documents that show what, who, how and where an activity forming part of the EMP and the EAS was carried out. The management of ASOHECA and the FFA must establish the was to systematically and promptly review and control those records.
8.16.	EAS Audit	The recommendation to the management of ASOHECA and the FFA is to conduct internal audits of the EAS and the EMP, at least once a year.
9.	Control the EAS documentation	Any person in a position of responsibility must have the correct information and everyone must know where the information is kept.
10.	Control of activities for the attainment of the proposed targets	Operational control consists of those procedures necessary for an action, system or environmental technology to operate within the specified conditions.

STEP	ACTIVITY	OBSERVATIONS AND RECOMMENDATIONS
11.	Identify risks of emergencies.	New activity. In the case of the latex industrial processing plant, proposed for the Department of Caquetá, it is recommended to prepare a ASSESSMENT OF OPERATING RISK FACTORS.
12.	Verify progress in your programs.	ASOHECA and FFA must establish and maintain documented procedures to regularly monitor and measure the key characteristics of their operations and activities which might have a significant impact on the environment. The EA control and monitoring plan is a great contribution to this activity.
13.	Correct the errors detected.	Identify the causes of the errors, prevent their repetition by taking the appropriate actions to correct the problem.
14.	Perform record control.	Keep and control the following records: – Legislative and regulatory requirements – Permit and compliance records – Environmental aspects of the organization – EAS audit and review reports – Personnel training certificates – Maintenance records – Incident reports – Communications with interested parties – Recognitions for environmental results – Identification of product composition – Customer-supplier agreements – Monitoring data – Plans to correct deficiencies – Review of results – Calibration records – Other.
15.	Periodically audit the EAS.	Periodically review the performance of your EAS, apply corrective actions and start again. Define the specialized outside personnel and agencies.
16.	Review and improve your progress.	The Senior Management of ASOHECA and the FFA must review the EAS at intervals in order to ensure its continuing suitability, adequacy and effectiveness.

- **Costs of the EAS**

The implementation of the EAS is a voluntary option for the operator companies of the rubber projects in Caquetá and Putumayo. Their essential obligation lies in the correct implementation of the Environmental Management Plan, for which, even without adopting the EAS, each company must carry out a specific assessment in order to determine which of the following two alternatives is more viable: 1- implement the EMP, with the advice and assistance of an external advisory entity, or 2- develop their own capacity and infrastructure, which would minimize the costs and generate a certain independence and sufficiency in the topic. The best thing, before making any decision, is to appoint a professional to take charge of the matter and prepare, as a first task, the EMP implementation plan, as well as the convenience and costs of doing so through an EAS. With this outlook, it is understood that if ASOHECA and the FFA wish to be effective in their environmental management, they require at least one professional in the environmental field, for a minimum period of one year. This would demand, at least, a budget of 24 million pesos, considering a comprehensive salary of two (2) million pesos per month.

- **Guide for the allocation of responsibilities in the implementation and operation of the EAS at ASOHECA and the FFA.**

Table 38 includes a detailed listing of the activities, tasks and basic functions of the EAS for the companies ASOHECA and FUNDACIÓN FUTURO AMBIENTAL (FFA), and also presents the profile of the person or area that will be responsible for the various activities proposed in the Environmental Management Plan.

Table 38. Responsibilities, Functions and Tasks of the different areas (activities) of the companies ASOHECA and FFA, to the EMP and the EAS

UNIT	FUNCTION	TASKS TO BE PERFORMED BY THE PERSON IN CHARGE*
General Director	Is the moral leader of the project	Defines the company's ENVIRONMENTAL policy. Appoints the person in charge of managing the execution of the EMP and the EAS. Assigns RESPONSIBILITIES and AUTHORITY in environmental matters. Allocates the resources for the EAS. Periodically reviews the effectiveness of the EAS. PROFILE: Manager of ASOHECA and of FAA
Human Resource or social work area	His main function is related to the topics of the formation and professional competency of personnel in general and, in this case, of environmental matters.	Identify the needs for environmental EDUCATION. Promote environmental AWARENESS among all employees. Determine the level of EDUCATION and experience for specialized functions. Keep personnel education and qualification records. PROFILE: These functions and tasks may be undertaken by the Department or the person in charge of Social Development at the rubber project operators.
Commercial Area	The commercial officer, area or department must play the role of project promoter, detecting possible customer requirements or demands and following the steps of the competition. He will lead the communication work with the interested parties (community and customers).	External communication. Monitoring of the competition. Information to customers on the environmental products and services offered by the Cooperative. Promotion of the final product (latex) as an environmentally-friendly product. PROFILE: Whoever performs the latex marketing and sale functions.
Administrative Area	Information Management and records related to the EAS.	Process gathering. Information flows. File management. Minute preparation and control. PROFILE: Administrative division of the operators.
Purchasing	Supplier and contractor control in topics related to the EMP and EAS requirements.	Encourage suppliers and contractors to adopt an environmental policy and effectively communicate any anomaly or incidence. Identification of environmental aspects related to foreign products and services. Supplier selection.
Latex production and processing	Ensure the application of written procedures to effectively carry out key operations and activities which might affect the environment.	Implement Waste minimization plans. Waste management (reduction, reutilization, recycling, treatment). Environmental objectives and targets. Impact prevention. Contingency plans. Integrated Pest and Disease Management (IPDM) PROFILE: Separate responsibilities must be defined: 1). Purchasing Personnel (Plantation) and 2). Latex industrial processing plant.

UNIT	FUNCTION	TASKS TO BE PERFORMED BY THE PERSON IN CHARGE*
Maintenance	As with production, functions must be carried out according to specific and documented procedures.	Preventive maintenance of machinery and equipment. Calibration of measuring equipment. Stopping and starting of the activity. Temporary closing of facilities. Maintenance of protection areas in rubber plantations with agroforest arrangements. . PROFILE: The persons responsible for the following must be defined: 1). production. 2). For the latex industrial processing plant.
Engineering and Design	This person, area or department will be responsible for designing processes and products that are more respectful of the environment.	Reengineering of crop planting, harvesting, processing and eradication processes and procedures. Substitution of toxic materials. Mud separation. Design and improvement of biological pest control systems. PROFILE: The most advisable way to proceed would be to set up an Engineering and Design committee, since the project does not propose a department of this type.
Environment, Quality and Safety person or department. (The ISO 14001 Standard does not mandatorily require a department, but does require a clearly defined environmental structure and responsibilities).	Undertake most of the work load involved in an EAS. To such end, the work must be coordinated with other departments or individuals. Process the permits.	Coordinate the creation of the EAS Document Base. Manage the CONTROL of the documentation. Conduct internal audits in each region of the EAS. Identify and update the applicable environmental legislation. Perform measurements and recordings. Overall monitoring of the EAS. PROFILE: A person with great ability to coordinate, negotiate, plan, achieve goals and direct others.

5.9.2 Environmental Planning and Legal Management System of the Rubber Project In Caquetá and Putumayo.

Table 39 below indicates the steps to be taken by both ASOHECA and the FFA to obtain the relevant permits related to the implementation and operation of the project.

ENVIRONMENTAL ASSESSMENT STUDY
ALTERNATIVE RUBBER DEVELOPMENT PROJECT
ENVIRONMENTAL MANAGEMENT PLAN

ENVIRONMENTAL ADMINISTRATION SYSTEM
PROCEDURES AND STEPS BEFORE THE ENVIRONMENTAL AUTHORITIES FOR THE ENVIRONMENTAL PLANNING OF THE PROJECT

Table 39. Environmental requirements matrix

PROCESS	DEFINITIONS AND PROCEDURES BEFORE THE ENVIRONMENTAL AUTHORITY	REGULATORY DECREES
SURFACE WATER CONCESSION	In order to have direct access to the water sources (that is when water is not supplied by a particular institution, such as a water company or an irrigation district) a specific permit known as a Water Concession must be requested from the respective Regional Autonomous Corporation. Concessions, which have a term of 10 years, may be granted by two procedures: • Individual assignations to individuals or legal entities that require the water for any purpose. • Official regulation of currents by the corporation at the request of the interested parties, when there are several users and competing uses in the area of influence of a current. Concessions are granted in the following order of priorities: 1. Urban or rural collective human consumption (water supply systems). 2. Individual domestic uses. 3. Collective or individual farming uses. 4. Hydroelectric power generation. 5. Industrial uses. 6. Mining uses. 7. Recreational uses. **General procedures to obtain a water concession** Obtain a water concession application form at any office of the corresponding Autonomous Corporation (CORPONOR) and return it, properly filled out with the information and certificates required as special attachments. In general terms, these are: • Specify proposed use of the water • Description of the systems to be adopted for collecting, diverting, distributing and restoring surpluses. • Information on the easements that will be required for exploitation of the waters and to execute the projected works • Term for which the concession permit was requested. • Copy of the real-estate registration of the property that will benefit from the concession, issued by the Public Instrument Registry Office. •	Water concessions, which are governed by the provisions of Decree 1541 of 1978, are administrative acts by which an individual or legal entity, public or private acquires a right to exploit waters for any use. The administrative act defines the volume of flow and operating pattern, as well as the obligations of the user as to management and construction of the required collection and distribution works. Must be processed for each user under the coordination of the operators: ASOHECA and FUTURO AMBIENTAL

PROCESS	DEFINITIONS AND PROCEDURES BEFORE THE ENVIRONMENTAL AUTHORITY	REGULATORY DECREES
SURFACE WATER CONCESSION	• Pay the fees corresponding to the inspection visit, at the indicated financial institution. The respective Autonomous Regional Corporation will study the title deeds and issue the writ admitting the application, indicating the date and time of the inspection visit. At least 10 days before the inspection visit, the entity will post at a public place in its offices and at the offices of the mayor or the local police inspector, a notice indicating the place, date and purpose of the visit, so that anyone who believes they have a right to intervene may do so. The issuance of the resolution is communicated to the interested party so that it may be served notice of same and as of that date the work or activity may be carried out or the obtaining of resources may be processed, if necessary. The beneficiary must publish the approval resolution in the Official Gazette.	Water concessions, which are governed by the provisions of Decree 1541 of 1978, are administrative acts by which an individual or legal entity, public or private acquires a right to exploit waters for any use. The administrative act defines the volume of flow and operating pattern, as well as the obligations of the user as to management and construction of the required collection and distribution works. Must be processed for each user under the coordination of the operators: ASOHECA and FUTURO AMBIENTAL
GROUND WATER CONCESSION	The application must be filed by the owner. If the well is part of a project that requires an environmental license, the user must first process the license with the Corporación. After the well is built, the water concession o exploitation license must be applied for. The user must fill out a form which may be obtained from the Corporación, specifying the volume of flow requirements and operating pattern. He must also attach the technical information of the well (pump test, lithological column and design), chain of title certificate or public deed of the property and Chamber of Commerce certificate in case the owner is a company or industry. Based on this information, on the degree of exploitation and the availability of the ground waters in the area where the property is located, the entity issues the exploitation license through a resolution. In it it defines the volume of flow, the operating pattern for each well (daily, weekly and monthly) or the groundwater collection works, as well as the user's obligations. This license will be in force throughout the useful life of the well. When a well is abandoned because its useful life has run out and is then replaced by a new well, the respective exploitation license must be processed for the new well.	A well drilling permit must first be processed for the ground water concession. A letter is sent to the entity requesting a well drilling permit. The name of the property, the use of the water and the required volume of flow must be included here. Where required, the following must be processed for each operator: ASOHECA AND FUTURO AMBIENTAL
DISCHARGE PERMIT	In order to obtain the discharge permit, users must observe the provisions of Decree 1594 of 1984. In case the permissible limits are not observed, users must implement a compliance plan, which will specify the activities proposed by the user, which must be approved by the environmental authority, establishing the time limits to attain the minimum quality requirements for the discharge. In addition to the information requested for the water concession, discharge permits normally require:	The discharge permit is the authorization granted by the environmental authority to all users generating liquid discharges, as established by Decrees 1594 of 1978 and 1594 of 1984. It will only apply for the

PROCESS	DEFINITIONS AND PROCEDURES BEFORE THE ENVIRONMENTAL AUTHORITY	REGULATORY DECREES
	• Discharge quality study, conducted by an authorized laboratory. • Identification of the recipient bodies of the discharge. • Description of the production facilities or processes and location of the discharges. The Autonomous Regional Corporation will process the application as established by law and after a technical assessment of the information, with communicate its position, by means of a duly supported resolution.	pilot plant installed in Caquetá - ASOHECA
FOREST UTILIZATION PERMIT	The permit will only be granted to the owner of the work, activity, industry or establishment which proves the ownership of the lands. The general procedure is as follows: • Application for the permit, in writing, from the relevant environmental authority, providing evidence of the ownership of the lands. • Certificate of existence and legal representation in the case of a legal entity. • Detailed technical study with all the characteristics of the site and volume of exploitation. • Estimated project cost. • Description of the general environmental characteristics of the location. • Indicate whether areas of the national park system are affected. • Opening of writ to order the visit. • Technical opinion. • Answer through duly supported resolution.	The forest utilization permit to establish rubber plantations in suitable areas is the authorization issued by the environmental authority through an administrative act in conformity with the guidelines established in Decree 1791 of October 4, 1996, Chapter 10, article 70 The schedules to this document include the lists of users of each department, Putumayo and Caquetá, containing: identification number, geographical location (municipality – rural area (vereda)), and the unit to which they belong; to be delivered to CORPOAMAZONIA, so that it may register each Rubber Afforestation and its associated crops, by each one of the operators: ASOHECA AND FUTURO AMBIENTAL
SPECIAL PROCEDURES	**For environmental management plans** In the case of environmental management plans, the environmental authority, through an administrative act, notifies the company and attaches the terms of reference for their preparation. Once the environmental management plan has been submitted, the respective Regional Autonomous Corporation assesses it and issues the technical opinion for its approval through a duly supported resolution. Similarly, the Corporación reserves the right to conduct the technical visits it deems appropriate, in order to verify data o carry out the relevant follow-up and control. The legal representative of the company must promptly submit the environmental reports that may be requested through the means authorized by the Corporación.	

PROCESS	DEFINITIONS AND PROCEDURES BEFORE THE ENVIRONMENTAL AUTHORITY	REGULATORY DECREES
	For environmental assessment and environmental license In the case of the environmental assessment (EA), as a decision-making and environmental planning instrument, it will be required in all cases demanding an environmental license. The contents and depth of the EA must be in keeping with the characteristics of the project, work or activity, according to the terms of reference established by the environmental authority. The environmental license is the authorization granted by the competent environmental authority, through an administrative act, to a person, for the execution of a project, work or activity which according to the law and regulations may cause serious damage to the renewable natural resources or to environment, or introduce considerable or notorious changes in the landscape, and which establishes the requirements, obligations and conditions which must be met by the beneficiary of the environmental license.	Decree No. 1728 of August 6, 2002, "Which regulates Title VIII of Law 99 on 1993 on the Environmental License"
	For the implementation of retribution rates In general terms, the Self-declaration form contains: • Data of the collection source (Volume of flow in l/seg and time of use in h/day, BOD5 TSS in mg/l). • Data of the contaminating load to the effluent, preferably after the treatment (BOD5, TSS in mg/l, volume of flow in l/seg and time of discharge h/day). Based on the information, the value of the regional factor and the minimum rates, the amounts payable each month per load are calculated, according to the formulas included in the decree.	In accordance with Decree 901 of 1997, the interested party or the duly organized companies obtain from the respective Corporación the Self-declaration form to be filled out. This will only apply for the Pilot Plant installed in Caquetá

SECTION 6. LIST OF PREPARERS

Thomas Black Arbeláez.
General Director of the Study
Msc Economics - University of Texas
Executive Director of the Centro Andino para la Economía en el Medio Ambiente (CAEMA). Was Head of the Analysis and Economic Policy Office of the Colombian Ministry of the Environment during the period 1996-2000, where he directed the National Strategy Study for the Implementation of the Clean Development Mechanism in Colombia. Formed part of the Colombian negotiating delegation to the Climate Change Convention for three years, in charge of the negotiations on the Clean Development Mechanism. Was a research economist for the United States Congress, where he worked and published papers on the use pollution charges for lead, negotiable rights for the control of SO_2, and tax incentives to promote environmental investment. Has been a professor of environmental economy at the Master's level at Andes (Bogotá), Javeriana (Bogotá) and Concepción (Chile) Universities. Has published numerous papers and conducted several studies for the World Bank, the IDB, ECLAC, OECD and GTZ, among others, on the Clean Development Mechanism. Consultant for the World Bank, the Prototype Carbon Fund (PCF), the NSS-CDM (World Bank) on training in the Clean Development Mechanism and the development of studies related to the topic.

Luis Fernando Castro Hernández
Technical Director of the project
Consultant in EA
Sanitary and Environmental Health Engineer - Universidad de Antioquia
Urban-regional planning specialist
Sanitary and environmental health engineer Universidad de Antioquia, Urban-Regional Planning Specialist Universidad National, Conflict Management Facilitator for Sustainable Development Fundación Futuro Latinoamericano (Ecuador). Deputy Director General - Environmental Management, Deputy Director - Planning and Deputy Director - Control and Monitoring Corporación Autónoma Regional de los Ríos Negro y Nare – CORNARE, Responsible for implementing Retribution Rates Program at CORNARE. Researcher, lecturer and head of the advice and consultancy unit of the Centro Andino para la Economía en el Medio Ambiente – CAEMA

Liana Morera Yock
Consultant on agricultural science, environment and agrochemical management
Agronomist - Universidad de Costa Rica
Master's degree in Economics with emphasis on project assessment - Universidad de los Andes.
French graduate study program in economics - University of Versailles (France)

Agronomist. Agricultural Economist Universidad de Costa Rica, MSc. Economics Universidad de los Andes, DEA Integrated Economic, Social and Territorial Development University of Versailles. Project analyst - Servicio Nacional de Aguas Subterráneas, Riego y Avenamiento de Costa Rica; Researcher on Environmental Economics Support Unit for Pollution Control – Colombian Ministry of the Environment; Economic Advisor for the Development and Implementation of Economic Instruments for Pollution Control in the Economic Assessment Office Ministry of the Environment. Worked in the design of the decree on pollution charges in Colombia, Responsible for implementation of the Colombian Pollution Charges Program. Associate researcher and head of the training unit of the Centro Andino para la Economía en el Medio Ambiente.

Felipe Fonseca Fino
Field professional and advisor on forestry and environment
Forest Engineer of the Universidad Distrital Francisco José de Caldas with academic training in the management of geographical information systems as natural resource planning instruments. Has worked as Consultant in Land Use Planning, and regional environmental management, preparing municipal and regional diagnoses, analyzing physical and biotic links and relationships; has also carried out assessment and planimetric representation based on CAD and ArcVIEW and prepared technical documents. Jobs in which he has had the opportunity to socialize with different communities for their participation. Has worked in the private sector as consultant and legal representative of an environmental consultancy firm, participating in tenders for government and non-government entities, preparing proposals and carrying out projects

Orlando González
Field professional and in charge of civil infrastructure aspects (roads)
Technologist in civil works
Last semester student in civil engineering

María Janet Gómez Botero
Social worker - Universidad Francisco de Paula Santander
Work in the social area Operador Palma

Martha Liliana Sarmiento Ardila
Administrator
Business administrator - Universidad Nacional de Colombia
Specialization in Project Assessment - Universidad de los Andes
Experience in accounting and administrative management of companies related to the training at the primary and secondary school level, extramural training related to management and organization, and specific professional training in economic instruments for environmental protection. Research assistant in programs and projects related to agricultural protection.

Yohany Antonio Acosta Aguilar
Information technology - logistics support

Automation engineering and graphic design student - Universidad de La Salle
Experience in preparation of web pages and databases. Support in computer equipment and network maintenance.

Gloria Valencia Gallego
Psychology student - Universidad Antonio Nariño
Experience
Administrative assistant
Management and coordination of correspondence, support in internal and external communications, and other logistic support activities.

Maria Teresa Lara
Translator
María Teresa Lara, English-Spanish translator with more than 20 years of experience in her field. Graduated from Universidad Javeriana and obtained her license as official translator registered at the Colombian Ministry of Foreign Affairs in 1979. Certified by the American Translators Association (ATA) as an English-Spanish translator in 1998. Currently works for several law firms and important international companies, mainly in the legal area, but also in financial and commercial topics and, more recently, has done work in the field of information technology and telecommunications.

SECTION 7 APPENDIX

7.1 BIBLIOGRAPHY

COLOMBIA. Leyes, Decreto, etc. Ley 99 de 1993. Por la cual se crea el Ministerio del Medio Ambiente, se organiza el Sistema Nacional Ambiental (SINA), y se dictan otras disposiciones.

_____. Decreto No. 1728 de Agosto 6 de 2002, "Por el cual se reglamenta el Título VIII de la Ley 99 de 1993 sobre la Licencia Ambiental"

CONESA FDEZ.-VITORA Vicente, 1995. Guía metodológica para la evaluación del impacto ambiental. Ediciones Mundi – Prensa, Madrid, Barcelona, México. 390 p.

_____, 1997. Auditorias Medioambientales, Guía metodológica. Ediciones Mundi – Prensa, Madrid, Barcelona, México. 552 p.

INSTITUTO COLOMBIANO DE NORMAS TÉCNICO Y CERTIFICACIÓN -ICONTEC- Guía implementación de la norma NTC ISO 14001. Bogotá, 1997

7.2 CONCLUSIONS

- Even before taking any of the preventive, mitigative or corrective measures indicated in the EMP, the substitution of the 1,250 hectares of coca with 2,500 hectares of agroforest arrangements of rubber with plantain, pepper and timber in Putumayo, and rubber with arazá, plantain and timber in Caquetá, will greatly benefit the initial reference status, since the impacts generated on the soil, waters and human resources are entirely eliminated as a consequence of the preparation, planting, marketing and eradication of coca (which is an obligation of the State).

- The most important measure, and therefore the one that represents the most significant cost among the activities budgeted in the EMP ($ 180 million), has to do with the management, treatment and monitoring of wastewater from the industrial processing of latex, proposed for the Caquetá project.

- Another substantial cost under the EMP, is that related to the mitigation of the problem of excreta disposal and wastewater management in the farms where the nonindustrial processing of latex is carried out. In the case of Caquetá, where there are 438 farms (beneficiary families), a total of 482 million pesos must be invested in individual treatment systems. In Putumayo, where 250 families will benefit, the required investment is 276 million pesos. The remaining costs are related to training and generation of capability and knowledge for environmental management. As long as the farms continue to use the same sewerage and final disposal system for discharges from the nonindustrial processing of latex and domestic wastewater, it will be necessary to implement combined and cost-effective systems, which guarantee minimum basic sanitation conditions in the homes. This condition makes the investment in basic sanitation (grease traps, septic tanks and filters) essential in the farms of Putumayo and in those of Caquetá that will not be processing latex in the pilot plant.

  In this case it is important to underscore that these problems will continue, even without the implementation of the rubber project at both locations, as these are basic sanitation problems of the homes, which must be resolved by users who are home owners.

- After the potential impacts of wastewater discharges, we should highlight those generated by the preparation of the soil and the general management of agrochemicals. The families store the agrochemicals without the minimum safety measures.

- The project does not impact the air resource, in any of its phases or at either location.

- The condition of the roads and the incipient marketing mechanisms for temporary products such as plantain, can affect the alternative development model designed, generating distrust among some families and parallel coexistence, for lack of family means of support, of certain users with the illicit activities (coca planting), which the rubber and basic subsistence crop agroforestry projects are trying to correct in the communities. This phenomenon occurs more strongly in Putumayo.

- The beneficiary properties of the projects are for the most part plots of land previously dedicated to farming, pasture lands, planted with subsistence crops or coca. A lower percentage (approximately 20%) are secondary succession relicts, which were felled to plant rubber. This situation indicates that the illicit crop substitution and beneficiary selection policies should be strengthened, with better assessment and control measures.

- Biodiversity, one of the most important aspects in the project area, will be amply benefited with the planting of the rubber and its supplement with the biological corridors that are being proposed, mainly for the water source protection areas. Because rubber is a native species of the Amazon region, and by proposing a technical management, subject to environmental control and management measures, the gradual restitution of the flora and fauna species, which were displaced by the practices established by cattle farming and coca plantations, is guaranteed.

- If the EMP and its optional Environmental Administration System (EAS) component are implemented, the region and the subsector of the economy consisting of rubber production and processing, would add an environmental institutional development component of great value and interest to the area. Despite the environmental and institutional benefits, the project should be considered with greater ambition going beyond simple compliance with the environmental requirements, to think of a product that is so clean that it can be marketed taking advantages of its ecological characteristics, in the international markets.

- The development of rubber farms and production units in the regions of Caquetá and Putumayo, should become a positive element, for the supervision and control of access roads and secondary roads in the region. The road infrastructure is vital to the future of the beneficiary communities, but also to the environmental equilibrium that must be guaranteed throughout the Amazonia. It is necessary to guarantee and supervise it through roads with better environmental specifications in their construction and maintenance.

- The illicit coca crop substitution project, through the alternative development option, with rubber planting and its various agroforest arrangements, supplemented with the proposed EMP, is without a doubt, an opportunity for social redemption. Although the implementation and proper administration of the EMP ensure environmental equilibrium and sustainability conditions, there is no doubt that the most significant

impact relates to the improvement of the socioeconomic conditions of the beneficiaries, and to the ray of hope it provides for those who, for lack of alternatives, continue immersed in the infrahuman conditions and uncertainty generated for society by the illegal economy of illicit crops.

- The analysis of alternatives allows us to conclude that the third option is the most appropriate for the sustainability conditions that must be guaranteed by a project of this nature, in an area requiring special care, such as Amazonian foothills.

7.3 RECOMMENDATIONS

- The first thing which ASOHECA and the FUNDACIÓN FUTURO AMBIENTAL must do, as operators and responsible for environmental management in their respective projects, is to study the proposed environmental management actions in detail, in order to proceed to design an OPERATING IMPLEMENTATION PLAN. It is very important to study, with priority, the chapter which develops the Environmental Administration System – EAS, as it provides all the guidelines to structure the institutionality required for the implementation and operation of the EMP.

- The EMP has been designed to give priority to the environmental measures and limits established in the first place by Colombian legislation, by Regulation 216, which governs the environmental policies of the USAID/CHEMONICS, and by measures which have been proven and backed by the self-control techniques and voluntary systems for business environmental management. In this respect, it is recommended to give priority in the implementation of those measures identified in the budget as of mandatory compliance. Actions such as the following are highlighted in this recommendation: the wastewater treatment and management infrastructure at the rubber processing pilot plant in Caquetá. – The construction of combined treatment systems for domestic and industrial waters in the farms of Caquetá and Putumayo, which continue to process latex by nonindustrial methods – The measures related to best soil management and preparation techniques for planting.- The structuring, implementation and administration of Integrated Pest and Disease Management (IPDM). The training of workers and beneficiaries in the responsible management agrochemicals. – A reforestation plan for areas in an advanced state of erosion or which present threats for people and crops. In this case, it is recommended to supplement the EMP, taking an inventory at all the farms in order to establish the specific reforestation operating plan. The water source protection areas which are not in this situation, do not require a reforestation plan but an induction plan for natural revegetation.

- In the Putumayo area, and in those farms in Caquetá that will not be using the latex processing pilot plant; where users will continue to process latex by nonindustrial methods, with the consequent use of substantial quantities of water and the discharge of significant volumes of liquid waste, polluted with organic substances, it is a priority to build combined systems for liquid waste management and treatment. The farms that do not generate industrial wastewater must implement a self-management process, aimed at guaranteeing better basic sanitation conditions. The law provides that this is the responsibility of each home owner.

- In the department of Putumayo, the FUNDACIÓN FUTURO AMBIENTAL should become involved in a management process, committing resources of the Municipality,

the Department, the environmental authority and other entities interested in attaining a better condition and construction process of the roads. The management plan has included in guideline 22P (as preventive and not as mitigative measures), certain recommendations for the environmental management of roads, despite the fact that their construction is not part of this project. In any event, there is a high risk of failure, if when the time comes to market the products of the farms, there are no good roads available. It is very important that the managers of ASOHECA and FFA, or the persons in charge of processing the permits and licenses, clarify before CORPOAMAZONÍA that this project does not include road construction and, therefore, does not require any permit related to this item.

- The person in charge of environmental management at ASOHECA and FFA must identify the ENVIRONMENTAL REQUIREMENTS MATRIX, as well as the guideline which specifies the relevant environmental processes and permits, in detail. It is essential that several copies be made and a meeting be planned with the competent officers of CORPOAMAZONÍA, to begin the environmental legalization process. Each operator must open or update its own environmental procedures file.

- The EMP plan involves many training activities. To minimize costs, it is recommended that the operators generate their own knowledge and command of the topics, whenever possible, in order to subsequently make the internal transfer and implementation of the relevant measures in the beneficiary farms of the project. To the extent that they are less dependent on consultants, and learning is supported by illustrative and participative mechanisms, the environmental actions to be implemented cease to be tasks and become true processes intended to "do – do[38]".

- In order to minimize the costs involved in the environmental sanitation of the homes in each farm, a community project is recommended, which must become involved in a management process with the municipality and the environmental authority, where instead of the users making the entire investment, co-financing schemes are proposed. A training project in sanitation and home improvement through self-construction can be developed with the SENA. This will not only solve the problem, but also, the family and friends of the rubber project beneficiaries will receive training in building and related topics, in addition to generating a few additional temporary jobs.

- If the operator companies are thinking, as they in fact wish to do and the market is demanding, of gaining spaces from the competition and consolidating themselves in the sector, they must, sooner than later, consider certifying their ENVIRONMENTAL MANAGEMENT SYSTEM. The study has been developed in many of its methodological concepts and approaches, observing the recommendations of the ISO 14000 techniques, which will facilitate decision making and the undertaking of a project for these purposes. Being more ambitious, these companies should plan on investigating with INTERNATIONAL GREEN MARKET

[38] This means that not only are problems solved, but also, the capacity to solve them is created.

CERTIFICATION entities, so that after fully implementing the EMP, added value is generated for product, marketing it as "GREEN RUBBER FROM THE COLOMBIAN AMAZONIA"[39].

- A first exploration of the sustainability and socioeconomic and environmental impact conditions of the project indicates that there is a good chance than it will produce these benefits. The conditions are met, not only to produce high quality latex but also to generate better financial results and benefit more poor families of the Amazon region. It is recommended to carry out a project which assesses this potential.

- The actions recommended and the pre-dimensioned measures correspond to the best possible assessment and the best utilization of the information gathered and provided by USAID/CHEMONICS. Although most of them can be applied through a direct interpretation of the recommendations in the development guidelines, there are others, such as those related to specific sanitary engineering topics, which must be elaborated in greater detail. It is recommended to obtain the advice of specialized personnel for the final development of these measures.

- The recommendation is to implement option three of the environmental assessment of alternatives as the most appropriate and in line with the sustainability conditions required for the rubber project and for the Amazonian foothill area.

[39] National green market strategic plan. Ministry of the Environment, 2002.

7.4 SOCIAL LESSONS LEARNED DURING THE FIRST YEAR OF THE PROJECT IN CAQUETÁ.

- The educational process was implemented through active participation of the community that attended workshops on specific themes related to the rubber productive chain, associated crops, farm management and illicit crop issues. Training included bridge and road's maintenance, etc. These activities provided for social cooperation, solidarity and community interaction.
- The most important element was the active participation of the project beneficiary community in all processes. Experiences, expectations, special conditions in the region and knowledge of the area were taken into consideration by workshop organizers.
- Women and children participated in agro-forestry activities, fodd security and understanding of social and economic impacts caused by illicit crops, something that the participants had not noticed before.
- Collective motivation was evident in the response given by the community on adoption of technical recommendations, the farm's "new-look", the feeling of becoming part of the project, inquiries, and demonstrated desire of participation and commitment to the project
- It was possible to demonstrate to the community benefits derived from the project other than rubber farming, such as the opportunity to obtain educational benefits for children, improvement of the local road network, and health and informal training programs.
- Promotion of sport events and recreation assisted in a rebirth of the sense of community togetherness, and new interchange on common experiences and project development.
- People participated freely, without any feeling of hesitation, showing respect for ideas expressed by others. Technicians and social promoters earned the empathy of the participants in an open-minded ambience. Participants did not discriminate illicit crop growers, but did not patronize illegal activities either; their motivation was simple: participate in licit farming such as rubber, as an alternative to assure the future of their families. This created strong trust bonds among project beneficiaries, as participants shared common objectives and found sincere people willing to help them and living up to their commitments.
- The idea of "working together" in organized teams allowed for intensive community participation in activities of common interest. Participants were organized in groups of 20 people; this facilitated carrying out projects such as road and bridge's repairs and maintenance. People went back to the "*minga*", the traditional Indian system of "getting together and working together" in common projects, a way to achieve greater productivity in common farming activities such as planting rubber trees.
- New spaces for examining family issues were also created.
- Participants renewed their love for the land, as rubber farming provided the opportunity for long-term employment and social stability. Ignacio Vargas, a project

beneficiary expressed his feeling *"Thanks to the Almighty God, we have the support of an organization such as Asoheca, that remembered us and is helping us to move ahead. We never had before a project coming to our lands, such as rubber. Thanks to this project we are organizing ourselves and joining together in a single cause: rubber.*"

- Not having coca paste for sale recuperates the sense of security, self-confidence and self-esteem in any armed illegal group, as stated by Francisco Pastrana, a project beneficiary: " *I had about 24-hectares of coca, and even though I had always cash in my pockets, I was never able to get a good night's sleep, I was always carrying a gun, I lived in constant fear, I was the victim of several attacks, but thanks to God, my life was spared. However, all my neighbors and fellow coca-farmers are six feet under. That was when I made up mi mind and decided to end up coca growing. When the new project arrived, I had only 3-hectares of coca left. I eradicated all of it. I have no longer coca in my farm, instead, I now have peace and tranquility. I am grateful that the project gave me the opportunity of pulling out the coca plants. Now, I have my rubber trees and great hopes for a better future".* .
- Asoheca arrived in the Santiago de la Selva area shortly after a massive exodus of farmers fleeing illegal armed groups that attacked rural and urban populations alike. Asoheca provided assistance to displaced families and incentives to go back to their farms.
- Asoheca quickly organized farmers in nuclei around the project, the only alternative available to change their living conditions. Families engaged in farming activities and garden-crops, small-farm animals. Training in modern technologies was provided to participating families through workshops implemented by the project social team.
- Positive environmental and social impacts followed replacement of eradication of illicit crops by legal farming, as well as financial aid through the community services and credit funds.
- Farmers are being motivated to leave coca behind in favor of program sponsored activities that will assist them in improving their living conditions, that provide honest earnings.
- Participating communities returned to traditional team-work systems, and neighbor's meetings to discuss community projects such as school and road improvements, health programs and vaccination drives, sports and community fairs. Communities are also realizing the importance of the assistance rendered by public institutions and NGOs that provide assistance in solving community issues. Ashoeca has played a crucial role in community recuperation.
- The social work component is a key element in implementing any development project. A large percentage of the project social assistance was carried out successfully. Project beneficiaries need guidance in submitting projects and related activities to GCO agencies, and seeking assistance to resolve problems affecting the communities. Training workshops are not enough to find solutions to pressing community issues, social work must address these problems and find appropriate solutions.

- Project beneficiary farmers were able to identify the illicit crop issues by themselves, and sought commitments to keep their lands free from coca
- An important issue is generating awareness amongst producers on the importance of ethic and moral values, as well as establishing these values within the family, the community and the region.
- Another key factor is promoting the right scale of values amongst children, and interest in sports.

- Source: Asoheca, 2003

7.5 FOOD SECURITY LESSONS LEARNED DURING THE FIRST YEAR OF THE PROJECT IN CAQUETÁ

- Project participants need more availability of food and continuing cash-crop production: cassava, corn, garden vegetables, eggs and milk, as well as establishing adequate dietary provisions.
- Farmers found in food security arrangements a daily income generation activity, such as egg-laying hens.
- Logistics for acquisition of cattle was established in each project unit (nucleus) with active participation of the beneficiaries who learned how to deal with this activity in the future.
- Food security including fowl and garden vegetables helped farmers in discovering other licit productive activities apart from dairy products, that can generate income; and that several families, specially in La Samaria, were able to purchase more hens investing their own money and increase the number of hens provided under the CAD project.
- Neighboring communities soon learned and wanted to replicate food security schemes; this prompted farmers to seek technical assistance from the nearest project unit, requesting a visit to their farms to join the voluntary illicit crop eradication program. This facilitated selection and identification of future project beneficiaries, and meeting Asoheca project coca voluntary eradication goals in the immediate future.
- Egg consumption improved family diets adding nutritional values (protein, vitamins). In the words of a participating lady: *"Now our food is improved, we have eggs and coleander to replace meat…"*

Source: Asoheca, Project Progress Report, First Year, 2003

7.6 ENVIRONMENTAL IMPACTS RATED AS LOW (B) ANDERY LOW (MB) CAUSED IN THE RUBBER PROJECT IN CAQUETA

PROJECT PHASE	CELL	ENVIRONMENTAL IMPACT CAUSED IN THE PROJECT PHASES ON THE ENVIRONMENT	CLASS	ENVIRONMENTAL RATING	ENVIRONMENTAL IMPORTANCE	NATURAL ELEMENT
			C	Ca	IA	
VEGETABLE MATERIAL PRODUCTION PHASE	B2	Contamination caused by waste discharge from soil preparation activities	N	-2,9	B	SOIL
	I2	Contamination caused by discharge of solid waste runoffs from pest control activities in the seedling nursery	N	-3,0	B	
	J2	Contamination caused by discharge of solid waste runoffs from pest control activities in the soil	N	-3,0	B	
	L2	Contamination caused by discharge of solid waste from soil preparation for fill in bags to be used for transplantation of seedlings	N	-3,4	B	
	O2	Contamination caused by discharge of solid waste from pest control activities in preparation of seedling bags in the nursery	N	-3,4	B	
	U2	Contamination caused by discharge of solid waste from pest and disease control activities in the clone garden	N	-3,0	B	
	A4	Contamination of soil due to improper management of agrochemicals (storing and/or application) in nursery installations and sanitary infrastructure.	N	-2,9	B	
	H4	Contamination of soil due to improper management of agrochemicals (storing and/or application) in nursery activities	N	-3,1	B	
	I4	Contamination of soil due to improper management of agrochemicals (storing and/or application) in pest and disease control in the nursery	N	-3,1	B	
	L4	Contamination of soil due to improper management of agrochemicals (storing and/or application) in filling seedling bags in the nursery	N	-2,9	B	
	Ñ4	Contamination of soil due to improper management of agrochemicals (storing and/or application) in management bags in the nursery	N	-3,1	B	
	O4	Contamination of soil due to improper management of agrochemicals (storing and/or application) in management of pests and disease in bags in the nursery	N	-3,1	B	
	T4	Contamination of soil due to improper management of agrochemicals (storing and/or application) in management of the clone garden	N	-3,1	B	
	B5	Erosion and loss of organic layers from preparation of soil in the nursery	N	-2,0	MB	
	B6	Affectation of soil hydro-geologic dynamics due to soil preparation activities in the nursery	N	-0,7	MB	
	G6	Affectation of soil hydro-geologic dynamics due to irrigation and drainage systems in the nursery (soil)	N	-0,7	MB	
	N6	Affectation of soil hydro-geologic dynamics due to irrigation and drainage systems in the nursery (bags	N	-0,1	MB	
	B7	Alteration of natural systems due to change of use of soil resource, from preparation the nursery (soil)	N	-0,7	MB	
	J7	Alteration of natural systems due to change of use of soil resource, from preparation the nursery (bags)	N	-0,7	MB	
	P7	Alteration of natural systems due to change of use of soil resource, from preparation the clone garden	N	-0,7	MB	
VEGETABLE MATERIAL PRODUCTION PHASE	I8	Contamination for improper disposal of solid waste (bags, containers, etc.) and or materials from pest and disease control in the nursery (soil)	N	-1,7	MB	SOIL
	O8	Contamination for improper disposal of solid waste (bags, containers, etc.) and or materials from pest and disease control in the nursery (bags)	N	-1,7	MB	

PROJECT PHASE	CELL	ENVIRONMENTAL IMPACT CAUSED IN THE PROJECT PHASES ON THE ENVIRONMENT	CLASS	ENVIRONMENTAL RATING	ENVIRONMENTAL IMPORTANCE	NATURAL ELEMENT
			C	Ca	IA	
VEGETABLE MATERIAL PRODUCTION PHASE	U8	Contamination for improper disposal of solid waste (bags, containers, etc.) and or materials from pest and disease control in the nursery (clone garden	N	-1,7	MB	
	W10	Quality alteration due to washing of agrochemical products in containers and equipment, generated during the vegetal material production phase	N	-1,9	MB	WATER
	A11	Quality alteration and/or the hydro-biologic resource due to liquid waste discharge generated during housing and sanitary infrastructure process	N	-1,8	MB	
	I11	Quality alteration and/or the hydro-biologic resource due to liquid waste discharge generated during plague and disease control in the nursery (soil)	N	-1,9	MB	
	J11	Quality alteration and/or the hydro-biologic resource generated by liquid waste discharge generated during preparation of soil in the nursery (bags)	N	-1,2	MB	
	O11	Quality alteration and/or the hydro-biologic resource generated by liquid waste discharge generated during pest and disease control in the nursery (bags)	N	-1,7	MB	
	U11	Quality alteration and/or the hydro-biologic resource generated by liquid waste discharge generated during pest and disease control in the clone garden	N	-1,9	MB	
	A12	Alterations due to solid waste generated during activities in nursery installations and sanitary infrastructure	N	-0,7	MB	
	I12	Alterations due to solid waste generated during pest and disease control activities in the nursery (soil)	N	-0,8	MB	
	O12	Alterations due to solid waste generated during pest and disease control activities in the nursery (bags)	N	-0,8	MB	
	U12	Alterations due to solid waste generated during pest and disease control activities in the clone garden	N	-1,8	MB	
	B13	Affectation of aquifers and/or watersheds generated during soil preparation activities in the nursery (soils)	N	-1,1	MB	
	A14	Alterations generated by burnings and forest fires originated in homes and sanitary infrastructure	N	-1,6	MB	AIR
	B14	Alterations generated by burnings and forest fires originated in nursery soil preparation activities (soil)	N	-2,2	B	
	I15	Contamination generated by small particles originated during pest and disease control activities in the nursery (soil)	N	-1,5	MB	
	L15	Contamination generated by small particles originated during pest and disease control activities in the nursery (soil)	N	-0,9	MB	
	O15	Contamination generated by small particles originated during pest and disease control activities in the nursery (bags))	N	-0,9	MB	
	U15	Contamination generated by small particles originated during pest and disease control activities in the clone garden	N	-1,5	MB	
	W16	Contamination generated by small particles originated during pest and disease control activities in the clone garden	N	-1,4	MB	
	B18	Alteration of fauna and flora generated during preparation of soil in the nursery (soil)	N	-0,6	MB	BIODIVERSITY
	I18	Alteration of fauna and flora generated during pest and disease control activities in the nursery (soil)	N	-1,7	MB	
	J18	Alteration of fauna and flora generated during preparation of soil in the nursery (bags)	N	-0,3	MB	
	O18	Alteration of fauna and flora generated during pest and disease control activities in the nursery (bags)	N	-0,9	MB	
	P18	Alteration of fauna and flora generated during preparation of soil in the clone gardenl	N	-0,5	MB	
	R18	Alteration of fauna and flora generated during sowing of clones in the clone garden	N	-0,5	MB	

PROJECT PHASE	CELL	ENVIRONMENTAL IMPACT CAUSED IN THE PROJECT PHASES ON THE ENVIRONMENT	CLASS	ENVIRONMENTAL RATING	ENVIRONMENTAL IMPORTANCE	NATURAL ELEMENT
			C	Ca	IA	
	U18	Alteration of fauna and flora generated during pest and disease control activities in the clone garden	N	-1,7	MB	
	B19	Inadequate extraction of renewable natural resources during preparation of soil activities in the nursery (soil)	N	-1,4	MB	
	J19	Inadequate extraction of renewable natural resources during preparation of soil activities in the nursery (bags)	N	-0,5	MB	
	W20	Damages to equipment and infrastructure that could generate accidents during development of the integral production phase of vegetal material	N	-1,0	MB	SOCIAL
PLANTATION PRODUCTION PHASE	AI6	Alteration of the hydro-biologic dynamics generated by irrigation and drainage activities during plantation production phase	N	-1,1	MB	SOIL
	AC8	Contamination for improper disposal of solid waste (bags, containers, etc.) and/or materials during rubber tree planting activities during the plantation production phase	N	-1,4	MB	
	AC12	Alterations generated by solid waste (bags, containers, etc.) disposal during rubber tree planting activities during the plantation production phase	N	-2,2	B	WATER
	AJ12	Alterations generated by disposal of solid waste during pest and disease control activities in the plantation production phase	N	-3,5	B	
	Z13	Quality alteration and/or the hydro-biologic resource generated by liquid waste discharge during the land clearing and soil preparation during the plantation production phase	N	-1,8	MB	
	AD18	Alteration of fauna and flora generated during establishment of associated crops during the plantation production phase	N	-2,7	B	BIODIVERSITY
RUBBER PROCESSING PHASE	AM9	Establishment and development of disease vectors generated during collection of latex during rubber processing	N	-1,3	B	SOIL
	AO9	Establishment and development of disease vectors generated during lamination processes	N	-1,3	B	
	AL10	Quality alteration due to washing of agrochemical products in containers and equipment, generated in beneficiary homes during rubbers processing	N	-4,0	B	WATER
RUBBER PROCESSING PHASE	AN11	Quality alteration and/or the hydro-biologic resource generated by coagulation during rubber processing	N	-2,8	B	WATER
	AO11	Quality alteration and/or the hydro-biologic resource generated by liquid waste discharge during the lamination processes	N	-2,8	B	
	AP11	Quality alteration and/or the hydro-biologic resource generated by liquid waste discharge during the drying process	N	-1,2	MB	
	AN13	Affectation of aquifers and/or watersheds generated by coagulation during rubber processing	N	-3,0	B	
	AO13	Affectation of aquifers and/or watersheds generated by lamination during rubber processing	N	-3,0	B	
	AS20	Damages to equipment and infrastructure that could generate accidents during development of the integral production phase of artisan rubber processes	N	-1,7	MB	SOCIAL

7.7 IMPACTS THAT CAN NOT BE ASSESSED - NE - IN THE RUBBER PROJECT IN THE DEPARTMENT OF CAQUETÁ

Cell	Impacts that can not be Assessed - NE –	Natural Element
Vegetal Material production Phase		
C1	Physical alterations generated by soil compaction during road construction and maintenance activities	SOIL
D1	Physical alterations generated by soil compaction during plotting, staking and hole digging	
K1	Physical alterations generated by soil compaction during Plotting, staking and hole digging	
J5	Erosion and loss of organic layers generated during soil preparation in nursery (bags)	
Vegetal Material production Phase		
Y1	Physical alterations generated by soil compaction during construction and maintenance of roads	SOIL
Y5	Erosion and loss of organic layers generated during construction and maintenance of roads	
Y6	Alteration of hydro-geologic dynamics generated during construction and maintenance of roads	
Y7	Alteration of natural resources generated by change of use of soil during construction and maintenance of roads	
Y8	Contamination generated by inadequate solid waste (bags, containers, etc.) and/or materials generated during construction and maintenance of roads	
Y12	Alterations generated by solid waste disposal during construction and maintenance of roads	WATER
Y13	Affectation of aquifers and watersheds during construction and maintenance of roads	
Y18	Alteration of fauna and flora generated during construction and maintenance of roads	BIODIVERSITY
Y19	Inadequate exploitation and extraction of renewable natural resources during construction and maintenance of roads	
Y26	Alteration of road networks generated during construction and maintenance of roads	SOCIAL
Y28	Destruction of rubber and associated crops generated during construction and maintenance of roads	
Y30	Community participation generated during construction and maintenance of roads	
Y32	Institutional presence generated during construction and maintenance of roads	